



# Rethinking Protected Areas in a Changing World

The 2009 George Wright Society  
Biennial Conference on Parks,  
Protected Areas, and Cultural Sites

## Program & Abstracts

### Contents

<b>The Week at a Glance</b> .....	2	Tuesday Late PM Concurrent Sessions (45–55) .....	20
<b>Meeting Room Locations</b> .....	3	Wednesday On-Going & Special Events .....	21
<b>Welcome &amp; Acknowledgments</b> .....	4	Wednesday Plenary Session .....	23
<b>Conference Overview</b> .....	5	Wednesday AM Concurrent Sessions (56–66) .....	24
The George Wright Society: Caring for Protected Areas ..	5	Wednesday Early PM Concurrent Sessions (67–77) ....	25
The GWS Biennial Conferences .....	5	Wednesday Late PM Concurrent Sessions (78–88) .....	26
The 2009 Conference Themes .....	5	Thursday On-Going & Special Events .....	27
Overview of Conference Sessions .....	6	Thursday Plenary Session .....	27
A Note on Punctuality / Last-Minute Changes .....	7	Thursday AM Concurrent Sessions (89–99) .....	29
Conference Proceedings & <i>The George Wright Forum</i> ....	8	Thursday Early PM Concurrent Sessions (100–110) ....	30
Overview of Special Events and Field Trips .....	8	Thursday Late PM Concurrent Sessions (111–121) ....	31
Powell's Books Sales Table .....	9	Friday Events & Side Meetings (Sessions 122–145) ....	32
The George M. Wright Student Travel Scholarships .....	9	<b>Abstracts</b> .....	35
The Native Participant Travel Grant Program .....	9	Monday AM Concurrent Sessions (1–11) .....	35
<b>Daily Schedule of Events</b> .....	10	Monday Late PM Concurrent Sessions (12–22) .....	42
Sunday Events .....	10	Tuesday AM Concurrent Sessions (23–33) .....	50
Monday On-Going & Special Events .....	11	Tuesday Early PM Concurrent Sessions (34–44) .....	59
Monday Plenary Sessions .....	11	Tuesday Late PM Concurrent Sessions (45–55) .....	68
Monday AM Concurrent Sessions (1–11) .....	14	Wednesday AM Concurrent Sessions (56–66) .....	74
Monday Late PM Concurrent Sessions (12–22) .....	15	Wednesday Early PM Concurrent Sessions (67–77) ....	83
Tuesday On-Going & Special Events .....	16	Wednesday Late PM Concurrent Sessions (78–88) .....	89
Tuesday Plenary Session .....	16	Thursday AM Concurrent Sessions (89–99) .....	95
Tuesday AM Concurrent Sessions (23–33) .....	18	Thursday Early PM Concurrent Sessions (100–110) ....	104
Tuesday Early PM Concurrent Sessions (34–44) .....	19	Thursday Late PM Concurrent Sessions (111–121) ....	113
		Friday Side Meetings (122–145) .....	120
		Posters / Computer Demos / Exhibits .....	123

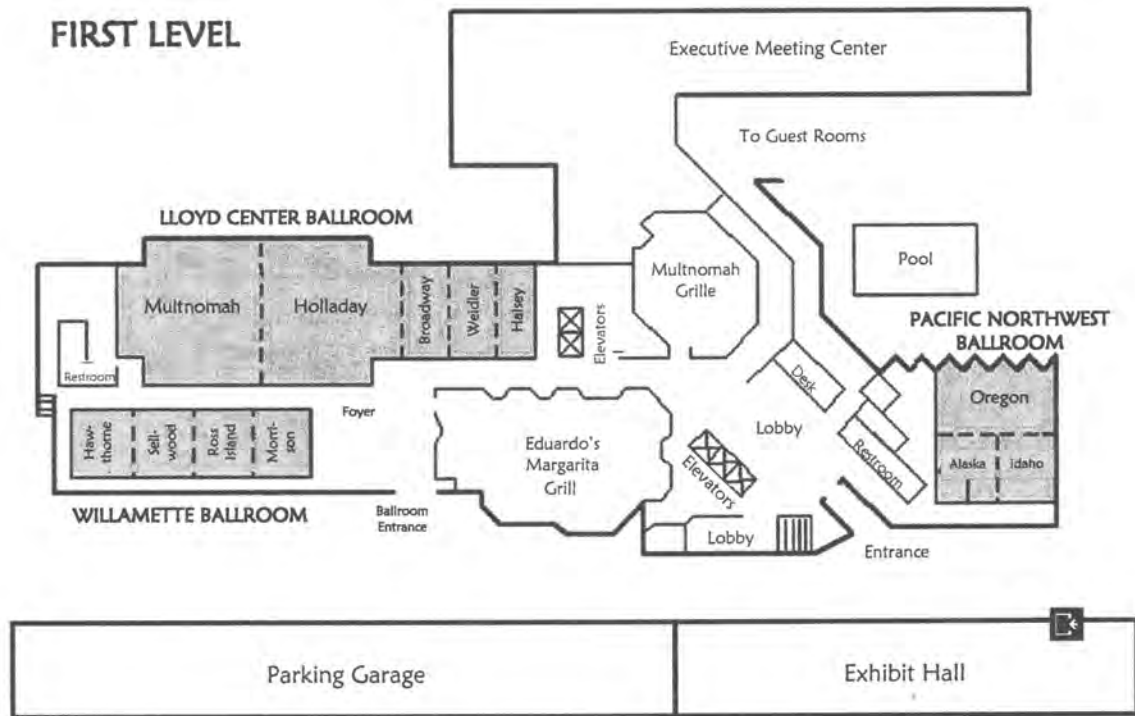
# The Week at a Glance

Time	Sunday, March 1	Monday, March 2	Tuesday, March 3	Wednesday, March 4	Thursday, March 5	Friday, March 6
7:00–8:00a		Registration (until 6:00p)	Registration (until 6:00p)	Registration (until 6:00p)	Registration (until 6:00p)	Registration (until 9:00a)
8:00–9:30a		Plenary I • Ken Burns & Dayton Duncan Film Screening	Plenary III • Thinking Like a Mountain	Plenary IV • Water for Life	Plenary V • Hana Lima Kokua (Partnerships)	Field trips depart 8:00a
9:30–10:00a		BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	SIDE MEETINGS: Concurrents 122–127 (8:00–10:00a)
10:00a–12:05p		Concurrents 1–11	Concurrents 23–33	Concurrents 56–66	Concurrents 89–99	Concurrents 128–133 (10:00a–12:00p)
12:05–1:30p		LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK (12:00–1:00p)
1:30–3:35p	Registration (until 9:00p)	Plenary II • Keeping It Real: Engaging with Youth	Concurrents 34–44	Concurrents 67–77; Half-Day Field Trips; Field Workshop	Concurrents 100–110	SIDE MEETINGS: Concurrents 134–139 (1:00–3:00p)
3:35–4:00p		BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	BREAK (complimentary beverages in Exhibit Hall)	Concurrents 140–145 (3:00–5:00p)
4:00–6:05p		Concurrents 12–22	Concurrents 45–55	Concurrents 78–88	Concurrents 111–121	
Evening	Orientations for GMW Travel Scholarship, NPTG Recipients	Welcoming Reception (7:00–8:30p)	Poster Spotlight Reception; Silent Auction Wrap-up (6:30–8:30p)	Native Social/Film Night; Special Evening Sessions; Receptions	GWS / NPS Awards Banquet (7:00–9:30p)	
Poster Session	Poster / Computer Demo / Exhibit Set-Up (3:00–9:00p)	Poster Session continues all day	Poster Session continues all day	Poster Session continues all day	Poster Session concludes (3:00p)	
Silent Auction	Item Check-in; Bidding Begins (3:00–9:00p)	Bidding continues all day	Bidding continues all day (until conclusion at 8:30p)			

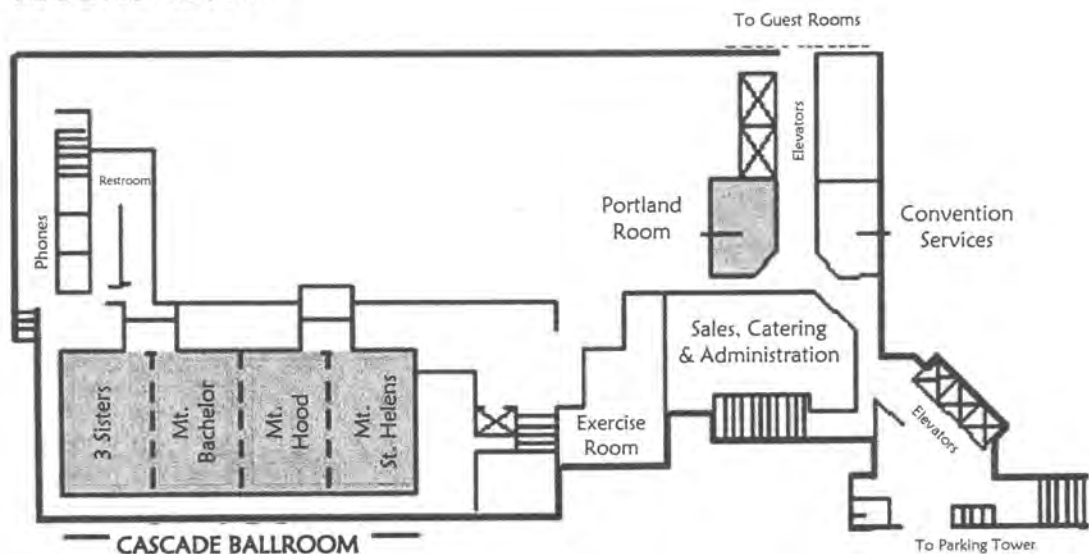
# Meeting Room Locations

## DOUBLE TREE® HOTEL & EXECUTIVE MEETING CENTER PORTLAND • LLOYD CENTER

### FIRST LEVEL



### SECOND LEVEL



1000 NE Multnomah St., Portland OR 9723  
(503) 281-6111

# Welcome & Acknowledgments

## Welcome to Portland ... and Thank You for Attending GWS2009!

Thank you for choosing to attend the 2009 George Wright Society Biennial Conference on Parks, Protected Areas, and Cultural Sites. We want to make your time here as rewarding as possible. If you have a problem, a question, or need any kind of assistance, please see a conference representative in the registration area.

***The 2009 Conference Committee and GWS Board of Directors extend a warm welcome to you!*** Chaired by Stephanie Toothman, the 2009 Conference Committee members are Brad Barr, Rebecca Conard, Rolf Diamant, Melia Lane-Kamahele, Abby Miller, Rebecca Stanfield McCown, John Waithaka, and Stephen Woodley. The members of the GWS Board of Directors are Rolf Diamant (President), Stephanie Toothman (Vice President), Rebecca Conard (Treasurer), David Graber (Secretary), Brad Barr, Melia Lane-Kamahele, Suzanne Lewis, Suzette Kimball, Brent Mitchell, John Waithaka, and Robert Winfree; Rebecca Stanfield McCown is the Graduate Student Representative to the Board. Dave Harmon is the GWS Executive Director and Emily Dekker-Fiala is Conference Coordinator. Welcome! Let us know how we can assist you.

## Our Thanks to the People Who've Helped Make this Conference Possible

First and foremost, we thank our organizational sponsors and supporters, all of whom have worked with us for many years: the National Park Service, the U.S. Geological Survey, and Eastern National. Their missions are described below.

Beyond that, the GWS is grateful to the many individuals who helped make this conference happen. For securing vital funding for the conference, our thanks go to Bert Frost and John Dennis of the National Park Service; Sue Haseltine of the U.S. Geological Survey; and Bill Schenk of HDR, Inc. We thank all the people who organized the slate of field trips. We also express our appreciation to all the institutions and individuals who helped sponsor the George Melendez Wright Student Travel Scholarships and the Native Participant Travel Grants; here, we particularly thank Gillian Bowser and Sharon Franklet, respectively, for their tireless efforts on behalf of these programs (see below for full details on the programs). Beyond this, many others provided assistance on various aspects of the conference—to all of them, we extend our sincere appreciation.

## Our Organizational Sponsors and Supporters



The National Park Service oversees nearly 400 units of the national park system for the enjoyment, education, and inspiration of this generation and those yet to come. NPS also works with local communities to preserve historic sites, develop trail systems, and advise on recreational needs. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world. <http://www.nps.gov>



The principal science agency of the Department of the Interior, the U.S. Geological Survey serves the nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect the quality of life. <http://www.usgs.gov>



In business since 1917, HDR is an employee-owned architectural, engineering, planning, and consulting firm that helps clients manage complex projects and make sound decisions. One of the largest such firms in the United States, HDR has more than 150 offices nationwide and works in over 60 other countries. <http://www.hdrinc.com>



# Conference Overview

## The George Wright Society: Caring for Protected Areas and Cultural Sites

Founded in 1980, the **George Wright Society** is an international nonprofit association of researchers, resource managers, educators, administrators, and similar professionals working in parks, other kinds of protected natural areas, and cultural and historic sites. The GWS advances the scientific and heritage values of parks and protected areas. We promote professional research and resource stewardship across natural and cultural disciplines, provide avenues of communication (such as this conference and our thrice-yearly journal, *The George Wright Forum*), and encourage public policies that embrace these values. We strive to be the premier organization connecting people, places, knowledge, and ideas to foster excellence in natural and cultural resource management, research, protection, and interpretation in parks and equivalent reserves.



**If you share these goals, please join us!** Membership in the GWS is open to anyone, and includes a subscription to *The George Wright Forum*. See the GWS display for more details. You can join here in Portland by filling out a membership form and turning it in to us at the Registration Desk, or you can do it later on-line.

Who was George Melendez Wright? He was the first scientist to work for the U.S. National Park Service, and was active in the late 1920s and 1930s. Wright was known for his keen ecological insights and winning personality. He was a strong proponent of putting “resources first” in parks and fought for ecological integrity in protected natural areas. More than this, as a Hispanic American he respected the value of cultural diversity, and understood the importance of marshaling natural and cultural resource disciplines in concert to achieve park management goals. Wright died, far too young, in a car accident. Had he lived, he had the potential to become a major figure in American conservation. With its name, the George Wright Society honors his vision.

Please visit us on-line at <http://www.georgewright.org>.

## The GWS Biennial Conferences

**GWS2009 is the 15th in a series of conferences that date back to 1976.** Since 1982, the GWS has organized the conferences, which now take place in odd-numbered years. The GWS biennial has become the USA’s largest interdisciplinary conference on parks, protected areas, and cultural sites. It is the only such conference to actively seek participation from across the entire spectrum of disciplines and activities that are necessary for successful protected area management. We welcome your comments and suggestions for improvement, so please be sure to fill out the conference evaluation questionnaire at [http://www.georgewright.org/gws2009\\_evaluation.html](http://www.georgewright.org/gws2009_evaluation.html).

## The 2009 Conference Themes

The title of these biennial conferences, “Rethinking Protected Areas in a Changing World,” is a challenge to the community of park and resource professionals to assess the large-scale changes that are transforming the world. For GWS2009, we invited people to submit proposals focused around four themes:

### “Thinking Like a Mountain”: Effective Collaboration in the Management of Protected Areas

When Aldo Leopold wrote the phrase “thinking like a mountain,” he was expressing the idea that long connection to a place is essential to understanding what is needed for effective stewardship. Many cultural groups, native and non-native, have lived close

to the land and sea, have developed deep cultural, subsistence and spiritual connections to particular places, and have acquired extensive knowledge of cycles of life, changing landscapes, and climate. As managers of parks, protected areas, and cultural sites who share stewardship responsibility with indigenous peoples and other cultural groups, there is value in better understanding these deep connections with place. Contributions under this theme will focus on fostering communication and partnership between such communities and managers.

### **Water for Life**

The conference venue in Portland—situated close to the Pacific coast at the confluence of the Columbia and Willamette rivers—affords a unique opportunity to consider the role of parks and protected areas in safeguarding both marine and freshwater resources. This theme also acknowledges the United Nation’s “Water for Life” Decade for Action (2005–2015). This theme of the conference will emphasize stewardship of natural and cultural resources associated with marine and aquatic ecosystems in parks and protected areas.

### **“Keeping it Real”: Engaging with Youth**

Long-term stewardship of the resources of parks, protected areas, and cultural sites is dependent on passing the values inherent in stewardship from one generation to the next. Although recent data on visitation show that dependent children are visiting national parks in the same numbers as in the past, concern is being expressed in both the professional and popular literature that changing recreational pursuits are resulting in “nature deficit disorder”—a growing disconnection between the current generation of children and the natural environment that could erode the commitment to stewardship. Artificial or virtual reality has become a widely embraced substitute for hands on, first-person engagement and learning. Children are not in the woods; neither are they in places connected to history and culture. Similarly, while the numbers of science Ph.D.s increase (though there are decreases in traditional zoology and botany fields), older management professionals fear that younger professionals will not have the same level of commitment to parks and protected areas shown by older professionals who have eschewed higher salaries and comfortable life styles to pursue their careers. These changes in recreation activities also impact the health of children in the United States. A deeper understanding is needed about how these changing dynamics affect learning about history and cultural traditions, understanding and appreciating the natural world, and commitment to the preservation of both.

### **Hana Lima Kokua (Many hands working together, joined in a common goal)**

Partnerships form the bedrock of support for parks, protected areas, and cultural sites. Effective collaborations bring together the resources and aspirations of multiple partners to address common goals. In some cases, parks, protected areas, and cultural sites function as a “hub” in a much larger network of community and regional partners and their effectiveness is often dependent on their ability to leverage the success of key partners. This is a very different approach from a more traditional “park-centric” perspective that only values partners for their direct, mostly monetary, contributions. Ultimately, working in partnership toward a collaborative vision of sustainability and being recognized and supported as a trusted partner is perhaps the best investment that park and protected area systems can make in their future. These sessions will explore the wide range of approaches for building and managing partnerships and networks that support parks, protected areas, and cultural sites and conservation efforts throughout the world. Sustaining partnerships and networked-based strategies can be complex, and these sessions will offer insights into successes and missteps while providing conference participants with new tools for better understanding and developing collaborative approaches.

**If you are interested in following a theme throughout the Concurrent Sessions, you will find sessions and individual papers color-coded by theme in your Conference Pocket Guide.** (Keep in mind identifying a proposal by theme was optional, not required, so not all sessions/papers will be color-coded.)

## **Overview of Conference Sessions**

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GWS2009 features 5 Plenary Sessions, 145 Concurrent Sessions, and a Poster Session.

- **Plenary Sessions** are those where all conferees come together to learn about and discuss important topics. At GWS2009, the opening Plenary Session is a special screening of a portion of the forthcoming documentary *The National Parks: America’s Best Idea* by the acclaimed filmmakers Ken Burns and Dayton Duncan. This segment focuses on the accomplishments

and legacy of George Melendez Wright. Each of the other four Plenaries focuses on one of the conference themes. *For a full description of the plenary sessions, see the Daily Schedule of Events later in this book.*

- **Concurrent Sessions** are the heart of the conference. **Invited Papers Sessions** and **Contributed Papers Sessions** usually consist of five individual paper presentations, each lasting 25 minutes, the last 5 minutes of that period being reserved for questions and answers (Q&A) with the audience. Some of these sessions have fewer than five papers, in which case the unused time is reserved for consolidated Q&A or else remarks from a discussant. A few sessions involve individual presentations that are shorter or longer than 25 minutes; these are indicated on the concurrent session charts found later in this book. **Panel Discussions** involve short panel presentations followed by extensive interactions with the audience. **Workshops** are also designed to be interactive: their goal is to get input or other assistance from attendees on a specific product, such as a report. All of these sessions last 2 hours 5 minutes. **Day-cappers** are intended to give people an alternative to standard sessions during the late afternoon. They are shorter than regular sessions, lasting from 4:00–5:15 PM, and take a variety of innovative formats. The last day of the conference (Friday, March 6) is reserved for **Side Meetings**, which are small-group sessions designed for a particular interest or discipline. All Concurrent Sessions are open to all registrants, except for those Side Meetings that are marked “by invitation only.” You do not have to sign up in advance to attend a particular session, and you are welcome to move between sessions to catch individual presentations.
- The **Poster Session** is in the Exhibit Hall and runs continuously from Sunday evening through mid-afternoon on Thursday. The Poster Session includes **Posters**, **Computer Demos**, and **Exhibits**. Set-up is Sunday, March 1, 6:00–9:00 PM; see a conference representative in the Exhibit Hall for a diagram of assigned locations. Take-down is Thursday, March 5, 2:00–3:00 PM. All Posters, Computer Demos, and Tabletop Exhibits must be removed by 3:00 PM so that the rental company can remove its poster boards, chairs, and tables. Posters and Exhibits are available for continuous viewing for the duration of the Poster Session. Computer Demos are available for viewing anytime the presenter is in attendance. A Poster Session Spotlight Reception will be held on Tuesday, March 3, from 6:30–7:30 PM in the Exhibit Hall. Presenters should plan to stand by their Poster, Demo, or Exhibit during this time.

*Complimentary beverages will be available to all registrants during the morning and afternoon breaks on Monday, Tuesday, Wednesday, and Thursday. All breaks are served in the Exhibit Hall.*

## **An Important Note on Punctuality and Last-minute Changes**

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We know that many people like to jump between Concurrent Sessions to catch individual presentations, and that it’s frustrating to come into a room only to find a session running behind schedule. We have asked session chairs to do their utmost to keep the sessions running on schedule. Inevitably, however, some sessions will be affected by late changes that take place after this *Program & Abstracts* book has been printed. To deal with this, we produce a photocopied *Late Changes, Additional Abstracts & Errata* handout just before the conference.

We urge you to take a few moments to go through the accompanying *Late Changes* handout and mark the changes on your copy of the *Program & Abstracts* and the *Pocket Guide*. The *Late Changes* handout captures all changes communicated to the conference organizers between the time the *Program & Abstracts* and the *Pocket Guide* went to the printers (in late January and early February, respectively) and February 26. Some changes involve alterations to the printed schedule of certain sessions, so it is especially important for you to note these on the *Program & Abstracts* and your copy of the *Pocket Guide*.

In the event of last-minute cancellations (i.e., those coming after February 26) and/or no-shows in Invited Papers or Contributed Papers sessions, the session chairs have been instructed to keep to the printed schedule (as amended by the *Late Changes* handout, where necessary). In such instances there will be “holes” in the schedule for the affected session. The session chair, at his or her discretion, can choose to fill these holes by encouraging informal Q&A between presenters and the audience. Once the gap in the session has passed, the session’s regular schedule will resume.

## Conference Proceedings & The George Wright Forum

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A Conference Proceedings will be published by the George Wright Society as a record of the conference. The Proceedings will be published as a paperback book (which can be ordered at an extra cost) and online as a series of PDF files. Certain papers will be selected for publication in the GWS's journal, *The George Wright Forum*. Anyone who is making a presentation at the conference is welcome to prepare a paper—even people who are giving Posters or Computer Demos. For more on how to submit a paper for the proceedings, see [http://www.georgewright.org/gws2009\\_instructions.html](http://www.georgewright.org/gws2009_instructions.html). *The deadline for submissions is April 1, 2009.*

## Overview of Special Events and Field Trips

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**Special events.** A variety of special events are scheduled throughout the week, and details for some events were still pending at the time this book went to press; those will be described in the *Late Changes* handout. Here's a sampling of what's in store:

- **Walkin' in the Footsteps of George: A Silent Auction to Benefit the George Melendez Wright Student Travel Scholarship Program** — Sunday evening, March 1 through Tuesday evening, March 3 — Exhibit Hall  
A wide variety of park-related items — books, artwork, garments, and more — are available for bid. All proceeds benefit the minority student Travel Scholarship program.
- **Welcoming Reception** — Monday evening, March 2, 7:00–8:30 PM — Multnomah Ballroom  
We welcome you to Portland with an informal get-together in the Doubletree's Multnomah Ballroom ... it'll be a chance to renew old acquaintances and cement new ones! Open to all registrants. *Complimentary hot and cold hors d'oeuvres; cash bar.*
- **Poster Spotlight Reception** — Tuesday evening, March 3, 6:30–7:30 PM — Exhibit Hall  
Presenters will be standing by their posters and computer demos so you can ask questions. It's the perfect time to cruise the posters and demos! *Complimentary light snacks; cash bar.*
- **Walkin' in the Footsteps of George Silent Auction Wrap-Up** — Tuesday evening, March 3, 7:30–8:30 PM — Exhibit Hall  
Immediately following the Poster Spotlight Reception, we'll segue to the wrap-up of the Walkin' in the Footsteps of George Silent Auction to benefit the minority student Travel Scholarship program. Come put in your final bid on a variety of fun silent auction items. Your winning bids benefit a great cause, so plan to be there! *Complimentary desserts; cash bar.*
- **Native Reception & Film Night** — Wednesday evening, March 4, 7:30–8:30 PM (Reception), 8:30–9:30 PM (Film Night) — Broadway/Weidler Rooms  
A dessert reception honoring the Native Participant Travel Grant recipients will be followed by a screening of short films. Complimentary desserts (Reception) and refreshments (Film Night). For full details, see the Daily Schedule for Wednesday, later in this book. *Open to all registrants.*
- **Discussion of the Proposed National Park Service Cultural Resources Challenge** — Wednesday evening, March 4, 8:00–9:00 PM • Mt. St. Helens Room  
For full details, see the Daily Schedule for Wednesday, later in this book. *Open to all registrants.*
- **Small-Group Receptions** — Wednesday evening, March 4 — Various times & locations  
For full details, see the Daily Schedule for Wednesday, later in this book.
- **The George Wright Society / National Park Service Awards Banquet** — Thursday evening, March 5, 7:00–9:30 PM — Governor Hotel, downtown Portland  
A GWS tradition, the Awards Banquet recognizes the winners of "Imagine Excellence," the GWS awards program, as well as the presentation of the National Park Service Director's Awards for Natural Resources Stewardship. The banquet will be held at the historic Governor Hotel in downtown Portland, a 10-minute ride from the Doubletree on the free MAX light rail system. *Advance ticket purchase required. Directions to the Governor Hotel will be provided with your ticket. Seating is limited, and will be reserved on a first-come, first-paid basis. A cash bar will be available.*

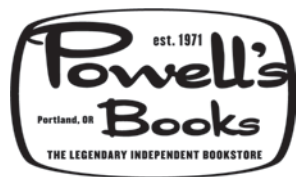
**Field trips.** As always, we have an interesting array of field trips on tap. There are two short trips on Wednesday afternoon, March 4, and two full-day trips on Friday, March 6. For full descriptions of the trips, see the Daily Schedule for the appropriate day, later in this book. *Advance sign-up or ticket purchase required.*

- Wednesday, March 4: **Portland's Architectural Heritage Center** • 1:15–3:15 PM
- Wednesday, March 4: **Portland's Willamette Greenway: Tour of South Waterfront Greenway Development** • 1:30–6:00 PM
- Friday, March 6: **Lewis & Clark National Historical Park: Hike & Paddle** • 8:00 AM–6:00 PM
- Friday, March 6: **The Many Meanings of the Columbia Gorge** • 8:00 AM–7:00 PM

**Wednesday afternoon field workshop —A Confluence of People: The Confluence Land Bridge Partnership.** This special off-site panel discussion and workshop will explore the extraordinary partnership that created the Confluence Project Land Bridge, in Vancouver, Washington, across the river from Portland. For full details, see the Daily Schedule for Wednesday, later in this book. *Free, but space is limited and advance sign-up required.*

## Powell's Books Sales Table

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Powell's Books is one America's largest and best-known independent book stores. A Portland institution since the early 1970s, the main store, Powell's City of Books, is located downtown, covers a whole city block, offering more than 1 million titles with new, used and out-of-print books sharing the same shelves. Visiting the main store is truly a unique experience for book lovers. At GWS2009, Powell's will be offering a sales table in the Exhibit Hall stocked with a variety of titles of interest, including a number authored by GWS conferees themselves. The sales table will be open Monday through Thursday during the day. <http://www.powells.com>

## The George Melendez Wright Student Travel Scholarships

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The George Melendez Wright Student Travel Scholarships were created in 2005 to encourage students from diverse ethnic and cultural backgrounds to participate in our biennial conference and develop an interest in the conservation and preservation of parks, protected areas, and cultural sites worldwide. By offering these scholarships, students will be encouraged to pursue a profession in fields directly related to parks, protected areas, and cultural sites. Scholarship recipients have the opportunity to participate in conference sessions and learning activities, as well as network with peers and professionals from a variety of disciplines in protected areas conservation. The GWS extends a special thanks to all the universities and government organizations that have donated money, transportation, lodging, and other in-kind considerations to help realize the vision of bringing a diverse and talented student pool to the George Wright Society Conference. We are pleased to welcome all the Student Travel Scholarship recipients to the conference.

## The Native Participant Travel Grant Program

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In partnership with the National Park Service, the George Wright Society has launched the Native Participant Travel Grant Program to support the participation of Native people at these conferences. The interface between Native interests and protected areas is a realm of great ferment, both in terms of policy and philosophy. To have genuine and critically enriching dialogue, there must be face-to-face engagement between Native and non-Native people. This dialogue can lead to multi-directional learning, improved relationships, new conservation strategies, and expanded vision and planning. The GWS hopes to facilitate this dialogue by offering these travel grants.

Non-student indigenous people from Canada, Mexico, or the USA who are involved in the protection, management, or study of land, its biological/cultural systems and features, or Native land rights were invited to apply. ("Indigenous people" in this context includes people identifying as American Indians, Alaska Natives, indigenous Mexicans, First Nations, Métis, Native Hawaiians, Inuit, and Aborigines.) Applicants were screened by a committee composed of Native people, who selected 15 recipients. We extend a warm welcome to all Native Participant Travel Grant Awardees.



# Daily Schedule of Events

**Sunday, March 1**

## Today's On-going Events

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**>>> Registration • 1:30–9:00 PM • Main Lobby**

The registration area is located beyond the hotel's main desk near the restaurant. We urge you to register on Sunday if at all possible — that way you beat the Monday-morning rush. GWS personnel will be available at the registration area throughout the week to answer your questions and help with any problems.

**>>> Walkin' in the Footsteps of George Silent Auction • 6:00–9:00 PM • Exhibit Hall**

If you are bringing items to donate to the auction, please check them in at the Silent Auction desk in the Exhibit Hall. Items will be put on display in the Exhibit Hall as they are received, and bidding on each item opens as soon as it is displayed.

**>>> Poster / Computer Demo / Exhibit Set-up • 6:00–9:00 PM • Exhibit Hall**

If you are presenting a poster, computer demo, or exhibit, set up your presentation as soon as possible after you register. There will be a chart showing your assigned location in the Exhibit Hall. A special section of the Poster Session will be devoted to a large number of posters being presented by the National Park Service Inventory and Monitoring Program.

## Today's Special Events

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**>>> Meeting of Native Participant Travel Grant Recipients • 7:00–8:00 PM • Hawthorne**

All NPTG recipients will gather for an orientation/welcoming meeting.

**>>> Meeting of George Melendez Wright Student Travel Scholarship Recipients & Mentors • 7:00–8:00 PM • Sellwood**

All student travel scholarship recipients and their mentors will gather for an orientation/welcoming meeting.

**>>> Social Hour for NPTG & GMW Student Travel Scholarship Recipients • 8:00–9:00 PM • Hawthorne/Sellwood**

We'll pull the airwall between the Hawthorne and Sellwood Rooms and bring everyone together for an informal social hour. All conference registrants are welcome to drop in and meet the travel grant/travel scholarship recipients.

## Monday, March 2

### Today's On-going Events

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>>> **Registration • 7:00 AM–6:00 PM • Main Lobby**

>>> **Walkin' in the Footsteps of George Silent Auction • 8:00 AM–9:00 PM • Exhibit Hall**

The Auction continues! All proceeds benefit the George Melendez Wright Student Travel Scholarship program.

>>> **Poster Session: Posters, Computer Demos, Exhibits • 8:00 AM–9:00 PM • Exhibit Hall**

GWS2009 features our largest Poster Session ever, starting Sunday evening, March 1, and running through Thursday mid-afternoon, March 5. Posters are available for viewing anytime. Computer demos are available at the discretion of the presenter.

>>> **Powell's Books Sales Table • 9:00 AM–5:00 PM • Exhibit Hall**

Powell's Books, one of America's largest and best-known independent book stores, will be having a sales table stocked with titles of interest—including a range of titles authored by conference participants.

### Today's Special Events

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>>> **Welcoming Reception • 7:00–8:30 PM • Multnomah Ballroom**

The George Wright Society welcomes you to Portland and GWS2009! Join us in the Multnomah Ballroom to greet old friends and meet some new ones. It's a fun way to relax and get the conference week off to a great start. All registrants welcome; no tickets required but please do wear your name badge for entry. *A selection of complimentary hot and cold hors d'oeuvres; cash bar.*

### Today's Plenary Sessions

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#### Plenary Session I

**8:00–9:30 AM • Multnomah/Holladay Ballrooms**

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#### Call to Order • Welcome to the Conference • Announcements

**Stephanie Toothman**, National Park Service / Vice President, George Wright Society / GWS2009 Conference Chair

#### Session Introduction / Moderator

**Rolf Diamant**, National Park Service / President, George Wright Society

#### George Melendez Wright in *The National Parks: America's Best Idea*

**Ken Burns** and **Dayton Duncan**, Filmmakers, Florentine Films



GWS2009 kicks off with a visit from acclaimed documentary filmmakers **Ken Burns** and **Dayton Duncan**, who'll join us for a screening of excerpts from their much-anticipated PBS film series *The National Parks: America's Best Idea*, which is due to air in the fall of 2009. The story of George Melendez Wright plays a prominent role in one of the episodes, and Burns and Duncan will tell us why they found Wright such a compelling part of the story of America's national parks. There will be an opportunity for the audience to discuss the film series with the creators. You won't want to miss this chance to hear from two of the most important documentarians working today.

## Plenary Session II

1:30–3:30 PM • Multnomah/Holladay Ballrooms

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### Call to Order • Announcements • Session Introduction

**Rebecca Stanfield McCown**, University of Vermont / Graduate Student Representative to the George Wright Society Board of Directors

### Session Moderator

**Woody Smeck**, National Park Service, Santa Monica Mountains National Recreation Area

## “Keeping it Real”: Engaging with Youth

### Panelists

**Akiima Price**, Chief of Education and Programs, New York Restoration Project

**Fernando Villalba**, Biologist, National Park Service

**Wendy Davis**, Servicewide Education Program Coordinator, National Park Service

Long-term stewardship of the resources of parks, protected areas, and cultural sites is dependent on passing the values inherent in stewardship from one generation to the next. Concern is being expressed in both the professional and popular literature that changing recreational pursuits are resulting in “nature deficit disorder”—a growing disconnection between the current generation of children and the natural environment that could erode the commitment to stewardship. Artificial or virtual reality has become a widely embraced substitute for hands-on, first-person engagement and learning. Children are not in the woods; neither are they in places connected to history and culture. A deeper understanding is needed about how these changing dynamics affect learning about history and cultural traditions, understanding and appreciating the natural world, and commitment to the preservation of both. In this plenary panel, we will hear the voices of three dynamic young professionals who themselves are concerned about ways to engage youth in the stewardship of natural and cultural heritage.



**Akiima Price** is chief of education and programs at the New York Restoration Project (NYRP). NYRP restores, develops, and revitalizes underserved parks, community gardens, and open spaces throughout New York City. At the heart of Price’s passion for connecting urban youth with the natural environment is her strong belief that the natural environment is a wonderful medium to engage youth in meaningful, positive experiences that can affect the way they feel about themselves, their communities, and their place on earth. At NYRP, Price has created a program called “R-E-S-P-E-C-Trees,” as a component of the Million Trees NYC program, a partnership between NYRP, the City of New York Parks and Recreation and the office of Mayor Michael Bloomberg. R-E-S-P-E-C-Trees is a multi-faceted initiative to educate children and adults across New York about the importance of trees and the environment in major cities. As a component, Price’s program incorporates tree planting in areas identified across the city where children and adults experience higher rates of asthma and other respiratory diseases. Her passion makes it possible for her

to interface with some of New York’s wealthiest and most powerful movers and shakers and attract them to her vision just as quickly as she does with her students. Going even beyond educating youth about the environment and preparing them for responsible citizenship, Price is dedicated to teaching the basics: confidence, courage, and life skills.



**Fernando Villalba** is a biologist for the National Park Service. In 2005, he received an undergraduate degree from University of California–Davis in Wildlife Biology and Chicano Studies. Villalba is currently pursuing a Master’s degree in Native American Studies, also at UC-Davis, focusing his research on ethnobiology. He has worked for the National Park Service since 2000, after being recruited through the Santa Monica Mountains National Recreation Area (SAMO) Youth Program. Since, he has worked at various parks such as Zion National Park in Utah and Fire Island National Seashore in New York. Raised in East Los Angeles, Villalba learned at a young age how to find nature in the subtlest of places and how important these places are to people. This understanding eventually blossomed into his deep reverence for protected natural areas coupled with a keen interest in their cultural significance.



**Wyndeth “Wendy” Davis** is the servicewide education coordinator for the National Park Service and a leader in the expansion and improvement of NPS’s Junior Ranger program. Her most audacious goal is that every young person in America know that the national parks belong to them. She believes to do this we must look not only at the people who visit the parks and love them, but the people who do not visit, but explore them through media. She began her career with the National Park Service as an archeologist in the Alaska Region in 1989. Soon, she found she was spending more time with the public, focused on education, than she was in the field focused on excavation. Davis was soon developing curriculum for K-12, and designing interpretive publications and exhibits for the Alaska Region. Gradually she made the transition to the Interpretation and Education team. Her philosophy: What we do means nothing if we cannot communicate with the rest of the world about it—and let others, especially youth, help us discover, explore and tell the stories of their national parks. Davis has a Masters degree in Anthropology/Archeology from the

University of Oregon, where she served as assistant director of the archeological field school for two years. She taught Archeology and Physical Anthropology for the University of Alaska for nine years.

# Concurrent sessions • Monday morning, March 2 • 10:00–12:05

	10:00–10:25	10:25–10:50	10:50–11:15	11:15–11:40	11:40–12:05
<b>Session 1</b> Multnomah	Beyond Naturalness: Park and Wilderness Purposes and Stewardship Objectives for the 21st Century	<b>PANEL DISCUSSION</b> Chair: David Cole Panelists: David Parsons, David Graber, Stephen Woodley, Erika Zavaleta, Jon Jarvis			
<b>Session 2</b> Holladay	The Power of Story: Reaching Diverse Audiences with National Park Service Science and Stories	<b>PANEL DISCUSSION</b> Chair: Mike Whalley Panelists: Dayton Duncan, Ken Burns, Tim Merriman, Susan Jacobson, Denis Galvin			
<b>Session 3</b> Broadway / Weidler	Beyond Consultation: Successful Relationships and the Integration of Native Voices into Park Resource Management	<b>PANEL DISCUSSION</b> Chair: Douglas Deur Panelists: Karin Anderson, Jacilee Wray, Janet Balsom, Laura Schuster			
<b>Session 4</b> Hawthorne / Sellwood	Best Practices for Building Partnerships / Bonnie Haida, chair	Turning Planning and Partnership into Great Regional Protected Areas in the Capital Region of British Columbia / Jeff Ward et al.	The Herring River Restoration Project: When "Park-centricity" is Not an Option / Carrie Phillips	Sharing Knowledge: Learning from Each Other / Kathryn Myers et al.	The Regional Integration of Protected Areas: A Study of Canada's National Parks / Julia McCuaig
<b>Session 5</b> Ross Island / Morrison	Stones Overturned: Emerging Opportunities in the Vanishing Treasures Program	<b>PANEL DISCUSSION</b> Chair: Virginia Salazar-Halfmoon Panelists: Sunde McDermott, Corky Hays, Brooks Jeffery, Jake Barrow, Calvin Chimoni			
<b>Session 6</b> Oregon	BioBlitzes and ATBIs: Citizens and Scientists in Biodiversity Conservation I • All Taxa Biodiversity Inventory (ATBI): Bridging the Gap	<b>PANEL DISCUSSION</b> Chair: Niki Nicholas Panelists: Raymond Sauvajot, Gillian Bowser, Linda Brindle, Michael Soukup			
<b>Session 7</b> Alaska / Idaho	How Much Water Do Water-dependent Resources Need? / Chuck Pettee, chair	The Treatment of Federal Reserved Water Rights, 1992–2008 / Michelle Belco	Protecting Natural Resources at Saguaro National Park through Water Rights / Paul Christensen	The Effect of Rising Salinity on Egg and Early-instar Larval Survival of the Orange-black Hawaiian Damselfly, ( <i>Megalagrion xanthomelas</i> ) / Lori Tanga et al.	Can Depletion of Surface-Water Flows in Great Basin NP Result from Large-Scale Ground-Water Withdrawals in Adjacent Valleys Below? / Bill Van Liew
<b>Session 8</b> 3 Sisters	Monitoring Visitor Use / Bob Manning, chair	Long-Term User Capacity Monitoring Programs: Lessons Learned in Yosemite National Park / Todd Newburger et al.	Analysis of Carrying Capacity at Lake Umbagog National Wildlife Refuge / William Valliere et al.	Tradeoffs Among Resource, Social, and Managerial Conditions on Mountain Summits of the Northern Forest / Carena van Riper	Addressing Federal Recreation Special Use Permit Policy Changes with National Visitor Use Monitoring Data / Robert Burns et al.
<b>Session 9</b> Mt. Bachelor	Assessing Airborne Pollutants / Bob Winfree, chair	Monitoring Air Quality in Southeast Alaska: Linking Ambient and Depositional Pollutants with Ecological Effect / Dave Schrakauer	Mercury Deposition and Accumulation in National Park Ecosystems: A Service-wide Compilation of Research and Results / Colleen Flanagan	Critical Loads for Air Pollutants: Tools for Communication, Planning, and Collaboration / Ellen Porter	Appalachian Trail MEGA-transect Deposition Effects / Alan C. Ellsworth
<b>Session 10</b> Mt. Hood	Burned Up or Burned Out? I • Current and Future Relationships between Fire and Resource Managers / Richard Schwab, chair	Drivers of Fire-Resource Management Conflict: Insights from the Social Sciences / Vita Wright	Can Fire Managers and Resource Specialists Collaborate to Protect Rare and Imperiled Plant Communities? / Jeff Connor et al.	Resources and Fire: A Logical Partnership / Bruce Fields	Integrating Resource Management in the Life-cycle of Wildland Fire Decision-making / Sandee Dingman
<b>Session 11</b> Mt. St. Helens	Human Interactions in Marine Ecosystems / Brad Barr, chair	Coastal Circulation and Sediment Dynamics on the Coral Reefs of War in the Pacific National Historical Park / Curt Storlazzi et al.	Ocean Acidification: Osteoporosis of Our Marine Resources / Kristen Keteles	Boating Impacts on Seagrass in Florida Bay: Visitor Use Associations and Implications for Management / David Hallac	Coral Reef Monitoring and Emergency Responses to Outbreaks of Coral Disease in Dry Tortugas NP / Benjamin Ruttenberg et al.



# Concurrent sessions • Monday afternoon, March 2 • 4:00–6:05

	4:00–4:25	4:25–4:50	4:50–5:15	5:15–5:40	5:40–6:05
<b>Session 12</b> Holladay	Natural Resource Inventory and Monitoring by 32 I&M Networks: Key Lessons Learned to Date	<b>PANEL DISCUSSION</b> Chair: Steven Fancy Panelists: Bruce Bingham, Lisa Thomas, Mike DeBacker			
<b>Session 13</b> Broadway / Weidler	The National Parks Second Century Commission: Where We Are, and Where We're Going	<b>PANEL DISCUSSION</b> Chair: Loran Fraser Panelists: Deny Galvin, Jon Jarvis			
<b>Session 14</b> Hawthorne / Sellwood	The Next Decade of Science and Stewardship in the National Park Service: Meet the New Associate Director / Elaine Leslie, chair	<b>DAY-CAPPER</b> Speakers: Elaine Leslie, Bert Frost, Beth Johnson			
<b>Session 15</b> Ross Island / Morrison	Wildlife Ecology / Kate Kendall, chair	Non-native Predators Implicated in Declines of Olympic Marmots / Suzanne C. Griffin et al.	Riparian Wildlife Communities Prior to Restoration of Anadromous Fish in the Elwha River Ecosystem / Kurt Jenkins et al.	Implications of Elk Movements for Herd and Habitat Management in Midwestern Parks / Glen Sargeant et al.	Tidal, Circadian, and Visitation Effects on Brown Bear Activity in a Meadow / Salmon Stream Complex / Troy Hamon et al.
<b>Session 16</b> Oregon	Sovereignty and Co-Management / Sharon Franklet, chair	Working with Sovereign Tribal Nations / Robert Miller	Empowerment in an Era of Self-Determination: The Case of the Washoe Tribe and U.S. Forest Service Co-Management Agreement / Mary Adelzadeh	Linking Sovereignty and Ecocultural Approaches in Water Resource Management and Restoration: The Port Gamble S'Klallam Tribal Initiatives / Tracy Andrews et al.	The Land That We Keep For Us: An Aboriginal Perspective on Conservation—The Case of Thaidene Nene / East Arm of Great Slave Lake / Stephen Ellis
<b>Session 17</b> Alaska	Visitor Perceptions of Protected Areas / Elizabeth Halpenny, chair	Understanding Visitor Images of the Florida Suwannee River Wilderness Trail as a Tourist Destination / Natalia Buta et al.	Do Visitors Know or Care About Invasive Species in the NPS? / Ryan Sharp	The National Park System: Trends in Public Opinion towards Management and Preservation / Yen Le et al.	Co-management of Protected Areas: International Lessons on the Role of Indigenous Rights / Sandra Piel et al.
<b>Session 18</b> Idaho	From the Stars to Underwater Depths and Sea to Shining Sea: LIVE Distance Education Programs	<b>WORKSHOP</b> Chair: Susan Teel Presenters: Kimberly Bruch, Richard Curry		Visitor Profiles and Knowledge of Kamchatka's Protected Natural Areas / David Ostergren et al.	Developing Normative Standards for Wildlife Viewing in Parks and Protected Areas / Laura Anderson et al.
<b>Session 19</b> 3 Sisters	One Health: A Coupled System Approach to Improve Human, Animal, and Environmental Health / Margaret Wild, chair	One Health as an Approach for Integrated Health Management in the NPS / Margaret Wild et al.	One Health, Many Priorities / Todd Shury et al. (Stephen Woodley presenting in lieu of Shury)	Perceptions of Wildlife-associated Disease Risk: A Challenge for "One Health" in National Parks / Daniel Decker et al.	Coral Diseases: A Threat to Reefs, Fisheries, and Island Nations / Jeff Miller
<b>Session 20</b> Mt. Bachelor	CECU Cultural Resource Field Schools in National Parks / A. Trimble Jones, chair	Historic Preservation Field School at Hawaii Volcanoes National Park / Laura C. Schuster	The Montana-Yellowstone Archaeological Field School Project / Douglas MacDonald et al.	Archaeology and the Warriors' Project: Exploring a Buffalo Soldier Campsite in the Guadalupe Mountains of Texas / Eleanor King	Kilauea Caldera: Sourcing an Explosive Eruption / Jadelyn Moniz Nakamura et al.
<b>Session 21</b> Mt. Hood	Burned Up or Burned Out? II • Fire Crosses Boundaries (Physically, Socially, Politically, and Internally) / Richard Schwab, chair	Adapting Fire to Address Uncertainty in a Changing Climate / Dick Bahr	Fire and Climate Change: Managing in the Face of Escalating Risk and Uncertainty / Nate Stephenson	Fire Management in the Mediterranean Coast Network: Trying to Fit a Square Peg into a Round Hole / Marri Witter	Interface between Fire and Forests—Tree Management in the National Parks / Brian Mattos et al.
<b>Session 22</b> Mt. St. Helens	Going with the Flow: Ground- and Surface-water Management / Mary Ann Madej, chair	Regional and Local-scale Evaluation of Surface- and Ground-water Resources at Great Basin National Park, Eastern Nevada / Donald Sweetkind et al.	Application of Regional Environmental Flow Assessments to Protected Areas / Christopher Konrad	Impacts of Regulated Flow below Hetch Hetchy in Yosemite National Park and Potential Mitigation Measures / James Roche et al.	Status versus Trends: Understanding Temporal Scales and Baseline Conditions in Trend Analysis / Eric Dinger et al.

## Tuesday, March 3

### Today's On-going Events

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>>> **Registration • 7:00 AM–6:00 PM • Main Lobby**

>>> **Walkin' in the Footsteps of George Silent Auction • 8:00 AM–9:00 PM • Exhibit Hall**

Today is the final day of the auction! All proceeds benefit the George Melendez Wright Student Travel Scholarship program. See Today's Special Events for information on the Auction Wrap-Up Gala.

>>> **Poster Session: Posters, Computer Demos, Exhibits • 8:00 AM–9:00 PM • Exhibit Hall**

Posters are available for viewing anytime. Computer demos are available at the discretion of the presenter. See Today's Special Events for information on the Poster Spotlight Reception.

>>> **Powell's Books Sales Table • 9:00 AM–5:00 PM • Exhibit Hall**

Powell's Books, one of America's largest and best-known independent book stores, will be having a sales table stocked with titles of interest—including a range of titles authored by conference participants.

### Today's Special Events

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>>> **Poster Spotlight Reception • 6:30–7:30 PM • Exhibit Hall**

This evening from 6:30 to 7:30, we will host a reception in the area immediately adjacent to the posters. Presenters will be standing by their posters, computer demos, and exhibits so you can ask questions. Presenters from the National Park Service I&M Program will be highlighting selected posters from the I&M section. It's the perfect time to cruise the Poster Session! *Complimentary light snacks; cash bar*. Once you've viewed the posters, stick around for the Silent Auction Wrap-Up Gala.

>>> **Silent Auction Wrap-Up Gala • 7:30–9:00 PM • Exhibit Hall**

Immediately following the Poster Spotlight Reception, we'll segue to the wrap-up of the Walkin' in the Footsteps of George Silent Auction to benefit the Travel Scholarship program. An emcee will get you in the mood to bid on a large variety of fun silent auction items. Your winning bids benefit a great cause, so plan to be there! *Complimentary desserts; cash bar*. Winning bidders can pick up and pay for their items as soon as bidding closes on them.

### Today's Plenary Session

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**Plenary Session III**

**8:00–9:30 AM • Multnomah/Holladay Ballrooms**

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**Call to Order • Announcements**

**Brent Mitchell**, QLF Atlantic Center for the Environment / George Wright Society Board of Directors

**Session Introduction / Moderator**

**Brad Barr**, NOAA National Marine Sanctuaries / George Wright Society Board of Directors

**“Thinking Like a Mountain”: Effective Collaboration in the Management of Protected Areas**

**Presenters**

**Billy Frank, Jr.**, Chairman, Northwest Indian Fisheries Commission

**Jonathan B. Jarvis**, Director, Pacific West Region, National Park Service

When the conservationist Aldo Leopold wrote the phrase “thinking like a mountain,” he was expressing the idea that long connection to a place is essential to understanding what is needed for effective stewardship. Many cultural groups, native and non-native, have lived close to the land and sea, developing deep cultural, subsistence, and spiritual connections to particular places, and have acquired extensive knowledge of cycles of life, changing landscapes, and climate. These cultures are connected to specific places, and the attachment can be measured in centuries or even millennia.

As protected area managers begin to share more stewardship responsibility with indigenous peoples and other cultural groups, there is value in better understanding these deep connections with place, the shared knowledge that has grown from such connections, and how these can be used to create meaningful and productive partnerships in the management of protected areas. This plenary session will feature a dialogue between two thinker/practitioners who have long considered how to build such collaborations.



**Billy Frank, Jr.**, of the Nisqually Indian Tribe, has been chairman of the Northwest Indian Fisheries Commission (NWIFC) for over 20 years. In this capacity, he “speaks for the salmon” on behalf of 19 Treaty Indian Tribes in western Washington. Under his leadership, the tribal role over the past 30 years has evolved from activists fighting to secure fishing rights to that of managers of the resource. Formed in 1975, NWIFC helps the tribes develop cooperative fisheries plans and coordinate such programs as habitat enhancement and habitat management.

In the 1960s and early 1970s, Frank was a grassroots political activist who was frequently jailed for his role in civil disobedience, which involved taking part in numerous “fish-ins” in opposition to state authority over the tribes. Years of resistance finally paid off when federal court ruled in favor of the tribes in *U.S. v. Washington*, the “Boldt Decision” of 1974. The ruling, supported by the U.S. Supreme Court in 1979, reaffirmed the treaty-protected fishing rights of the tribes.



**Jon Jarvis** completed undergraduate study in biology and graduate work in natural resources management and has served in the National Park Service for over 25 years. Starting as a seasonal interpreter, Jarvis moved up through the organization as a protection ranger, resource management specialist, park biologist, chief of natural and cultural resources, and superintendent in Prince William Forest Park, Guadalupe Mountains National Park, Crater Lake National Park, and North Cascades National Park, Craters of the Moon National Monument, Wrangell-St. Elias National Park and Preserve, and Mount Rainier National Park. Since 2002 he has served as director of the Pacific West Region, with direct responsibilities for 54 units of the National Park System in Washington, Idaho, Oregon, California, Hawaii and the Pacific Islands.

Jarvis has published and lectured on the role of science in parks at conferences and workshops around the U.S. He has extensive experience in developing government-to-government relations with Native American tribes. He is also a past president of the George Wright Society.



# Concurrent sessions • Tuesday morning, March 3 • 10:00–12:05

	10:00–10:25	10:25–10:50	10:50–11:15	11:15–11:40	11:40–12:05
<b>Session 23</b> Multnomah	Navigating Terra Incognita: New Management Strategies in an Era of Climate Change I • Averages Belie the Extremes: Anticipated Changes and Effects in the Pacific Northwest	Climate Change in Western National Parks: Adaptation Underway / Kelly T. Redmond	Uncertain Future: Climate Change Impacts on Northwest Salmon / Nathan Mantua	Old-Growth Forests of Olympic National Park: Carbon Storage and Sensitivity to Climate / Steven Perkins	A Manager's Perspective: Adapting to Climate Change on Olympic National Forest / Kathy O'Halloran
<b>Session 24</b> Holladay	Healthy Parks, Healthy People: Innovations from U.S. National Parks and Parks Victoria (Australia)	<b>PANEL DISCUSSION:</b> Co-chairs: Mark Stone, Sibdas Ghosh Panelists: Jonathan Jarvis, Ernie Quintana, James Gramann, Diana D. Spain			
<b>Session 25</b> Broadway / Weidler	Achieving Restoration Goals in Protected Areas: Challenges and Obstacles / Laura Hudson, chair	Beyond Boundaries: Partnerships for Corridor Restoration at Pinnacles National Monument / Daniel George et al.	Restoring Estuarine Wetlands along the Lower Columbia River: A Case Study at Lewis and Clark NHP / Mirah Russell et al.	Declines in Yosemite's Bird Populations / Sarah Stock et al.	Restoring and Protecting Yosemite's Declining Amphibians / Heather McKenny et al.
<b>Session 26</b> Hawthorne / Sellwood	Conservation in Mexico's Protected Areas System: Looking Ahead / Ernesto C. Enkerlin-Hoeflich, chair	The Fund for Protected Areas: An Effective Public-Private Partnership / Renée Gonzalez Montague et al.	Deforestation, Natural Protected Areas, and Biodiversity Conservation in Mexico / Victor Sánchez-Cordero et al.	Conservation With, For and By People: Protected Areas Contributing to Improving Livelihoods of Indigenous and Rural Communities / José Juan Arriola-Arroy et al.	Species At Risk Conservation as a Tool to Integrate Protected Areas into Broader Landscapes / Oscar Ramirez-Flore
<b>Session 27</b> Ross Island / Morrison	Science Education / Judy C. Cammer, chair	Real Science: Real Connection to the Parks / Bill Zoellick	Building Commitment to Parks through Service Integration: Creating a Park and University Learning Community / Donald A. Rodriguez et al.	Why Reinvent the Wheel? Sharing Lessons Learned from "A Forest for Every Classroom" / Christina Marts	Integrating Groundwater, Watersheds, Hydrographs, and Art into Hydrology Education at Congaree National Park / David Shelley et al.
<b>Session 28</b> Oregon	Sacred Natural Sites: Guidelines for Protected Area Managers	<b>PANEL DISCUSSION</b> Chair: Dorothy FireCloud Panelists: Susan Johnson, Toby McLeod			
<b>Session 29</b> Alaska / Idaho	Connecting Public Opinion with Management Decision Making / Chair TBA	Changes in Public Attitudes toward U.S. National Park Service Policies / Patricia A. Taylor et al.	Making the Most of the Annual Visitor Survey Card Results / Jennifer Hoger Russell et al.	Conflict Management in the NPS: A Negotiated Rulemaking Case Study / Lavell Merritt	The Importance of Public Influence in Decision Making: Elk Management at Rocky Mountain National Park / Therese Johnson et al.
<b>Session 30</b> 3 Sisters	Large-Scale Inventory and Monitoring / Lewis Sharrman, chair	Assessing Trends in Streamflow: A Critical Element of Vital Signs Monitoring / Mary Ann Madej	Airborne Lidar Remote Sensing Applications in Inventory and Monitoring for Coastal Resource Management / Amar Noyegandhi	Modeling Future Forest Conditions / Bruce Larson et al.	The CAXN Flowing Waters Program: A Multi-tiered Approach to Ecological Monitoring in Alaskan National Parks / Trey Simmons
<b>Session 31</b> Mt. Bachelor	New Approaches for Documenting and Managing Cultural Landscapes / Bonnie Haddad, chair	Finding a Common Vision for Fort Hill, Cape Cod National Seashore / Margaret Brown et al.	A Genealogy of Place: Land Use Legacies at Rural Plains/Totopolo-may Creek Civil War Battlefield / Tonia Horton	Collaborative Planning for Historic and Ecological Resource Restoration at Saugus Iron Works NHS, Massachusetts / Marc Albert	Public Use, Private Meaning: A Study of Two New England Summer Communities / Emily Donaldson
<b>Session 32</b> Mt. Hood	Burned Up or Burned Out? III • Innovations in Fire Management / Richard Schwab, chair	Raiding the NIFC Data Pantry / Bill Yohn et al.	Revisiting Spatial Patterns of Lightning Strikes and Fires in Yosemite National Park / Kent van Wageningen	Modeled and Actual Impacts of Fire Management on Carbon Sequestration in Yosemite National Park / Leiland Tarnay et al.	Fuel and Vegetation Modeling Utilizing Plots, Burn Severity, and Time Since Fire in Denali National Park & Preserve / Jennifer Allen et al.
<b>Session 33</b> Mt. St. Helens	Integrating Biological and Human Dimensions to Manage Human-Wildlife Habituation: The Opportunity for Interdisciplinary Collaboration	<b>WORKSHOP</b> Chairs: Kirsten Leong & Dan Decker Presenters: Dan Foster, Bill Merkle, Kathy Brown, Frank Young, Chuck Young			

# Concurrent sessions • Tuesday afternoon, March 3 • 1:30–3:35

		1:30–1:55	1:55–2:20	2:20–2:45	2:45–3:10	3:10–3:35
<b>Session 34</b> Multnomah	Navigating Terra Incognita: New Management Strategies in an Era of Climate Change II • Confronting Climate Change in Everglades and South Florida / J. Cross, chair	Impacts of Climate Change on Resources, Infrastructure, and Visitor Experience at Everglades National Park / Dan Kimball	Sea Level Rise on the Southern Florida Coast: Past, Present, and Future Trends / Harold Wanless	Vegetative Changes in Southern Florida Ecosystems as a Result of Climate Change, Restoration, and Hurricanes / Kevin R.T. Whelan	Coral Reef Monitoring: Tracking the Tropical Pulse of Global Climate Change / Matt Patterson	Submerged and Littoral Archeological Sites: Management Challenges in Light of Global Climate Change / David L. Conlin
<b>Session 35</b> Holladay	The Future Shape of the National Park System	<b>WORKSHOP</b> Chairs: Warren Brown & Mike Soukup Panelists: Denis Galvin, Jerry Rogers, Ron Tipton, Stephanie Toothman, Destry Jarvis				
<b>Session 36</b> Broadway / Weidler	Effective Marine Protected Areas / Suzette Kimball, chair	Coral Recruitment Dynamics in Hawaiian National Parks and Marine Protected Areas: Are Reefs Recruitment Limited? / Larry Bosch et al.	Depth Matters: Differential Coral Mortality at Teikite Reef in US Virgin Islands after Coral Bleaching / Andy Davis et al.	Assessing the Efficacy of Marine Protected Areas in American Samoa / Dillon Brown	Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area / David Hall et al.	National Parks in Hawaii and the US Virgin Islands: Effective Marine Reserves for Fish Assemblages? / Eric Brown et al.
<b>Session 37</b> Hawthorne / Sellwood	An Integrated Study of Visitor Capacity for the Denali Park Road / Philip Hooge, chair	Using Multidisciplinary Modeling and an Experimental Approach to Adaptive Management to Inform a Controversial Issue / Philip Hooge et al.	Grizzly Bear Movements and Habitat Use in Denali National Park Relative to the Park Road / Richard Mace et al.	Indicators and Standards of Quality for the Denali Park Road Experience / Robert Manning et al.	Modeling Traffic Impacts on the Visitor Trip Experience and on Wildlife on the Denali National Park Road / Ted Morris et al.	An Experimental Approach to Adaptive Management Designed to Protect Important Park Wildlife and Visitor Resources / Laura Phillips et al.
<b>Session 38</b> Ross Island / Morrison	The Pacific Northwest Preservation Field School, Fifteen Years Old in 2009: What the Future Holds	<b>PANEL DISCUSSION</b> Chair: Hank Florence Panelists: Don Peling, Suzi Pengilly, Jan Wooley, Gerry Toys				
<b>Session 39</b> Oregon	BioBlitzes and ATBIs: Citizens and Scientists in Biodiversity Conservation II • ATBIs and BioBlitzes: Where the Rubber Meets the Road / Niki Nicholas, chair	Hidden Biodiversity: A Molecular ATBI within Yellowstone Lake / Ann Rodman	Blitzing the Acadia Way / David Manski	ATBI Specimen Classification Strategies / Jerry Freilich	SpiderBlitz Inventories at Congaree National Park, South Carolina / Theresa Thom et al.	PBoston Harbor Islands All Taxa Biodiversity Inventory: A Model for Small Urban Parks / Jessica Rykken
<b>Session 40</b> Alaska / Idaho	Connecting Science to Management: Case Studies in Coordination / Charles van Riper, chair	From Archeology to Zoology: Creating a Comprehensive Resource Stewardship Strategy at Point Reyes National Seashore / Marie Denn et al.	Incorporating Science into a Proposed Visitor-Focused Marine Reserve at Biscayne National Park / Elsa Alvar et al.	Applying Tools to Evaluate Management Effectiveness: Where Science Meets Management / Tony Varcoe	Tools for Better Resource Management: A Learning Model that Connects Managers to Researchers / Giselle Mora-Bourgeois et al.	Lessons Learned from Two Decades of Training: CSU's Intensive Five-Week Field Course for Protected Area Managers / Ch'aska Huayhuacca-Frye et al.
<b>Session 41</b> 3 Sisters	Wilderness Post, Wilderness Future / Garry Oye, chair	The History of National Park Service Indecision about Wilderness / John Miles	Indian Lands and the National Wilderness Movement / Diane Krahe	"True" Wilderness Preservation: Looking Forward to a Better Future / Jonathan Voos	Tools in the Wilderness: Institutionalizing R&D and Optimizing Relevance / Lewis Sharman et al.	Negotiating a New Wilderness Proposal at Sleeping Bear Dunes National Lakeshore / Tom Ulrich
<b>Session 42</b> Mt. Bachelor	The Future of Working Cultural Landscapes: Parks, Partners and Local Products	<b>PANEL DISCUSSION</b> Chair: Rolf Diamond Panelists: John Debo, Nancy Nelson, Laura Rotegard, Lucy Lawliss				
<b>Session 43</b> Mt. Hood	Protecting Natural Sounds I: Current Issues in Soundscape Management / Vicki McCusker, chair	Transportation Noise in National Parks / Randy Stanley	Noise in Wilderness: or, "Can You Hear Me Now?": Managing Noise Sources at Zion National Park / Jack Whitworth	The Nationwide Survey of Acoustical Environments in Parks / Lelaina Marin	Motorized Recreation: Planning and Technical Challenges for Soundscapes Impact Assessment / Vicki McCusker	Effects of Natural and Mechanical Sounds on Laboratory Performance / Jacob Benfield et al.
<b>Session 44</b> Mt. St. Helens	Managing Protected Areas Against a Background of Conflict / Brent Mitchell, chair	Peace, War and Protected Areas: The Opportunity and Need for "Swords to Plowshares" Conservation / Garry Machlis	Modernization of "Multiple-Use": A Forest Resource Protection Concept in Bosnia and Herzegovina / Geoffrey Middaugh	Peacemaking through Forest Conservation: Conflict Transformation in the Maya Biosphere Reserve / Michael Yadrick	Reimagining Protected Areas in the Making of New Nepal / Sudeep Jana Thing	Managing Conflict in an Era of Climate Change: The Evolution of Tribal Consultation / Linda Moon Stumpff



# Concurrent sessions • Tuesday afternoon, March 3 • 4:00–6:05

	4:00–4:25	4:25–4:50	4:50–5:15	5:15–5:40	5:40–6:05
<b>Session 45</b> Multnomah	Navigating Terra Incognita: New Management Strategies in an Era of Climate Change III • Building the Bicycle While Riding It: Examples of How Managers are Preparing	Adapting to Climate Change through Science-Management Partnerships / Dave Peterson	What Can Be Done in a Park to Adapt to Climate Change? / Lara J. Hansen	Climate Change Scenario Planning: A Tool for Structured Decision Making in an Era of Uncertainty / Leigh A. Welling	Q&A
<b>Session 46</b> Holladay	The Urban File	<b>PANEL DISCUSSION</b> Chair: Barbara MacDonald Panelists: Kevin Strange, Tony Varcoe, Barbara MacDonald			
<b>Session 47</b> Broadway / Weidler	Sharing Science Using Research Learning Center Models	<b>PANEL DISCUSSION</b> Chair: Christie Anastasia Panelists: Kristen Friesen, Susan Sachs, Wendy Smith, Sarah Melena			
<b>Session 48</b> Hawthorne / Sellwood	Bison Restoration Collaboration between Native Entities and Parks Canada / U.S. National Park Service	<b>PANEL DISCUSSION</b> Chair: Kristine Read Panelists: Jim Stone, Brady Grant, Ervin Carlson			
<b>Session 49</b> Ross Island / Morrison	Things Look Different Here: Cultural Resource Planning and Design in Oregon / Kathy Schutt, chair	A Taste of Oregon: Cultural and Natural Resource Planning at Dorris Ranch / Laurie Matthews et al.	The Historic Columbia River Highway Reconnection Project / Magnus Bernhardt et al.	Q&A	
<b>Session 50</b> Oregon	Risky Behavior: Assessing and Managing Risks Associated with Visitor and Employee Activities / John Shultis, chair	Improving Efficacy of Visitor Education in Haleakala National Park Using the Theory of Planned Behavior / Nathan Reigner et al.	Operational Leadership: An Employee-Centered Approach to Managing Risk and Achieving Professional Excellence / Mary Hinson et al.	Park Resource Protection Planning through Comprehensive Threat Analysis and Risk Assessment / Troy Hamon et al.	Modeling Relationships among Visitor Use, Safety, and Crowding on the Half Dome Cables, Yosemite National Park / Nathan Reigner et al.
<b>Session 51</b> Alaska / Idaho	Managing Your Wild and Scenic River: The Next Forty Years	<b>PANEL DISCUSSION</b> Chair: Bill Hansen Panelists: Joan Harn, Jamie Fosburgh, Cassie Thomas, Sue Jennings			
<b>Session 52</b> 3 Sisters	Nunaa Iglooq: Protecting Yup'ik Traditions and Nationally Significant Resources in a Changing World	<b>PANEL DISCUSSION</b> Chair: Heather Rice Panelists: William Naneng, Ryan Maroney, Brian McCaffery, Lisa Holzapfel, Kevin Meyer			
<b>Session 53</b> Mt. Bachelor	Applying Cooperative Agreements for All-Hazards Emergencies: Two Examples	<b>PANEL DISCUSSION</b> Chairs: Ann Hitchcock & Barrett Kennedy Panelists: Ray Albright, James M. Sweeney, Andy Ferrell			
<b>Session 54</b> Mt. Hood	Kaloko Honokahau: An Emerging Case History of Integrated USGS Research Meeting Park Needs / David Foote, chair	Protecting a Rare Brackish-Water Ecosystem from Rapidly Emerging Threats / Elizabeth Morrock et al.	Numerical Modeling of the Groundwater-Flow System in and near Kaloko-Honokahau National Historical Park / Delwyn Oki et al.	Biological Communities Associated with Anchialine Pools in Hawaii's National Parks / David Foote et al.	Process Studies of the Flux, Fate, and Importance of Submarine Groundwater Discharge to Kaloko-Honokahau National Historical Park, Hawaii / Eric Grossman et al.
<b>Session 55</b> Mt. St. Helens	Can Noninvasive Research Methods for Wildlife Improve Our Understanding and Management of Wilderness?	<b>PANEL DISCUSSION</b> Chair: Michael Schwartz PANELISTS: Peter Landres, David Parsons, Katherine Kendall			

## Wednesday, March 4

### Today's On-going Events

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>>> **Registration • 7:00 AM–6:00 PM • Main Lobby**

>>> **Poster Session: Posters, Computer Demos, Exhibits • 8:00 AM–9:00 PM • Exhibit Hall**

Posters are available for viewing anytime. Computer demos are available at the discretion of the presenter.

>>> **Powell's Books Sales Table • 9:00 AM–5:00 PM • Exhibit Hall**

Powell's Books, one of America's largest and best-known independent book stores, will be having a sales table stocked with titles of interest—including a range of titles authored by conference participants.

### Today's Special Events

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>>> **Afternoon Half-Day Field Trips; Field Workshop**

We're offering two half-day field trips and a special off-site field workshop this afternoon. *Space is limited and you must sign up in advance.* See [http://www.georgewright.org/gws2009\\_fieldtrips.html](http://www.georgewright.org/gws2009_fieldtrips.html) for more detailed itineraries.

#### **Portland's Architectural Heritage Center**

- Depart 1:15 PM; Arrive back at Doubletree 3:15 PM
- The tour is free, but you must sign up in advance
- Transport is by foot and city bus, fare of \$2.00 each way

The Architectural Heritage Center preserves the historic character of Portland's built environment, and promotes the re-use of period homes and buildings in the city and surrounding region. AHC is owned and operated by the non-profit Bosco-Milligan Foundation, whose renowned collection of architectural artifacts is one of the largest in the United States. The AHC offers rotating exhibits from the collection. AHC also offers hands-on preservation workshops and educational programs to the public, and maintains a research library. We'll get an inside look at the AHC's operations and insights into their wide-ranging work to preserve Portland's historic architecture.

#### **Portland's Willamette Greenway: Tour of South Waterfront Greenway Development**

- Depart 1:30 PM; Arrive back at Doubletree 6:00 PM
- The tour is free, but you must sign up in advance
- Transport is by MAX light rail (no charge to ride because the trip is in the Fareless Zone)

The Willamette River has always played a central role in the history and growth of Portland and that of the state as a whole. This role has become more critical in recent times since the river is also seen as an open space, wildlife habitat, and recreation resource and as a key element for fostering a sense of place in the community. The South Waterfront Greenway Development Plan has achieved an integrated and balanced design that fuses the goal of creating a new high-density urban community with the desire of the public to create habitat in the Willamette River. This tour will give you an in-depth look at how the greenway integrates redevelopment, transportation, housing, commerce, and energy use into a green vision for urban living.

#### **Field Workshop**

##### **A Confluence of People: The Confluence Land Bridge Partnership**

- Depart 1:30 PM; Arrive back at Doubletree 6:00 PM
- The field workshop is free, but you must sign up in advance
- Transport is by chartered bus (no charge)

This special off-site panel discussion and workshop will explore the extraordinary partnership that created the Confluence Project Land Bridge, in Vancouver, Washington (just across the river from Portland). The Land Bridge is a 40-foot-wide, earth-covered pedestrian bridge that links the Columbia River waterfront and Old Apple Tree Park with the historic Hudson's Bay Company Village at Fort Vancouver National Historic Site. The bridge is planted with native, sustainable plants that recreate the transition between riverine and prairie environments that were critical to human settlement of this area. The artwork reflects the confluence of American Indian tribes along the Columbia River, and the later fur trade and military history of this important site. The \$12.25 million project required a complex partnership of artists, architects, American Indians, transportation specialists, the city of Vancouver, the state of Washington, the National Park Service, and private citizens and organizations.

The panel discussion will be held at Fort Vancouver to explore this successful confluence of disparate interests that came together to build this important educational, artistic, and recreational feature within an urban national park. After the panel, workshop participants will tour the park, including the Land Bridge, exploring the various ways in which the scientific and humanistic study of cultural resources at Fort Vancouver National Historic Site and the Vancouver National Historic Reserve are integrated with public involvement, interpretation, and educational activities. The tour will be led by archaeologists, curators, and historians of the Northwest Cultural Resources Institute at Fort Vancouver who have direct experience in interpreting their results to the public. Workshop participants will gain an understanding of the challenges and mechanisms used to create similar programs and opportunities at other protected places.

**>>> Native Reception and Film Night • 7:30–8:30 PM (Reception), 8:30–9:30 PM (Film Night) • Broadway/Weidler Rooms**  
Come meet the Native Participant Travel Grant recipients and other Native attendees at an informal dessert reception! *Complimentary desserts; cash bar. All registrants welcome.*



Immediately following the Reception, join us for Native Film Night: a screening and discussion of short films about Native communities and concerns as they related to resource use, protected areas, sacred places, and more. These thought-provoking films will deepen your understanding of Native perspectives. Native Film Night is presented in cooperation with the International Institute for Indigenous Resource Management and its Indigenous Film & Arts Festival; visit them at <http://www.iiirm.org>. *Titles will be announced in the Late Changes handout. Complimentary refreshments. All registrants welcome.*

**>>> The National Park Service Cultural Resource Challenge • 8:00–9:00 PM • Mt. St. Helens Room**

*Presenters: Lisa Deline, National Park Service; Bob Sutton, National Park Service*

Last year, the National Park Service commissioned a review of our park cultural resource programs by the National Academy of Public Administration (NAPA). Among its 18 recommendations, the Academy strongly suggested that we should undertake a service-wide Cultural Resource Challenge. Our Cultural Resource Challenge will be comprehensive, it will establish clear priorities, and it will use sound justification, with the goal of improving stewardship of all park cultural resources, to ensure that this generation and future generations can enjoy, benefit and learn from our amazing variety of cultural resources. Of course, for this effort to be successful, we need to enlist the help of as many cultural resource specialists as possible. In this session, we will describe where we are in the process of developing the challenge, and leave plenty of time for discussion. *All registrants welcome.*

**>>> Zoonotic Disease Prevention: Practical Approaches for Biologists • 8:00–9:30 PM • Hawthorne Room**

*Organizer: Margaret Wild, National Park Service*

In this session, members of the NPS Office of Public Health and the Wildlife Management and Health Program will review practical approaches for identifying and preventing zoonotic disease transmission pathways. Short instructional presentations and hands-on demonstrations will be aimed at assisting biologists in implementing disease prevention methods described in NPS Reference Manual 50B, Section 4.15, "Safe Work Practices for Employees Handling Wildlife." Ample opportunity for discussion will be included, so bring your questions for NPS public health and wildlife health professionals and useful information to share with your colleagues. *All registrants welcome.*

**>>> National Park Service Northeast Region Reception • 7:00–9:00 PM • Sellwood Room**

*Complimentary hors d'oeuvres; cash bar. All NPS Northeast Region employees and friends welcome.*

>>> **National Park Service Intermountain Region Resource Stewardship and Research Directorate Reception •**

**7:00–8:00 PM • Ross Island Room**

*Cash bar. All NPS Intermountain Region employees and friends welcome.*

>>> **National Park Service Pacific West Region I&M Reception • 7:00–8:00 PM • Morrison Room**

*Complimentary hors d'oeuvres; cash bar. All NPS Pacific Region I&M coordinators and staff welcome.*

## Today's Plenary Session

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### Plenary Session IV

**8:00–9:30 AM • Multnomah/Holladay Ballrooms**

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#### Call to Order • Announcements

**Suzette Kimball**, U.S. Geological Survey / George Wright Society Board of Directors

#### Session Introduction / Moderator

**David Graber**, National Park Service Pacific West Region / Secretary, George Wright Society Board of Directors

### Climate Change in the Arctic's Oceans: What Does it Mean for Protected Areas?

#### Speaker

**David G. Barber**, Director, Center for Earth Observation Science, University of Manitoba

The conference's "Water for Life" theme will be addressed by David G. Barber, one of Canada's leading scientists working on climate change. Barber will discuss his research on the relationship between ocean sea ice and atmosphere processes in the Arctic, the effects of climate change on those processes, and ramifications for marine protected areas in the Arctic and worldwide. He will help us understand the consequences of climate variability and change in the Arctic—and how to separate fact from fiction in the media's coverage of these issues.



**David G. Barber** obtained Bachelor's and Master's degrees in Biology and Resource Management from the University of Manitoba, and his Ph.D. (1992) in Arctic Climatology from the University of Waterloo, Ontario. He was appointed to a faculty position at the University of Manitoba in 1993 and received a Canada Research Chair in Arctic System Science in 2002. He is currently Director of the Centre for Earth Observation Science (CEOS), and Associate Dean (Research), Faculty of Environment, University of Manitoba. Barber has extensive experience in the examination of the Arctic marine environment as a system. His early work, with Fisheries and Oceans Canada, examined Arctic marine mammal habitat detection and change. His later work focused on the geophysics of snow and sea ice, and in particular the response of the snow/ice system to oceanic and atmospheric forcing. His research group has a special interest in the coupling between physical and biological systems in the Arctic and in the use of Earth Observation platforms in the study of ocean–sea ice–atmosphere (OSA) processes.

Barber has published over 80 articles in the peer-reviewed literature pertaining to sea ice, climate change and physical-biological coupling in the Arctic marine system. He has led several investigations into sea ice dynamic and thermodynamic process, ship navigation in sea ice, habitat selection, and Arctic climate change. He has undertaken leadership roles in network projects such as the North Open Water (NOW) polynya network, the Canadian Arctic Shelf Exchange Study (CASES), and the Collaborative Interdisciplinary Cryosphere Experiment (C-ICE). He is currently theme leader of ArcticNet (A Canadian Network of Centres of Excellence). He is also the principal investigator of a major International Polar Year (IPY) project known as the Circumpolar Flaw Lead (CFL) system study (2007–2011). In addition to his university teaching and administrative commitments, Barber has established the Community Based Monitoring Program (CBM) which links several Inuit communities into measurement and monitoring of sea ice and snow-related parameters in the Western High Arctic and Hudson Bay. He was also instrumental in establishing the "Schools on Board" program, which outreaches Arctic marine science to high schools throughout Canada aboard the Canadian Research Icebreaker *NGCC Amundsen*.



# Concurrent sessions • Wednesday morning, March 4 • 10:00–12:05

	10:00–10:25	10:25–10:50	10:50–11:15	11:15–11:40	11:40–12:05
<b>Session 56</b> Multnomah	Monitoring and Reporting Landscape Change in and around Protected Areas: From Good Science to Operational Monitoring and Reporting Systems Hollo, chair	<b>PANEL DISCUSSION</b> Chair: Stephen Woodley Panelists: Robert Fraser, Andy Hansen, John E. Gross			
<b>Session 57</b> Holladay	Transportation Planning Partnerships to Enhance National Parks and Gateway Communities / Katherine Turnbull	The Carrying Capacity of a National Park Scenic Road / Jeffrey Hall et al.	Incentives and Disincentives for Day Visitors' Use of Transit Services at Acadia National Park / F. Matthew Holly et al.	Bicycling on Federal Lands: A Win-Win Investment / Rebecca Gleason et al.	Visitor Experience and Transportation Systems in Yosemite National Park / Dave White
<b>Session 58</b> Broadway / Weidler	Water Allocation: The Right Amount of the Right Type / Joe Meyer, chair	Groundwater Withdrawal: How Will It Affect Small Mammals? / Bryan Hamilton	Water Chemistry Trends in Big Rivers of the Northern Colorado Plateau / David Thoma et al.	Fear and Loathing along the Colorado River / Sami Seeb et al.	Water Science from the U.S. Geological Survey in Support of Park Management / Glenn Patterson
<b>Session 59</b> Hawthorne / Sellwood	Cultural Landscape Approaches to Interpreting Difficult History / Rebecca Conard, chair	Toward Whole History at Stones River NHB / Carolyn Powell et al.	Interpreting the Cultural Landscape of "the Blues" through Film: "Refuse to Fold" / Brian Dempsey	Hawaiian Storyed Place Names: The Journey from Un-naming to Re-placing / Renee Louis 566	Indigenous Geography: A Case Study of Shared Authority / Amy Van Allen
<b>Session 60</b> Ross Island	Engaging New and Diverse Communities / Rebecca Stanfield McCown, chair	Involving Gateway Community Youth in Protected Areas Social Science Research / Andrew Ackermann et al.	Identifying Indigenous Community Visitor Needs at Bandelier National Monument / Michael Kelly et al.	Branching Out: An Exploration in Landscape Management for Boston-area Youth / Robert Page	PENDING-Michelle Harper
<b>Session 61</b> Oregon	Getting from Conflict to Resolution: Case Studies / Judy Alderson, chair	The Timbisha Shoshone and Death Valley National Park / Theodore Cation	From Sabotage to Sandwiches: The Transformation of Conflict in the Clackamas River Watershed / Wesley Wong	Thinking Like a Watershed: Working Together to Expand Nahanni National Park Reserve / Laura Pitkanen et al.	Managing Climbers in Denali National Park: The Role of Science and Calamity in Conflict Resolution / Frank Morris
<b>Session 62</b> Alaska	Trends in and Constraints on Recreation / Angeles Mendoza Sammet, chair	Declining National Park Visitation: Perceived Causes, Assumptions, and Research Needs / John Shultis	Understanding Visitors' Intention to Visit State Parks: An Application of Theory of Planned Behavior / Suresh Shrestha et al.	OPEN	OPEN
<b>Session 63</b> Idaho	Geoparks: Creating a Vision for North America	<b>PANEL DISCUSSION</b> Chair: Suzette Kimball Panelists: Robert Missolen, Tim Badman, Wesley Hill			
<b>Session 64</b> Mt. Bachelor	Recreation Ecology I / Jeff Marion, chair	Lessons Learned from Multi-scale Longitudinal Studies of Recreation Impacts / David Cole	Site Management and Education: Integrated Approaches to Keeping Visitors on Trail / Logan Park et al.	Quantifying the Natural Resource Consequences of Day Use in Rocky Mountain National Park / Christopher Montz et al.	Thirteen Years of Monitoring Campsite Conditions in Prince William Sound, Alaska, USA / Paul Twardock et al.
<b>Session 65</b> Mt. Hood	Protecting Natural Sounds II: Assessing Acoustical Conditions in Parks / Kurt Fristrup, chair	The Acoustical State of the Parks: A First Look / Kurt Fristrup et al.	Modeling and Mapping Transportation-related Noise Impacts in Protected Natural Areas / Ken Kaliski et al.	Alternative Sound Monitoring Methods: Logging Sounds in Rocky Mountain National Park / Adam Gibson et al.	Q&A
<b>Session 66</b> Mt. St. Helens	Threats to Ocean Parks: Looking for Solutions Outside the Boundary / Cliff McCready, chair	Making the Most of Coastal Water Quality Data in National Parks / Eva DiDonato	An Inconvenient Park: Urban Development and Resource Protection at Kaloko-Honokohau NHP / Sallie Beavers	Monitoring and Adaptive Management of Salt Marsh Restoration in an Urban Park / Patricia Rafferty	Staying Above Water: Maintaining Sediment Supplies for Coastal Parks During Climate Change / Julia Brunner



# Concurrent sessions • Wednesday afternoon, March 4 • 1:30–3:35

	1:30–1:55	1:55–2:20	2:20–2:45	2:45–3:10	3:10–3:35
<b>Session 67</b> Multnomah	Impacts of Energy Development on Parks and Opportunities for Mitigation Chair: Carol McCoy Panelists: Chuck Pettee, John Bunyak, Vickie McCusker, Elaine Leslie, Shawn Norton				
<b>Session 68</b> Holladay	Lessons Learned from the Application of Evaluation Research to Five Program Areas Chair: Nora Mitchell Panelists: Rebecca Stanfield McCown, Jodie Riesenberger, Jennifer Jewiss, Daniel Laven, Patti Reilly				
<b>Session 69</b> Broadway / Weidler	Communicating Science Effectively Workshop Chair: William Dennison Presenters: Tim Carruthers, Shawn Carter				
<b>Session 70</b> Hawthorne / Sellwood	Issues in Water Resource Management / James Roche, chair	A Study of Ground- and Surface-water Resources in and around Great Basin National Park, Eastern Nevada / Russell Plume et al.	Analyzing the Effects of Regulated Streamflow on the Hydrology of Congaree National Park Using Data Mining Techniques / Paul Contrads et al.	Threats to the Protection of Water Resources across National Park System Units / Gail Dethloff et al.	A New Approach to Wet Meadow Restoration at Halstead Meadow, Sequoia National Park / Joel Wagner et al.
<b>Session 71</b> Ross Island	Challenges in Protecting and Interpreting Paleontological Resources / Lisa Norby, chair	Cretaceous Dinosaurs in Denali: Cause for a Holocene Stampede? / Phil Breese et al.	Runaway Dinosaur Tracks: Cooperative Efforts to Preserve Fossil Resources at Two National Natural Landmark Sites / Heather Germaine et al.	Protecting Resources and Promoting Research: Contributions by Paleontology Interns at Florissant Fossil Beds National Monument / Herbert Meyer et al.	Evolutionary Theory, Modern Ecosystems, and Paleontology Exhibits: Complexity in Resource Interpretation / Ted Fremd
<b>Session 72</b> Oregon	Integrating Cultural Values with Western Science and Resource Management / Brent Mitchell, chair	Tunitag Contingency: Oral History and Caribou Logic on the Alaska Peninsula / Loukas Barton	Understanding the Footsteps of Ancestors: Integrating Cultural Values into Natural Resources Monitoring / Leslie HaySmith et al.	Utilizing Indigenous Knowledge in Ecosystem-based Management of Papahānaumokuākea Marine National Monument, Hawaii / Aulani Wilhelm et al.	The Arizona Trail: A Path to Appreciation / Shawn Hyde
<b>Session 73</b> Alaska	An Island No Longer: Bridges from Crater Lake to the Klamath Basin and Beyond / Steve Mark, chair	Cultural Endurance and Protected Areas: The View from Crater Lake / Douglas Deur et al.	Bull Trout Restoration: Partnering to Save Fish, Improve Water Quality, Restore Habitat, and Improve Irrigation / Mark Buktentica et al.	Bridging the Digital Divide: Putting Research and Archival Records Online from Crater Lake / Anne Hiller Clark et al.	Round Table: Streamlining the Crater Lake Science and Learning Center / Craig Ackerman et al.
<b>Session 74</b> Idaho	The Many Faces of Visitor Use Management in National Parks: Strategic Planning for the Future Chair: Kerri Cahill Presenters: Jim Bacon, Steve McCool, Wayne Freimund				
<b>Session 75</b> Mt. Bachelor	The Science and Strategies of Collaboration to Combat Marijuana Cultivation on Park Lands Chair: Barbara Alberri Panelists: Cammie D'Entremont Partelow, Steve Shackleton, Athena Demetri, Alan Foster				
<b>Session 76</b> Mt. Hood	Movies on the Mountain: Collaboration through Video Documentation Chair: Lawrence Johnson Presenters: Charles Hudson, Brent Johnson				
<b>Session 77</b> Mt. St. Helens	Water for Life: Integrating Natural Resources, Planning, and Management Chair: Barbara J. Johnson Panelists: David Vana-Miller, Steven Fancy, Don Weeks, Patrick Malone, Leigh Welling				

# Concurrent sessions • Wednesday afternoon, March 4 • 4:00–6:05

	4:00–4:25	4:25–4:50	4:50–5:15	5:15–5:40	5:40–6:05
<b>Session 78</b> Multnomah	Feral to Permitted to Preserved: Managing Scientific Collections Taken from National Parks	<b>PANEL DISCUSSION</b> Chair: Ann Hitchcock Panelists: Christie Hendrix, David Manski, Nancy Russell, Miriam Luchans, Carla C. Mattix <b>DISCUSSANT:</b> John Dennis			
<b>Session 79</b> Holladay	Transportation in Parks II / Jeffrey Hollo, chair	Research to Support Implementation of Transportation Planning and User Capacity Decisions in Rocky Mountain National Park / Peter Newman et al.	Exploring Visitor Preferences for Transportation Options in Rocky Mountain National Park / David Pettibone et al.	Linking Transportation with Resource and Experiential Conditions at Rocky Mountain National Park / Robert Chamberlin et al.	Standards of Quality and Levels of Service: Bridging the Gap between Efficiency and Sustainability in the context of Transportation for Tourism / Peter Pettengill et al.
<b>Session 80</b> Broadway / Weidler	Overcoming that Manifesting Destiny: Challenging NPS Interpretation of Nez Perce National Historical Park	<b>PANEL DISCUSSION</b> Chair: Gary F. Somers Panelists: Albert Andrews Redstar, Armand Minihorn, Nakia Williamson, Marc Blackburn, Timothy A. Nitz			An Evaluation of Visitor Decisions Regarding Alternative Transportation in Glacier National Park / Melissa Baker et al.
<b>Session 81</b> Hawthorne / Sellwood	NPS Director's Order 11B: Information Quality—Objectivity, Utility, and Integrity of Information; Ethics; Peer Review	<b>DAY-CAPPER</b> Chairs: John Dennis, Louise Hose			
<b>Session 82</b> Ross Island	Land and Water: Spirit and Form / Melia Lane-Kamabele, chair	Healing Landscapes: An Historical Perspective / Kurt Russo	Traditional and Cultural Uses Important in Spite of Change / Rosemary Ahluwalia	Water is Sacred: A Tribal Perspective on the State of Water in America / Mark Franco et al.	Return of the Chumash: Considerations and Institutional Challenges / Marcus Lopez et al.
<b>Session 83</b> Oregon	Aircraft Overflights: Things You May Want to Know / Catherine Lentz, chair	Assessing Impacts from Aircraft Overflights at Grand Canyon National Park / Rick Ermenwein	Military Overflight Management and Education Program: Immersion and Communication / Gregg Fauth	Echoes in the Canyons: Tools to Manage Soundscapes in Yosemite / Joe Meyer	Air Tours and National Parks: Lessons Learned (So Far) from the Mount Rushmore ATMP / Frank Turina
<b>Session 84</b> Alaska	Monitoring Vegetation and Climate Change in the Alpine: Establishing GLORIA Sites in the National Parks	<b>WORKSHOP</b> Chair: Isabel Ashton Presenters: John Spence, Mike Britten, Paul McLaughlin			
<b>Session 85</b> Idaho	International Collaborative Efforts / Tom Fish, chair	Causes and Potential Solutions for Conflicts between Park Management and Local Communities in Germany / Erick von Ruschkowski	Is Community-based Conservation an Effective Tool in the Lamahue Watershed, Chile? / Michelle Moorman et al.	Beyond the Boundaries: A Qualitative Case Study of Protected Areas in Chiapas, Mexico / Carla Morán Trejos et al.	Collaboration as Process: Transboundary Conservation across the Big Bend on the U.S.-Mexico Border / Geoff Kelley
<b>Session 86</b> Mt. Bachelor	NPS Inventory & Monitoring (I&M) Network Coordinators Workshop	<b>WORKSHOP</b> Chair: Bill Route			
<b>Session 87</b> Mt. Hood	NPS Inventory & Monitoring (I&M) Data Managers Workshop	<b>WORKSHOP</b> Chair: Dennis Skids			
<b>Session 88</b> Mt. St. Helens	NPS Inventory & Monitoring (I&M) Ecologists Workshop	<b>WORKSHOP</b> Chair: John Paul Schmit			

## Thursday, March 5

### Today's On-going Events

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>>> **Registration • 7:00 AM–6:00 PM • Main Lobby**

>>> **Poster Session: Posters, Computer Demos, Exhibits • 8:00 AM–3:00 PM • Exhibit Hall**

Last chance for the Poster Session! Posters are available for viewing anytime. Computer demos are available at the discretion of the presenter. Poster tear-down begins at 2:00 PM, and all Posters and Computer Demos, and any Exhibits that are in the Exhibit Hall, must be removed by 3:30 PM.

>>> **Powell's Books Sales Table • 9:00 AM–5:00 PM • Exhibit Hall**

Powell's Books, one of America's largest and best-known independent book stores, will be having a sales table stocked with titles of interest—including a range of titles authored by conference participants.

### Today's Special Event

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>>> **GWS / NPS Awards Banquet • 7:00–9:30 pm • Governor Hotel, 614 SW 11th Avenue, downtown Portland**

A George Wright Society tradition, the Thursday evening Awards Banquet recognizes the winners of "Imagine Excellence," the GWS awards program. The banquet will also feature the presentation of the National Park Service Director's Awards for Natural Resource Stewardship.

The banquet will be held at the historic Governor Hotel in downtown Portland, a 10-minute ride from the Doubletree on the MAX light rail system. Complete directions will be included with banquet tickets. *Seating for dinner is at 7:15; cash bar available. Advance ticket purchase required.*

### Today's Plenary Session

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**Plenary Session V**

**8:00–9:30 AM • Multnomah/Holladay Ballrooms**

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**Call to Order • Announcements**

**John Waithaka**, Parks Canada / George Wright Society Board of Directors

**Session Introduction / Moderator**

**Melia Lane-Kamahele**, National Park Service / George Wright Society Board of Directors

**Hana Lima Kokua (Many hands working together, joined in a common goal)**

**Panelists**

**Larry Innes**, Executive Director, Canadian Boreal Initiative

**T. `Aulani Wilhelm**, NOAA Superintendent, Papahānaumokuākea Marine National Monument

Partnerships form the bedrock of support for protected areas. Effective collaborations bring together the resources and aspirations of multiple partners to address common goals. Protected areas in some cases function as a "hub" in a much larger network of community and regional partners and their effectiveness is often dependent on their ability to leverage the success of key partners. The panelists in this session will discuss how they are building and managing innovative partnerships and networks that support protected area conservation efforts.



**Larry Innes** is the executive director of the Canadian Boreal Initiative, where he leads collaborative conservation efforts involving First Nations, environmental, and industry partners across Canada's Boreal region. Over the past two years, CBI and its partners have worked to designate some 40 million acres for conservation, largely by supporting First Nation-led conservation and land use planning initiatives. Innes has over a decade of experience in this area, having advised and represented several First Nations addressing major mining, forestry, and hydroelectric developments. Innes holds a law degree from the University of Victoria, a Master's in Environmental Studies from York University, and is also a graduate of McMaster University's interdisciplinary Arts & Science Programme. He is called to the bar in Ontario and Newfoundland and Labrador, and occasionally practices with Olthuis, Kleer, Townshend, a Toronto law firm specializing in Aboriginal and environmental law. He lives in Goose Bay, Labrador, with his wife, two children and a retired sled dog.



**T. Aulani Wilhelm** has been involved in conservation and management issues in Hawai'i for the past 12 years. Wilhelm is currently superintendent for the National Oceanic and Atmospheric Administration (NOAA) at Papahānaumokuākea Marine National Monument, the largest single conservation area under the U.S. flag and the world's largest marine protected area. The monument is co-managed by NOAA, the U.S. Fish & Wildlife Service, and the state of Hawai'i. Prior to this, she served as the acting superintendent and previously served as the acting reserve coordinator of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, providing continuity of management and operations for the project since 2000. Preceding her work at NOAA, Wilhelm served for six years as the special assistant to the director and public information officer of the Hawai'i Department of Land and Natural Resources, where she was involved in numerous terrestrial and marine planning and policy initiatives. She has served on the board of many conservation projects and is a well-recognized leader in the protection and perpetuation of Hawai'i's natural and cultural resources.



# Concurrent sessions • Thursday morning, March 5 • 10:00–12:05

	10:00–10:25	10:25–10:50	10:50–11:15	11:15–11:40	11:40–12:05
<b>Session 89</b> Multnomah	Climate Change: Responses by Protected Area Managers / Mary Foley, chair	Strategies for Addressing Climate Change in the National Park System in Alaska / Robert Wintfree	Rethinking Rare Plant Species Persistence in the Face of Global Change / Peggy Moore	Carbon Footprint Analyses of Resource Management Operations: Realistic Challenges and Timely Opportunities / Carol Guy et al.	Visitors' Perceptions of Local Climate Change: Awareness, Concern, and Civic Action / Matt Brownlee et al.
<b>Session 90</b> Holladay	Voices of a Collaborative System: Strategies and Lessons Learned from the Colorado River in Grand Canyon / Jan Balsom, chair	Southern Paiute People and Piopaxa 'Ujip: Adaptation and Lessons Learned in the Glen Canyon Dam Adaptive Management Program / Charley Bullett	Successful Collaboration Requires a Shared Objective / Nikolai Lush	Accomplishing Conservation to Benefit Biological Diversity through Collaborative and Adaptive Management / Sam Spiller	Preserving Grand Canyon's Resources: Adaptive Management or Adaptive Science? / Steve Martin
<b>Session 91</b> Broadway	New Directions, New Visions: The Future of Innovation in Park Management / David Ostergren, chair	Making a Case for Utilizing Integrated Science in Protected Areas / Charles van Riper III	Beyond the Trees: Protecting Parks in the Next 100 Years / Timothy Baird et al.	OPEN	OPEN
<b>Session 92</b> Weidler	Analyses and Syntheses of Inventory & Monitoring Data / Tom Philippi, chair	The Utility of Structural Equation Modeling for Synthesizing the Effects of Cards Using Monitoring Data / John Paul Schmitt et al. (10:20–10:40) • Bayesian Approaches to Trend Analysis / Scott Gende et al. (10:40–11:00) • Using Aquarius Time Series Software to Manage Data from Continuous Water Quality Monitors in UCBM / Eric Starkey (11:00–11:20) • An Overview of Habitat Analysis Approaches to Extracting Management Information / Tom Philippi et al. (11:20–11:40) • Multi-season Occupancy Models for Inventory and Monitoring Datasets / Tom Rodhouse (11:40–12:00)			
<b>Session 93</b> Halsey	World War II Home Front: Preservation Partnerships	<b>PANEL DISCUSSION</b> Chair: Vincent Santucci Panelists: Harry Butowsky, Tom Leatherman, Stephen Haller, Brandon Bies, Robert Sutton, Laura Cohen, Matt Virta			
<b>Session 94</b> Hawthorne / Sellwood	Invasive Species / Chair TBA	Controlling an Invasive Marine Algal Species in a Culturally Significant Hawaiian Fishpond / Moriska Weijerman et al.	Requests for Management of Invasive Species are on the Rise / Mark Wolawa et al.	The Challenge of Controlling the Invasive Offspring of Historic Olive Trees / Paula Power et al.	Cooperative Restoration: Integrating Traditional and Contemporary Concepts to Restore a Sierra Nevada Meadow / Brent Johnson
<b>Session 95</b> Ross Island / Morrison	Virtual Learning / Samantha Weber, chair	Partnerships in Communication: Recent Advances in Virtual Research Learning Centers / Emily Yost et al.	An Examination of Live Interactive Virtual Explorations at the Cabrillo National Monument in Southern California / Kimberly Bruch et al.	Bringing National Parks into America's Classrooms / Bruce Nash et al.	PENDING—Susan Teel
<b>Session 96</b> 3 Sisters	Understanding Protected Areas in Geographical Context / Claire Jantz, chair	Forecasting Urban Development in the Upper Delaware Watershed / Claire Jantz et al.	Connectivity: A Step Beyond Partnerships / John Donahue et al.	Assessing the Ecological Context of the National Park and National Wildlife Refuge Systems / Leona Svancara	Islands to Networks: Solution for Nature Conservation? / Stephen Woodley
<b>Session 97</b> Mt. Bachelor	Recreation Ecology II / Logan Park, chair	Classifying Approaches to Visitor Impact Assessment in U.S. and Australian Protected Areas / Yu-Fai Leung et al.	Recreation-Related Ecological Conditions of Mountain Summits in the Northern Forest: A Framework for Management / Kelly Goonan et al.	Utilizing GPS-based Measurements of Visitor Behavior in Parks and Protected Areas: Limitations and Opportunities / Ashley d'Antonio et al.	Assessing the Effect of Rock Climbing and Hiking on the Cliff Vegetation of Great Falls Park, VA / Chris Carr et al.
<b>Session 98</b> Mt. Hood	World Heritage: Where Are We Now?	<b>PANEL DISCUSSION</b> Chair: Stephen Morris Panelists: Cindy Orlando, Erika Harms			
<b>Session 99</b> Mt. St. Helens	The Untold Stories of the Famous and Forgotten: The National Trail System of the National Park Service	<b>PANEL DISCUSSION</b> Chair: W. Otis Hallmoon Panelists: Mike Taylor, Frank Norris			



# Concurrent sessions • Thursday afternoon, March 5 • 1:30-3:35

	1:30-1:55	1:55-2:20	2:20-2:45	2:45-3:10	3:10-3:35
<b>Session 100</b> Multnomah	Natural and Cultural Resource-Based Storm Response and Recovery in Ocean and Coastal Parks / Mark Borrelli & Rebecca Beavers, chairs	The Storm Project: Discussing Data Products and the Way Forward / Mark Borrelli et al.	Managing the Natural Recovery of Coastal Systems Following Extreme Storms / Chris Houser	Predicting Coastal Storm Impacts for National Parks / Patrick Barnard	Storm Recovery Planning for Natural and Cultural Resources: The Cape Lookout Storm Recovery Plan / Eric Bardenhagen et al.
<b>Session 101</b> Holladay	Linking Predators to Plants: What is the Role of Trophic Cascades in National Parks? / William Ripple, chair	Adolph Murie, Olaus Murie, Aldo Leopold, and Large Carnivore Conservation in the National Parks / Cristina Eisenberg	Wolves to Aspen and Cavity-nesting Birds: Trophic Cascades and Beyond in the Northern Yellowstone Ecosystem / Jeff Hollenbeck	Plant Recruitment Following Wolf Reintroduction in Yellowstone National Park / Josh Halofsky	Ecological Consequences of Large Predator Removal and Some Alternatives for Ecosystem Recovery / Robert Beschta et al.
<b>Session 102</b> Broadway	Restoration of Freshwater Aquatic Ecosystems in the National Park System / John Wulfschleger, chair	Restoration of Mountain Yellow-legged Frogs and Aquatic Ecosystems in Sequoia and Kings Canyon National Parks, California / Danny Boiano et al.	Implementing and Developing a Non-native Fish Control Strategy in the Upper Colorado River Basin / Melissa Trammell	The Effects of Ocean-Atmosphere Oscillation Phenomena on Sockeye Salmon Populations in Long Lake, Wrangell-St. Elias National Park & Preserve / Molly McCormick et al.	Effectiveness of Gill Nets for Controlling Self-sustaining Populations of Non-native Trout in North Cascades National Park Mountain Lakes / Reed Glesne
<b>Session 103</b> Weidler	Get the Lead Out! Reducing Environmental Risk to Natural Resources and Elevating Human Health Concerns	<b>SHORT PRESENTATIONS / Q&amp;A</b> Chair: Elaine Leslie Presenters: Mike Soukup, Mike Wallace, James Petterson, Vernon Thomas, Steve Cain, Kent Redford			
<b>Session 104</b> Halsey	Understanding and Managing Recreation Impacts / Jim Bacon, chair	A Cost Effective and Efficient Way to Assess Trail Conditions: A New Sampling Approach / Rachel Knapp et al.	A Multidisciplinary Approach to Coastal Composite Monitoring at Kenai Fjords National Park / Meg Hahr et al.	Best Practices for Equestrians in California National Parks / Mietek Kaliginski et al.	The Evolution of Minimum Impact Techniques on the Colorado River through Grand Canyon / Mathieu Brown
<b>Session 105</b> Hawthorne / Sellwood	Preparing the Next Generation of Protected Area Managers: The 2008 Park Break Program	<b>PANEL DISCUSSION</b> Chair: Sarah Stehn Panelists: Brandon Pope, Ryan Sharp, Michelle Moorman, Carena van Riper			
<b>Session 106</b> Ross Island / Morrison	Protecting Mexico's Heritage: Managing Complex Relationships along the Site-Society Interface / Jack Corbett, chair	International Standards and National Priorities: Creating Protected Areas in Mexico / Francisco Lopez Morales	Legal Protection and Grassroots Negotiation in Protected Area Management / Lourdes Nicolas	Caves, Cacti, and Calabazas: The Realities of Protected Area Management in Oaxaca / Antonio Martinez	Q&A
<b>Session 107</b> 3 Sisters	So, How Are We Doing? Evaluating Program Effectiveness / Tony Varcoe, chair	Evaluating Management Performance and Effectiveness for Protected Areas / Angeles Mendoza Sammet et al.	From Partnerships to Networks: New Approaches for Measuring National Heritage Area Effectiveness / Daniel Laven et al.	Beyond Outreach: Promising Practices for Engaging Diverse Audiences at Santa Monica Mountains National Recreation Area / Rebecca Stanfield McCown et al.	Stewardship 101: Great Smoky Mountains National Park Junior Ranger Program Evaluation Instrument Development / Susan Vezeau
<b>Session 108</b> Mt. Bachelor	Connecting the Dots: Systems and Networks of Marine Protected Areas / Lauren Wenzel, chair	Toward Common Conservation Objectives: Establishing a National System of MPAs / Lauren Wenzel	Lessons Learned from the Seamless Network / Cliff McCreedy et al.	Identifying Conservation Gaps to Build a National System of MPAs / Charles Wahle	Establishing a State System of MPAs: California's Marine Life Protection Act Initiative / Melissa Miller-Henson
<b>Session 109</b> Mt. Hood	Protecting Natural Sounds III: From Knowledge to Action: Researchers and Managers Working toward Soundscape Protection / Peter Newman, chair	Soundscape Acoustic Zones of Bryce Canyon National Park / Britton Mace et al.	Evaluation of Methods Used to Study Visitors' Perceptions of National Park Soundscapes / Steven Lawson et al.	An Interpretive Toolbox for Natural Soundscapes / Lelaina Marin et al.	Wow, Did You Hear That? Connecting Kids and Parks Through Science / Karen Trevino
<b>Session 110</b> Mt. St. Helens	Anticipating the Next Invasion: Protecting Park Resources from Aquatic Invasive Species	<b>PANEL DISCUSSION</b> Chair: John Wulfschleger Panelists: Paul Heimowitz, Sandee Dingman, Brenda Moraska Lafrancois, Jay Glase, John Wulfschleger			

# Concurrent sessions • Thursday afternoon, March 5 • 4:00–6:05

	4:00–4:25	4:25–4:50	4:50–5:15	5:15–5:40	5:40–6:05
<b>Session 111</b> Multnomah	Dealing with Hyper-abundant Native Wildlife: New Directions for Active Park Management? Chair: Stephen Woodley PANELISTS: John Wathaka, Tammy Dobbie, Peter Deering, Cliff White, Scott Gremel				
<b>Session 112</b> Holladay	Ecological Integrity Reporting / Dave Parsons, chair	A Closer Look at Environmental Indicators, Habitat Thresholds, and Report Card Frameworks / Tim Caruthers et al.	Collaborative Monitoring and Reporting of Forest Ecological Integrity / Brian Mitchell et al.	"Partners in Flight" Bird Conservation Focal Species Monitoring in the NPS Klamath I&M Network / John Alexander et al.	The Virals of Wetlands: Bioassessment of Park-scale Wetland Ecological Integrity in Rocky Mountain National Park / Billy Schweiger et al.
<b>Session 113</b> Broadway	Science Communication: Strategies for Successful Collaboration	PANEL DISCUSSION Chair: Sara Melena Panelists: Lindsay Paulding, Michelle O'Herron, Marcus Koenen, Mike DeBacker, Sherry Middlemiss-Brown			
<b>Session 114</b> Weidler	When a Line on the Map Isn't Enough: Thinking through Resource Stewardship Dilemmas	PANEL DISCUSSION Chair: Russell Galipeau Panelists: Kate Roney Faulkner, Christina Morts, Timothy Babalis, Paul DePrey, Susan Fritzke, Ann Huston			
<b>Session 115</b> Halsey	NPS Research Administration: Best Management Practices	PANEL DISCUSSION MODERATOR: Judith Visty PANELISTS: Tara Carolin, Tim Burchett, Brent Frakes, Christie Hendrix			
<b>Session 116</b> Hawthorne / Sellwood	Cultural Resource Management along Canada's Coasts / Thomas Hammer, chair	Cultural Resource Management on the Trent Severn Waterway / Peter Flood	Coastal Cultural Resource Management: A Nunavut Perspective / Douglas Stenton	Plugging the Holes: Improving Legal Protection of Canada's Marine Cultural Heritage / Patricia Kell	Towards an Understanding of the Effects of Climate Change on Parks Canada's Cultural Resources along its Waterways and Shorelines / Virginia Sheehan et al.
<b>Session 117</b> Ross Island / Morrison	Refuse to Fold: The Blue Front Café and Mississippi Heritage Tourism	DAY-CAPPER FILM SCREENING Filmmaker / Presenter: Brian Dempsey			
<b>Session 118</b> 3 Sisters	Changing Vegetation Communities: Management Challenges / Amy Symstad, chair	Minimizing and Managing Hemlock Forest Decline at Delaware Water Gap NRA / Richard Evans et al.	Conservation & Ecological Restoration of Rocky Mountain Subalpine Meadows: Understanding Vegetation Responses to Tree Encroachment / Adrienne Shaw	Strengthening the Chain: The Bay Area Early Detection Network / Andrea Williams et al.	Tamoligi ( <i>Falcattaria mouluccana</i> ) Control in Forests across Tutuila Island, American Samoa / Tavita Togia et al.
<b>Session 119</b> Mt. Bachelor	Diversification Tactics; or, Diversions, Ditches and Dams, Oh My! / Susan O'Ney, chair	Developing a Long-term Monitoring Program for Big Rivers on the Colorado Plateau / Dustin Perkins et al.	Spawning Patterns of Cutthroat Trout in the Snake River below Jackson Lake Dam / Kris Homel et al.	Fish Loss to Irrigation Diversions in the Gros Ventre River, Wyoming / Lisa Eby et al.	Gros Ventre River Hydrology, Diversions, and Water Rights, Grand Teton National Park, Wyoming / Gwen Gerber
<b>Session 120</b> Mt. Hood	Creating a Sense of Connection: The Practical Application of Place Attachment Research	DAY-CAPPER Chair: Elizabeth Halpenny Discussion Leaders: Linda Kruger, Carol Sheedy, Douglas Knopp			
<b>Session 121</b> Mt. St. Helens	New Insights into Wildlife Management / Glen Sargeant, chair	Demography and Genetic Structure of a Recovering Grizzly Bear Population / Kate Kendall et al.	Implications of Hunting in Channel Islands National Park / Dan Wakelee et al.	Wetland Networks Influence Bat Dynamics in Urban Parks / Todd Lookingbill et al.	The Influence of Human Visitor Activity on Patterns of Wildlife Parasite Infection / Chris O'Brien et al.
					Restoring the Fisher ( <i>Martes pennanti</i> ) to Olympic National Park / Patricia Happe et al.

## Today's Events

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>>> **Registration • 7:00–9:00 AM • Main Lobby**

>>> **Side Meetings • 8:00 AM–10:00 AM, 10:00 AM–12:00 PM, 1:00–3:00 PM, 3:00–5:00 PM**

This, the final day of the conference, is devoted entirely to Side Meetings and Field Trips. Some Side Meetings are by invitation only, while others are open to all registrants. See below for the day's schedule.

>>> **Full-Day Field Trips**

We're offering two full-day field trips, one to the Pacific Coast, and one up the Columbia Gorge, to cap off the week. *Space is limited; advance ticket purchase required.* See [http://www.georgewright.org/gws2009\\_fieldtrips.html](http://www.georgewright.org/gws2009_fieldtrips.html) for more detailed itineraries.

### **Lewis & Clark National Historical Park: Hike & Paddle**

- 8:00 AM–6:00 PM
- Cost: \$50 (box lunch included)
- Transport is by chartered bus

Lewis & Clark National Historical Park is located on the Pacific Coast at the mouth of the Columbia River. The park began as Fort Clatsop National Memorial, centered around the fort where the Corps of Discovery overwintered after making it to the Pacific. Congress recently expanded the park considerably, and this tour will emphasize a variety of current management issues, including ecological restoration, wildlife management, and land use.

### **The Many Meanings of the Columbia River Gorge**

- 8:00 AM–7:00 PM
- Cost: \$50 (box lunch included)
- Transport is by chartered bus

The Columbia River Gorge is an 80-mile-long canyon that provides the main water route to the Pacific Ocean through the Cascades Mountains. Much of the gorge is a National Scenic Area (administered by the U.S. Forest Service) and many activities in the Gorge are coordinated by the Columbia Gorge Commission. Our tour, led by Charles Hudson, public information chief for the Columbia River Inter-tribal Fish Commission, will emphasize the many (and sometimes conflicting) uses being made of the Gorge, including brand-new ones, such as Google's siting of one of its facilities in the town of The Dalles.

## Side Meetings • Friday morning, March 6 • 8:00–12:00

	<b>8:00 – 10:00</b>		
<b>Session 122</b> Hawthorne	OPEN		
<b>Session 123</b> Halsey	Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service CONTINUES IN SESSION 129	SIDE MEETING, BY INVITATION ONLY Chairs: Jim Kendrick, Duane Hubbard	
<b>Session 124</b> Weidler	Building the Capacity to Effectively Respond to the Challenge of Climate Change	SIDE MEETING, OPEN TO ALL NPS EMPLOYEES Chairs: Leigh Welling, Daniel Odess, Shawn Norton	
<b>Session 125</b> Morrison	Geology, Spreadsheets, Quantitative Literacy, and Natural Resources: Spreadsheets across the Curriculum Meet Research Learning Centers	SIDE MEETING, OPEN TO ALL Chairs: H.L. Vacher, Ben Becker	
<b>Session 126</b> Ross Island	Ocean Park Stewardship Meeting	SIDE MEETING, OPEN TO ALL Chairs: Cliff McCreedy, Jeffrey N. Cross	
<b>Session 127</b> Sellwood	NPS Fire GIS Committee CONTINUES IN SESSION 133	SIDE MEETING, BY INVITATION ONLY Co-chairs: Gladys Crabtree, Kathie Hansen	
	<b>10:00 – 12:00</b>		
<b>Session 128</b> Hawthorne	OPEN		
<b>Session 129</b> Halsey	Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service CONTINUES IN SESSION 141; CONTINUES IN SESSION 135	SIDE MEETING, BY INVITATION ONLY Chairs: Jim Kendrick, Duane Hubbard	
<b>Session 130</b> Weidler	National Park Service Climate Change Response Steering Committee Meeting	SIDE MEETING, BY INVITATION ONLY Chairs: Bert Frost, Steve Whitesell, Leigh Welling	
<b>Session 131</b> Morrison	Status Report on the National Park Service Socioeconomic Monitoring Program	SIDE MEETING, OPEN TO ALL Chair: James Gramann	
<b>Session 132</b> Ross Island	Vegetation and Soils Monitoring in National Parks: Developing and Implementing Long-term Monitoring Protocols	SIDE MEETING, OPEN TO ALL Chair: Donna Shorrock	
<b>Session 133</b> Sellwood	NPS Fire GIS Committee CONTINUED FROM SESSION 127	SIDE MEETING, BY INVITATION ONLY Co-chairs: Gladys Crabtree, Kathie Hansen	



## Side Meetings • Friday afternoon, March 6 • 1:00–5:00

	1:00–3:00		
<b>Session 134</b> Hawthorne	OPEN		
<b>Session 135</b> Halsey	Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service CONTINUED FROM SESSION 129; CONTINUES IN SESSION 141	SIDE MEETING, BY INVITATION ONLY Chairs: Jim Kendrick, Duane Hubbard	
<b>Session 136</b> Weidler	Rocky Mountain Network Board of Directors and Technical Committee Meeting	SIDE MEETING, BY INVITATION ONLY Chairs: Michael Britten, Art Hutchinson, Melana Stichman	
<b>Session 137</b> Morrison	USGS, NPS and the Natural Resources Preservation Program (NRPP): Funding Research to Meet the Science and Management Needs of the National Parks	SIDE MEETING, OPEN TO ALL Chair: Robin P. White	
<b>Session 138</b> Ross Island	Developing a Strategic Plan for NPS's International Programs	SIDE MEETING, BY INVITATION ONLY Chair: Jonathan Putnam	
<b>Session 139</b> Sellwood	Research Learning Center (RLC) Coordination Meeting CONTINUES IN SESSION 145	SIDE MEETING, BY INVITATION ONLY Chair: Ben Becker	
	3:00–5:00		
<b>Session 140</b> Hawthorne	OPEN		
<b>Session 141</b> Halsey	Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service CONTINUED FROM SESSION 135	SIDE MEETING, BY INVITATION ONLY Chairs: Jim Kendrick, Duane Hubbard	
<b>Session 142</b> Weidler	OPEN (NOTE: THIS ROOM IS ONLY AVAILABLE 3:00–4:30)		
<b>Session 143</b> Morrison	OPEN		
<b>Session 144</b> Ross Island	Law, Negotiation, and Partnerships: Reflections on Heritage Management in North America	SIDE MEETING, OPEN TO ALL Chair: Jack Corbett Presenters: Hilary Soderland, Larry Weise, Alastair Kerr, Nelly Robles Garcia	
<b>Session 145</b> Sellwood	Research Learning Center (RLC) Coordination Meeting CONTINUED FROM 139	SIDE MEETING, BY INVITATION ONLY Chair: Ben Becker	



# Abstracts

## Monday Morning, March 2

Concurrent Session #1 • Multnomah • Panel Discussion

### **Beyond Naturalness: Park and Wilderness Purposes and Stewardship Objectives for the 21st Century**

Chair: David Cole, Research Scientist, Aldo Leopold Wilderness Research Institute, Missoula, MT

For much of the 20th century, the goal of preserving parks and wilderness in their natural state was revolutionary. Naturalness requires that humans restrain their activities. But as the conservation challenge has shifted from protecting lands from development to the day-to-day stewardship of protected areas, the adequacy of naturalness as a guiding concept has eroded. The key challenge facing park and wilderness stewards today is knowing where and how to intervene in ecosystem processes in response to human impact and global change. Current agency policy, which directs managers to preserve or restore natural conditions, does not provide adequate guidance for meeting this challenge. In this session, we will explore reasons naturalness is no longer adequate, some alternative guiding concepts, and the importance of taking diverse stewardship approaches. We will open a discussion regarding how policy and practice might adjust to the need to move beyond naturalness in articulating park stewardship objectives.

Panelists: David Parsons, Director, Aldo Leopold Wilderness Research Institute, Missoula, MT

David Graber, Chief Scientist, Pacific West Region, National Park Service, Three Rivers, CA

Stephen Woodley, Chief Scientist, Ecological Integrity Branch, Parks Canada, Gatineau, Quebec

Erika Zavaleta, Assistant Professor, Environmental Studies Department, University of California, Santa Cruz, CA

Jon Jarvis, Regional Director, Pacific West Region, National Park Service, Oakland, CA

Concurrent Session #2 • Holladay • Panel Discussion

### **The Power of Story: Reaching Diverse Audiences with National Park Service Science and Stories**

Chair: Mike Whatley, Chief, Office of Education & Outreach, NPS, Natural Resource Program Center, Fort Collins, CO

Traditional media channels can be very powerful venues for connecting diverse audiences to the stories of the National Park Service.

Dayton Duncan and Ken Burns from Florentine Films, along with others with specialized knowledge of radio, print, and other media will share the power of their mediums for connecting audiences both emotionally and intellectually to the National Parks Service and to the resources it preserves. This session will examine how the National Park Service can benefit from and take advantage of different media channels to reach diverse audiences that may or may not be coming to parks. Panelists will also discuss how they are taking advantage of the web and “new technologies” to extend and enhance their stories.

Panelists: Dayton Duncan, Florentine Films, Walpole, NH

Ken Burns, Florentine Films

Tim Merriman, Executive Director, National Association for Interpretation, Fort Collins, CO

Susan Jacobson, Professor, University of Florida, Gainesville, FL

Denis Galvin, National Park Service Second Century Commission, Washington, DC

Concurrent Session #3 • Broadway/Weidler • Panel Discussion

### **Beyond Consultation: Successful Relationships and the Integration of Native Voices into Park Resource Management**

Chair: Douglas Deur, Research Coordinator, University of Washington, PNW Cooperative Ecosystem Studies Unit, Seattle, WA

Maintaining constructive and cooperative relationships between National Park Service units and Native peoples with ties to those park units is, at once, one of the most challenging but important aspects of NPS resource management. This panel features success stories from specific national parks (Redwood, Olympic, Grand Canyon, and Hawaii Volcanoes) in which these long-term relationships have been developed, nurtured, and honed into cooperative arrangements that help both parks and American Indian /Native Hawaiian communities meet their common goals. Panelists will devote attention to such topics as the value of Native knowledge in natural and cultural resource management, Native involvement in GMPs and MOUs, the value of successful Native-NPS relationships beyond park boundaries, and recent trends in related NPS policy.

Panelists: Karin Anderson, Cultural Resources Program Manager, NPS, Redwood National and State Parks, Orick, CA

Jacilee Wray, Anthropologist, NPS, Olympic National Park, Port Angeles, WA

Janet Balsom, Deputy Chief, Science and Resource Management, NPS, Grand Canyon National Park, Grand Canyon, AZ

Laura Schuster, Chief, Cultural Resources Division, NPS, Hawai'i Volcanoes National Park, Hawaii National Park, HI

Discussant: Frederick York, Anthropologist, NPS Pacific West Region, Seattle, WA

Concurrent Session #4 • Hawthorne/Sellwood • Contributed Papers

### **Best Practices for Building Partnerships**

Chair: Bonnie Halda, Chief, Division of Preservation Assistance, National Park Service, Northeast Region, Philadelphia, PA

### **Best Practices in Building Successful Relationships between Parks and Friends' Groups**

Cyndi Szymanski, Director, Center for Park Management, Washington, DC

As budgets and resources grow increasingly tight, partnerships are emerging as a way for park managers to accomplish more with less.

Many parks look to “friends’ groups,” non-profit entities dedicated to the support of specific parks or other protected resources.

While friends’ groups most commonly aim to leverage funding, they also provide access, accountability to parks, communities, and

individual citizens. However, fostering high-performing friends' groups is rarely as simple as shaking hands. This paper highlights examples of past successes and recommends a slate of best practices for creating the culture of collaboration and respect needed for effective partnerships.

### **Turning Planning and Partnership into Great Regional Protected Areas in the Capital Region of British Columbia**

Jeff Ward, Manager Planning, Conservation and Development, Capital Regional District Parks, Victoria, BC, Canada

Bill Turner, Executive Director, The Land Conservancy of British Columbia, Victoria, BC, Canada

British Columbia's Capital Regional District (CRD) developed a vision for its regional system of protected areas through a Regional Parks and Trails Master Plan. This Plan is being implemented to realize our vision of creating great protected areas in the CRD—old growth forest, Garry Oak meadows, beaches, ocean coastline, mountains, lakes and rivers—places for people to connect with nature and with each other. This presentation will focus on the journey and lessons of the CRD and The Land Conservancy of British Columbia (TLC) in working together to create great regional protected areas. Over the past 10 years the CRD and TLC have acquired 3000 hectares of land worth \$28 million. Partnerships have been the cornerstone of these acquisitions. CRD and TLC would like to share our story about working together to achieve our common goal.

### **The Herring River Restoration Project: When “Park-centricity” is Not an Option**

Carrie Phillips, Chief, Natural Resource Management, Cape Cod National Seashore, Wellfleet, MA

In 1908, the largest estuary on outer Cape Cod was cut off from its sustaining tide when a dike was constructed across the mouth of the Herring River. The ecological impacts are profound and include nearly complete elimination of saltmarsh, a meter of subsidence, 303d-listed surface waters, fish kills, and development of portions of the dewatered floodplain. Approximately 80% of the floodplain is within Cape Cod National Seashore. However, elements critical to the restoration, including the dike and the sub-basin closest to the mouth, are outside of the park boundary. Building consensus for restoration of this system has involved years of research, public education, and sustained and patient engagement with skeptical stakeholders. From those efforts, a partnership that includes the Seashore, two towns, several federal and state agencies, and a major private land-owner, has formed to carry this important restoration project forward.

### **Sharing Knowledge: Learning from Each Other**

Kathryn Myers, Museum Curator, Lake Clark and Katmai National Parks and Preserves, Anchorage, AK

Karen Stickman, Cultural Anthropologist, Lake Clark National Park and Preserve, Anchorage, AK

In the fall/winter of 2008/2009, the Lake Clark National Park Cultural Anthropologist and Museum Curator began a resource documentation project in communities in and surrounding Lake Clark NP in Southwest Alaska. This multi-year project highlights the importance of sharing knowledge through a collaborative process. Community residents share their knowledge and skills by identifying their invaluable cultural and historic resources through interviews, discussions, and demonstrations. The NPS staff shares their technical skills by demonstrating how to preserve and protect these resources including photographs, material culture, and oral histories. NPS staff will also provide options for preservation and collaboratively developed written agreements for the park's educational use of these materials. The park also provides information on Lake Clark's collections and education development programs. This exchange of information and documentation contributes to the LACL's programs and assists with community preservation, cultural knowledge and understanding.

### **The Regional Integration of Protected Areas: A Study of Canada's National Parks**

Julia McCuaig, Post-Doctoral Research Fellow, Faculty of Environmental Design, University of Calgary, Revelstoke, BC, Canada

The relationship between parks and their regions is often based on social interactions and building regional support for parks is crucial for their sustainability. Regional integration is a process by which park staff and regional actors engage in social interactions in order to reach independent and shared goals related to the park. A qualitative, interview-based study of the regional integration of five national parks in Canada has been recently completed. The case studies were Kejimikujik National Park and National Historic Site, NS; Gros Morne National Park, NL; Waterton Lakes National Park, AB; and Mount Revelstoke and Glacier National Parks, BC. It was found that each park had a unique regional context and mechanisms in place for interaction between park staff and regional actors. Several characteristics of strong regional integration are identified and suggestions are made for improving the regional integration of national parks in Canada.

Concurrent Session #5 • Ross Island/Morrison • Panel Discussion

### **Stones Overturned: Emerging Opportunities in the Vanishing Treasures Program**

Chair: Virginia Salazar-Halfmoon, Vanishing Treasures Program Manager, National Park Service, Santa Fe, NM

The Vanishing Treasures Program provides support to 45 parks in 8 states to protect and preserve irreplaceable sites. Resources included in the Program range in type from ancestral sites, historic structures, mining sites to a Japanese internment camp. Park managers and preservation staff follow agency and professional policies in preserving these sites which sometimes results in conflict with traditionally associated communities. The presenters on this panel will provide insight on efforts made to save ancestral and historic architecture, not just the structures themselves but essential intrinsic values that continue their cultural connection to communities and enhance the preservation, interpretation and visitor enjoyment.

Panelists: Sande McDermott, Deputy Associate Regional Director, Resources Management, National Park Service Intermountain Region, Denver, CO

Corky Hays, Superintendent, Natural Bridges and Hovenweep National Monuments, National Park Service, Lake Powell, UT

Brooks Jeffery, Associate Dean, College of Architecture and Landscape Architecture, University of Arizona, Tucson, AZ

Jake Barrow, Architectural Conservator, Vanishing Treasures Program, National Park Service, Santa Fe, NM

Calvin Chimoni, Masonry Worker (Preservation Worker), El Morro and El Malpais National Monuments, Grants, NM

Concurrent Session #6 • Oregon • Panel Discussion (Part 1 of 2-Part Track)

**BioBlitzes and ATBIs: Citizens and Scientists in Biodiversity Conservation I • All Taxa Biodiversity Inventory (ATBI): Bridging the Gap**

Chair: Niki Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA

BioBlitzes and All Taxa Biological Inventories (ATBI) engage the public by inviting citizens and scientists to explore protected areas and perform systematic surveys of species groups. This panel discussion will explore some of the major benefits and unresolved issues related to this sampling approach. Protected land managers have ascribed a range of objectives for these activities. For some ATBI is a powerful interpretative tool that can enhance protected area awareness by local populations, introduce citizens to the hands on concept of biodiversity, and excite young people to go into science. For others the actual science, methodology, and potential data is a main focus of the inventory efforts. Regardless of the preferred objective, ATBIs have the potential to link people to their parks and citizens to scientists. And the resulting data can provide managers with the information needed to make decisions to protect resources from a litany of growing threats.

Panelists: Raymond Sauvajot, Chief of Planning, Science and Resource Management, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA

Gillian Bowser, Associate Dean, Warner College of Natural Resources, Colorado State University, Ft. Collins, CO

Linda Brindle, Executive Director, Big Thicket Association, Saratoga, TX

Michael Soukup, formerly Associate Director, Natural Resource Science and Stewardship, National Park Service

(Track continues in Concurrent Session #39)

Concurrent Session #7 • Alaska/Idaho • Invited Papers

**How Much Water Do Water-dependent Resources Need?**

Chair: Chuck Pettee, Water Rights Branch Chief, NPS Natural Resource Program Center, Water Resources Division, Fort Collins, CO

Session overview: Water is a critical requirement for sustaining the resources and values for which many park units were established. A water right is one tool that the National Park Service can use to protect water-dependent resources in parks. Water rights can be acquired under state or federal law and many states are increasingly being asked to consider whether they should protect the water-dependent natural and cultural resources of national parks as legitimate “users” of water. One of the challenges of securing and protecting water rights in national parks is determining the minimum quantity of water that is required to maintain important water-dependent resources. Scientifically-based studies and monitoring play an essential role in this effort. This session describes investigations developed specifically to aid in quantifying the needs of riparian and ground-water dependent systems in four national parks.

**The Treatment of Federal Reserved Water Rights, 1992–2008**

Michelle Belco, Attorney and Ph.D. Candidate, University of Houston, Houston, TX

Presidential Proclamations and Congressional legislation are both used to reserve federal lands with express provisions for the reservation or non-reservation of water rights. This research is an effort to identify how the determination of water rights may be affected by the language contained within these instruments during two Democratic and two Republican administrations. Five alternative types language are used: (1) express reservation; (2) express non-reservation; (3) ambiguity (expressly mentioned but ambiguous in meaning); (4) silence (water rights are not mentioned) which heretofore has meant implied; and (5) cooperative state (procedural) and federal (substantive) reservation. The effect of these five alternatives on the outcome of federal reserved water rights has significant implications. This paper lays new groundwork in the study of federal reserved water rights by analyzing the type of language used as well as the effect of the language on the parties in reaching their objectives.

**Science in Support of a Historical In-Place Ground Water Right for Great Sand Dunes National Park and Preserve**

Jim Harte, Hydrologist, National Park Service, Water Resources Division, Fort Collins, CO

Andrew Valdez, Geologist, Great Sand Dunes National Park & Preserve, Mosca, CO

In a historic court decision, dated August 4, 2008, Great Sand Dunes National Park and Preserve (GRSA), located in the San Luis Valley of south-central Colorado, was decreed the right to use in-place, all ground water in the unconfined aquifer underlying the Park to protect Park resources. The water right was opposed by water development interests who argued against a connection between the Park’s water resources and the unconfined aquifer beneath the Park. Results of studies that describe the hydrogeology, ecology, and surface water/ground water interactions at GRSA along with ground water modeling of water table elevation changes due to proposed ground water pumping outside of GRSA were used to develop evidence in support of the Park’s claim. After hearing evidence the court ruled there was a demonstrated connection between surface water and the unconfined aquifer beneath the Park and lowering the ground water table could affect Park resources.

**Protecting Natural Resources at Saguaro National Park through Water Rights**

Paul Christensen, Hydrologist, National Park Service, Water Resources Division, Fort Collins, CO

In 1998, the NPS acquired lands adjacent to the east unit of Saguaro National Park near Tucson, Arizona. These lands included an intermittent stream called Rincon Creek. Associated with the creek are biota dependent on water in the creek and adjacent alluvial aquifer. To protect the water and natural resources from future water diversions, the NPS filed in 2002 a water-right application for instream flow maintenance with the state of Arizona. The NPS then acquired the services of experts on selected biota to determine the relationship between water and the biota. These relationships were used to demonstrate that a specific quantity of water was needed to maintain biotic viability. If the State grants a permit, the NPS must monitor stream flow and water diversions to determine if its water right is injured. This is the first attempt by the NPS to obtain an instream-flow right through administrative proceedings in Arizona.

### **The Effect of Rising Salinity on Egg and Early-instar Larval Survival of the Orange-black Hawaiian Damselfly (*Megalagrion xanthomelas*)**

Lori Tango, Graduate Student, University of Hawaii at Hilo, Department of Marine Science, Hilo, HI

David Foote, U.S. Geological Survey, Pacific Island Ecosystems Research Center, Hawaii National Park

James P. Beets, Department of Marine Science, University of Hawaii at Hilo, Hilo, HI

Decreased ground-water flux associated with urbanization and climate change have the potential to increase the salinity of anchialine pools at Hawaii's Kaloko-Honokohau National Historical Park. These unique tidal coastal aquatic features are important cultural resources that possess an endemic invertebrate fauna including candidate endangered crustaceans and aquatic insects. To assess some of the effects of rising salinities on anchialine pool biota, we are quantifying the survival of egg and early-instar larvae of the orange-black Hawaiian damselfly (*Megalagrion xanthomelas*). Preliminary results reveal an inverse relationship between egg and early-instar survival and salinity, with this species possibly exhibiting a threshold response to rising salinity at 20 ppt (approximately 60% seawater). Given the limited information on the effects of increased salinities on anchialine pool biota, this study will help resource managers ensure that adequate ground-water quality and quantity are available to support these rare environments into the future.

### **Can Depletion of Surface-Water Flows in Great Basin NP, a Mountainous Park, Result from Large-Scale Ground-Water Withdrawals in Adjacent Valleys Below?**

Bill Van Liew, Hydrologist, NPS Natural Resource Program Center, Water Resources Division, Fort Collins, CO

Great Basin National Park (GRBA) is situated in a north-south trending mountain range in eastern Nevada. Surface-water features in GRBA include large-volume springs that emanate from the limestone cave system that includes Lehman Caves, and numerous mountain streams that flow west and east off the crest of the range out into the adjacent valleys. Substantial ground-water withdrawals from the valleys adjacent to GRBA are being considered as water supply for a rapidly growing populous in southern Nevada. A USGS study done to evaluate whether any of the surface-water resources of GRBA could be depleted by adjacent ground-water withdrawals concluded that most of the surface-water resources at high altitude within GRBA were not susceptible; however, critical surface-water resources within GRBA at the edge of the mountain range near Lehman Caves were identified as "likely susceptible." Further studies are needed to enable quantitative estimates of the magnitude and timing of any depletions.

Concurrent Session #8 • Three Sisters • Contributed Papers

#### **Monitoring Visitor Use**

Chair: Bob Manning, Professor, University of Vermont, Burlington, VT

### **Long-Term User Capacity Monitoring Programs: Lessons Learned in Yosemite National Park**

Todd Newburger, Biologist / User Capacity Monitoring Program Manager, Yosemite National Park, El Portal, CA

Jim Roche, Hydrologist Resources Management and Science Division, Yosemite National Park, El Portal, CA

Yu-Fai Leung, Associate Professor, Parks, Recreation and Tourism Management, North Carolina State University, Raleigh, NC

Jessica Middleton, Archeologist, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Bret Meldrum, Branch Chief, Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Tori Seher, Wildlife Biologist, Resources Management and Science Division, Yosemite National Park, El Portal, CA

In its fifth year of a long-term monitoring program focused on addressing user capacity issues, Yosemite National Park has learned many important lessons about monitoring and designing indicators and standards to determine cultural and ecological integrity while ensuring an adequate amount of recreational opportunities. As an interdisciplinary group focusing on a variety of factors that gauge the impact of visitor use on ecological, cultural, and social impacts, research managers have faced several obstacles in experimental design, development of standards and implementation of monitoring procedures. In this presentation, six examples of long-term monitoring projects will be presented. Details will be provided that display how these work groups identified the scope of the problem addressed by each indicator and are making attempts at prescribing corresponding solutions. This session offers a unique opportunity to discern important lessons learned in the implementation of a park-wide monitoring program.

### **Addressing User Capacity for the Tuolumne Wild and Scenic River Plan in Yosemite National Park: Integrating Numeric Expressions of Capacity and Adaptive Management Processes**

Jim Bacon, Outdoor Recreation Planner, Yosemite National Park, El Portal, CA

Kristina Rylands, Planning Project Manager, Tuolumne River Plan, Yosemite National Park, El Portal, CA

Bret Meldrum, Branch Chief, Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Todd Newburger, Biologist / User Capacity Monitoring Program Manager, Yosemite National Park, El Portal, CA

The Tuolumne Wild and Scenic River extends 53 miles across the northern high country of Yosemite National Park. For the past three years the park has been engaged in comprehensive management planning for the Tuolumne—including the often contentious issue of addressing user capacity. The Wild and Scenic Rivers Act states that river plans must address user capacity, however, the act did not define the term. Interior and Agriculture Department inter-agency guidelines published in 1982 define it as the kinds and amounts of public use which the river can sustain without impact to the values for which it was designated. Further, the guidelines state that studies will be made during preparation of the management plan and periodically thereafter to determine the quantity and mixture of recreation and other public uses which can be permitted without adverse impact on the resource values of the river area. Accordingly, the Tuolumne River Plan has taken a deliberate approach to addressing user capacity including numeric expressions of the kinds and amounts of visitor use appropriate in the river corridor and establishing indicators and standards of quality to measure and monitor impacts associated with this use. Key steps in this process, including techniques used to quantify use and establish indicators and standards of quality are presented. Lessons learned and implications for overall visitor use planning and management are also discussed.



### **Analysis of Carrying Capacity at Lake Umbagog National Wildlife Refuge**

William Valliere, Research Specialist, University of Vermont, Burlington, VT

Robert Manning, Professor, University of Vermont, Burlington, VT

Lake Umbagog National Wildlife Refuge (New Hampshire and Maine) accommodates over 50,000 visits per year, and this can result in significant resource and social impacts. A two-phase study of the area was conducted, to analyze the carrying capacity of the area. The first phase of study focused on identifying indicators of quality of the visitor experience through the use of a visitor survey. Indicators identified included number of boats seen on the lake and rivers, number of boats at fishing sites, and percentage chance of seeing wildlife and catching fish. The second phase of research focused on determining standards of quality for the above indicators. This was accomplished through a second visitor survey, and a survey of camp and home owners adjacent to refuge waterways. Standards of quality were measured using normative theory and methods and a series of visual simulation.

### **Tradeoffs Among Resource, Social, and Managerial Conditions on Mountain Summits of the Northern Forest**

Carena van Riper, Graduate Research Assistant, University of Vermont, Burlington, VT

Robert Manning, Professor, University of Vermont, Burlington, VT

Kelly Goonan, University of Vermont, Burlington, VT

Christopher Monz, Assistant Professor, Utah State University, Logan, UT

Outdoor recreation opportunities are comprised of resource (e.g., ecological conditions), social (e.g., crowding), and managerial (e.g., management intensity) components. To what extent are visitors sensitive to the conditions of each of these components, and how would they prefer to make tradeoffs among them? For example, would visitors prefer to limit use levels or accept intensive management practices to protect resource conditions? These questions are especially relevant for mountain summits which are popular recreation sites and ecologically fragile. This study administered visitor surveys at three mountain summits in the Northern Forest that ranged from low to high use. The surveys employed stated choice modeling and visual simulations. A range of six attributes representing the resource, social, and managerial components of recreation opportunities were incorporated in the surveys, and study findings suggest the relative importance of these attributes.

### **Addressing Federal Recreation Special Use Permit Policy Changes with National Visitor Use Monitoring Data**

Robert Burns, Professor, West Virginia University, Morgantown, WV

Jessie Meybin, MS Student, West Virginia University, Morgantown WV

Alan Graefe, Penn State University, State College, PA

James Absher, US Forest Service, Riverside, CA

Charles Frayer, Recreation Staff Officer, US Forest Service, Portland, OR

Michael Heilman, Recreation Staff Officer, US Forest Service, Portland, OR

A significant policy change governing recreation special use permits on US federal lands was implemented in October 2008. Primary objectives of the policy were to simplify procedures for outfitting and guiding permits; develop a process for allocation of temporary use permits that would facilitate greater participation in outfitting/guiding by youth, educational, and religious groups; and clarifying policy for priority use permits governing performance, evaluations, and allocation of use. The changes may have a major impact on current and potential recreation users, members of local communities, and existing outfitter/guide services. This presentation will discuss methods of drawing upon existing recreation use data from the National Visitor Use Monitoring process to determine impacts on outfitter guides and end users. Results are based on a pilot test conducted on federal lands in Oregon, Washington and Colorado focused on developing a systematic approach to special use permitting decision making processes.

Concurrent Session #9 • Mt. Bachelor • Contributed Papers

### **Assessing Airborne Pollutants**

Chair: Bob Winfree, Science Advisor, National Park Service, Alaska Regional Office, Anchorage, AK

### **Monitoring Air Quality in Southeast Alaska: Linking Ambient and Depositional Pollutants with Ecological Effect**

Dave Schirokauer, Biologist, Natural Resources Program Manager, Klondike Gold Rush National Historical Park, Skagway, AK

Results of a 1998-99 pilot study in Klondike Gold Rush NHP (KLGO) revealed that local lichens had higher levels of heavy metals and sulfur in lichen tissues than baseline values established on the surrounding Tongass National Forest. In 1998-99 the KLGO Skagway area exceeded lichen tissue air pollution indicator thresholds set by the USDA-Forest Service for heavy metals, sulfur and other elements. Since then, visitation and the associated transportation needs (busses, trains, and cruise ships) have increased by 57%. This presentation will describe the follow-up study underway in the southeast Alaska network designed to: 1) Track trends in air quality; 2) Contribute to the development of models linking ambient conditions to concentrations of pollutants in lichen tissue by deploying passive air concentration and deposition samplers; 3) Assess the effects of air pollution on lichen community composition; 4) Collect data on lichen community composition for future trends analysis.

### **After the Western Airborne Contaminants Assessment Project (WACAP): Ongoing and Future Strategies**

Tamara Blett, Ecologist, National Park Service, Lakewood, CO

Colleen Flanagan, Ecologist, National Park Service Air Resources Division, Denver, CO

The Western Airborne Contaminants Assessment Project (WACAP) was designed to determine the risk to ecosystems and food webs in western US and Alaskan national parks from the atmospheric transport of toxic contaminants such as mercury and pesticides. Key parks included in the study were: Denali, Gates of the Arctic, Glacier, Mount Rainier, Noatak, Olympic, Rocky Mountain, and Sequoia. Detecting measurable levels of contaminants in the twenty national park ecosystems studied, the 6 year multi-agency project (2002-2007) yielded a wealth of data about the distribution and effects of contaminants in these parks. Over the past year study results have been widely shared with federal and state agencies, as well as stakeholders and the international community, resulting in follow-up studies and partnerships. This talk presents an overview of ongoing and future efforts by the NPS and other partners to apply data and communicate results from the WACAP study for policy, management, and research applications.

### **Mercury Deposition and Accumulation in National Park Ecosystems: A Service-wide Compilation of Research and Results**

Colleen Flanagan, Ecologist, National Park Service Air Resources Division, Denver, CO

Mercury is a heavy metal emitted through processes such as burning coal for electricity that causes neurological and reproductive impairment. Accumulation of mercury in aquatic food webs and its toxic effects on aquatic biota are of growing concern both for the health of fish and the fish-eating birds and mammals (including humans) that prey upon them. In fact, some fish tested across NPS waters have been found to have mercury concentrations that exceed wildlife and/or human health consumption thresholds. In order to further understand mercury in NPS ecosystems, this talk will present a service-wide compilation of mercury research and results. Findings presented will include mercury measurements in atmospheric deposition (e.g., snow, lake sediment), the vital role of mercury methylation, and subsequent effects on environmental indicators such as salamanders and loons. Combined with results of a sensitivity analysis and the need to establish baseline values in advance of future mercury control programs, mercury awareness is an increasingly important service-wide topic.

### **Critical Loads for Air Pollutants: Tools for Communication, Planning, and Collaboration**

Ellen Porter, Biologist, NPS Air Resources Division, Denver, CO

Air pollution can damage the very resources that parks were created to preserve. Air pollution has caused acidification and eutrophication of sensitive streams, lakes, and soils, as well as affecting biodiversity. Limitations in ecosystem models have made it difficult to quantify the amount of pollution causing these effects, limiting managers' ability to communicate resource condition and desired conditions for parks. However, advances in research and modeling now allow managers to quantify the "critical load" for sensitive ecosystems, that is, the amount of air pollution causing harmful effects. A critical load now serves as a management goal for Rocky Mountain NP and is incorporated into a nitrogen reduction plan developed collaboratively by NPS, State of Colorado, and EPA to reduce nitrogen impacts in the park. Critical loads are being developed for many other parks, in a variety of ecosystem types, and will be used to inform desired conditions and management goals.

### **Appalachian Trail MEGA-transect Deposition Effects**

Alan C. Ellsworth, Regional Hydrologist, National Park Service Northeast Region, Troy, NY

The Appalachian Trail (AT), a 14-state footpath from Maine to Georgia, is managed cooperatively by the National Park Service (NPS), the Appalachian Trail Conservancy (ATC), AT Club volunteers, the USDA Forest Service (USFS), and other public land-management agencies. High-elevation and ridge-top ecosystems, which comprise much of the trail corridor, have been impacted by and remain extremely sensitive to acidic deposition. Such effects include forest die-back and aquatic ecosystems that are no longer able to support sensitive species of fish. The goal of the MEGA AT-Transect deposition effects study is to establish the status and susceptibility of this publicly managed land with respect to environmental change, and in particular atmospheric deposition. To achieve this result, research will be conducted to allow critical loads to be modeled for the trail, which will be used to assess current conditions and the effect of future air quality management strategies.

Concurrent Session #10 • Mt. Hood • Invited Papers (Part 1 of 3-Part Track)

### **Burned Up or Burned Out? I • Current and Future Relationships between Fire and Resource Managers**

Chair: Richard Schwab, National Burned Area Rehabilitation Coordinator, National Park Service, National Interagency Fire Center, Boise, ID

### **Drivers of Fire-Resource Management Conflict: Insights from the Social Sciences**

Vita Wright, Science Application Specialist, USDA-Forest Service, Rocky Mountain Research Station, Missoula, MT

Knowledge from the social sciences sheds light on the intra-agency conflict between fire managers and natural resource managers. Many natural resource conflicts, such as restoration and fuel reduction using prescribed fire, can be characterized as wicked problems. Wicked problems are driven by differences that run much deeper than science-based knowledge. Even in the total absence of scientific uncertainty, managers of wicked problems can only move forward by recognizing that different groups frame problems differently based on inherent cultural and value differences, different missions and priorities, and backgrounds that rely on different bodies of science. Interview excerpts from in-depth interviews conducted in 2007 with National Park Service (NPS) fire specialists will be used to illustrate the nature of conflict among fire and resource management professionals concerning fuel reduction and prescribed fire in the NPS. In conclusion, understanding the fundamental causes of such conflict can provide insight into what we can and can't change about the problem.

### **Everglades National Park Fire and Resource Management**

Hillary Cooley, Botanist, Everglades National Park, Homestead, FL

Rick Anderson, Fire Management Officer, Everglades National Park Homestead, FL

David E. Hallac, Chief, Biological Resources Branch, Everglades and Dry Tortugas National Parks, Homestead, FL

The importance of fire in shaping the biodiversity of Everglades National Park was mentioned soon after establishment. On April 21, 1958, one of the earliest prescribed burns in a National Park was conducted within Everglades N.P. Fifty years of fire history and research suggest fire is part of the "natural condition". However, debate continues concerning the effects of fire frequency and timing. Many rare, threatened, and endangered species, such as candidate butterflies, recently reintroduced pineland birds, endemic sparrows, and rare plants are found in Everglades N.P. and these species often have competing needs. While the historical presence of fire is often well known, development of fire management plans and resource management plans must consider multiple species within a fragmented landscape and the interplay of fire across habitats with altered hydrology. Discussed are the ongoing refinements to communication and collaboration which continue to present challenges to scientist and resource managers.

### **Can Fire Managers and Resource Specialists Collaborate to Protect Rare and Imperiled Plant Communities?**

Jeff Connor, Natural Resources Specialist, NPS Continental Divide Research Learning Center, Estes Park, CO

Mike Lewelling, Fire Management Officer, Rocky Mountain National Park, Estes Park, CO

Protecting rare and imperiled plant communities within Rocky Mountain National Park from an over abundance of elk, exotic plants and changing climatic conditions is a challenge. Simply conducting a prescribed fire where these plant communities occur does not necessarily constitute restoring natural conditions or restoring the natural role of fire in the ecosystem. Research supports that the level of herbivory present in the park is affecting post-burn successional patterns by impeding rare and imperiled plant communities' regeneration. Resource Management Specialists caution fire managers against the use of any type of prescribed fire that would burn a substantial portion of these plant communities while ungulate levels are elevated. Some of these plant communities occur within Wildland Urban Interface areas where fire management objectives are to reduce fire risk and return the fire return interval to a more natural range of variability. Park staff collaborated to protect rare plant communities while meeting the fire management objectives.

#### **Resources and Fire: A Logical Partnership**

Bruce Fields, Fuels Specialist, Bryce Canyon National Park, Bryce Canyon, UT

Kristin Legg, Chief of Resource Management and Research, Zion National Park, Springdale, UT

Resource Management and Wildland Fire Management traditionally are not organized within the same division of the National Park Service. When these programs are separated, there is a decreased chance for cohesive management that can result in a failure to use fire effectively in conservation of the natural and cultural resources of the park. At Bryce Canyon National Park the wildland fire management program is a branch of the Resource Management Program. This has led to well integrated decision making and collaboration with park resource and fire management specialists. As a result prescribed fire and other fire management activities have been used as a tool to further the restoration of natural ecosystems while implementing protection of historic and non-historic developments within and around the park. An active fire management program requires coordination within the park of all divisions, but specifically the development of burn prescriptions and desired outcomes is a function of the fire and resource specialists. A greater understanding about the resources as a whole is reached when the two specialists sit at the same table discussing daily activities. This cross sharing would not happen if fire was not present at the resource table. Also the fire staff are more integrated and able to help develop strategies to overcome threats to the resources such as exotic weeds, something that is a challenge in parks when fire is not part of resource management. As a result the park has been able to implement prescribe fires and wildland fire use that meet resource management goals to enhance the natural ecosystem processes including threatened and endangered species habitat and protect the unique cultural resources.

#### **Integrating Resource Management in the Life-cycle of Wildland Fire Decision-making**

Sandee Dingman, Natural Resource Specialist, Lake Mead National Recreation Area, Boulder City, NV

The decisions to prescribe burn, suppress, or not suppress and what happens after that decision have serious implications for park resources, both positive and negative. This presentation will be framed around the "life-cycle" of fire in protected area landscapes, with a focus on the challenges and opportunities for resource managers to engage with wildland fire professionals in planning for fire, managing fire incidents, and responding post-fire.

(Track continues in Concurrent Sessions #21 and #32)

Concurrent Session #11

#### **Human Interactions in Marine Ecosystems**

Chair: Brad Barr, Senior Policy Advisor, NOAA Office of Marine Sanctuaries, Woods Hole, MA

#### **Coastal Circulation and Sediment Dynamics on the Coral Reefs of War in the Pacific National Historical Park**

Curt D. Storlazzi, Research Oceanographer, U.S. Geological Survey, Western Coastal and Marine Geology Team, Santa Cruz, CA

M. Kathy Presto, Oceanographer, U.S. Geological Survey Pacific Science Center, Santa Cruz, CA

Josh B. Logan, Geographer, U.S. Geological Survey Pacific Science Center, Santa Cruz, CA

In 2007, the USGS and NPS investigated coastal circulation and sediment dynamics in War in the Pacific National Historical Park's Asan Unit. Previous work by NPS has shown that inputs of terrestrial material from intentionally-set wildfires and poor land use practices to the park's waters in Asan Bay have inhibited coral larval settlement and recruitment in the bay's fringing reef system. Results from this circulation study suggest that when waves break on the reef crest, they generate currents that drain sediment-laden water off the reef flat primarily through a deep embayment offshore the Asan River known locally as "the Cut." Outside of the Cut, turbidity is usually lower and flow is to the west during windy periods and offshore during periods with large waves. In general, turbidity is confined to a relatively thin, low-salinity surface layer, but downward mixing of this layer occurs during spring tides and large wave events.

#### **Twenty-seven Years of Kelp Forest Monitoring at the Channel Islands: What Does It All Mean?**

David Kushner, Marine Biologist, Channel Islands National Park, Ventura, CA

Kelly Moore, Channel Islands National Park, Ventura, CA

Joshua Sprague, Channel Islands National Park, Ventura, CA

The Kelp Forest Monitoring program at Channel Islands National Park was one of the first "vital signs" Inventory and Monitoring programs implemented by the National Park Service. The program has been collecting baseline population data on over 70 species of algae, invertebrates and fish for 27 years. Information garnered from the program has aided fishery management decisions and the establishment of marine reserves. In addition, the information is becoming useful in explaining large scale ecological patterns in kelp forest communities as well as predicting population trends for some species. With a recently expanded monitoring program we expect the information to be an excellent tool in evaluating the effectiveness of the newly established marine reserves at the Channel Islands.



### **Ocean Acidification: Osteoporosis of Our Marine Resources**

Kristen Keteles, Toxicologist, EPA, Denver, CO

In addition to raising sea levels and temperatures, the increased concentration of carbon dioxide in the atmosphere is changing ocean chemistry by reducing the pH of the ocean. This decreased pH reduces the availability of minerals which marine organisms such as corals, snails, oysters, clams, scallops, lobster, sea urchins, and starfish use to build shells and reef structures. Scientists predict a drop in ocean pH of about 0.4 pH units by the end of this century, and a 60% decrease in the concentration of shell-building minerals in ocean waters. Many of the coastal parks within the National Park System will be negatively impacted by these changes. Consequently, NPS will need to partner with other federal agencies and researchers to better understand the consequences of ocean acidification on park resources. Furthermore, Parks are in a unique position to provide education and outreach to the public along with taking specific management actions to address the consequences of ocean acidification.

### **Boating Impacts on Seagrass in Florida Bay: Visitor Use Associations and Implications for Management**

David Hallac, Chief, Biological Resources Branch, Everglades and Dry Tortugas National Parks, Homestead, FL

Jimi Saddle, Everglades and Dry Tortugas National Parks, Homestead, FL

Leonard Pearlstine, Everglades and Dry Tortugas National Parks, Homestead, FL

Fred Herling, Everglades and Dry Tortugas National Parks, Homestead, FL

Everglades National Park includes 200,000 ha of marine environments, including most of Florida Bay. Much of Florida Bay, which was designated as submerged wilderness in 1978, supports submerged aquatic vegetation comprised of seagrasses. Recreational boating in shallow water has resulted in substantial scarring damage in seagrass beds. To integrate information on propeller scarred seagrass in the development of a new general management plan, we analyzed digital imagery of Florida Bay and used geostatistical analyses to examine associations between scarring density and physical and visitor use factors. Specifically, we explored relationships between scar density versus water depth, proximity to shorelines, marked and unmarked navigational channels, boating activity, and marine facilities inside the park and in nearby communities. Physical and visitor use factors, as associated with scarring, are discussed in the context of management strategies that may be considered to meet natural resource management objectives.

### **Coral Reef Monitoring and Emergency Responses to Outbreaks of Coral Disease in Dry Tortugas NP**

Benjamin Ruttenberg, Marine Ecologist, South Florida/Caribbean Network, US National Park Service, Palmetto Bay, FL

Robert Waara, South Florida/Caribbean Network, US National Park Service, Palmetto Bay, FL

Marilyn Brandt, South Florida/Caribbean Network, US National Park Service, Palmetto Bay, FL

Brian Witcher, South Florida/Caribbean Network, US National Park Service, Palmetto Bay, FL

Matt Patterson, South Florida/Caribbean Network, US National Park Service, Palmetto Bay, FL

W. Jeffrey Miller, South Florida/Caribbean Network, Virgin Islands National Park, St. John, VI

The South Florida/Caribbean Network (SFCN I&M) of the National Park Service recently expanded their coral reef monitoring program in Dry Tortugas National Park. SFCN staff installed 18 permanent sites in May 2008 and began data collection (e.g. coral cover, disease, etc). In June, SFCN returned to complete year 1 data collection. Divers noted a significant outbreak of coral disease on some of the healthiest reefs in the park. SFCN immediately notified the Coral Disease and Health Consortium and collected additional disease prevalence data. During the International Coral Reef Symposium in July, SFCN staff met with coral disease experts and regional stakeholders to organize an emergency response cruise, which departed the following week. Divers discovered that disease prevalence had dropped to pre-outbreak levels and collaborators have examined samples of diseased tissue. This effort demonstrates the critical role the I&M program can play in identifying and responding to acute events.

## **Monday Late Afternoon, March 2**

Concurrent Session #12 • Holladay • Panel Discussion

### **Natural Resource Inventory and Monitoring by 32 I&M Networks: Key Lessons Learned to Date**

Steven Fancy, National I&M Program Leader, National Park Service, Natural Resource Program Center, Fort Collins, CO

The NPS has organized more than 270 parks with significant natural resources into 32 Inventory and Monitoring (I&M) networks to leverage current investments and to carry out extended I&M activities. I&M results are integrated into park operations, are used in resource condition assessments and park planning documents, and are provided to managers, planners, interpreters, scientists, and the public through numerous approaches such as websites, technical reports, resource briefs, journal publications, and oral presentations. This year, park managers, key collaborators, and other park, network, and regional staff from the first 14 I&M networks (131 parks) participated in "3-year Start-up Reviews" to evaluate their progress after three years of operational monitoring and to ask the basic question, "Is the network set up to succeed?" This panel discussion will focus on key lessons learned from evaluations of these 14 I&M networks and the feedback received from park managers, planners, and other key audiences on the network approach.

Panelists: Bruce Bingham, Regional I&M Coordinator, National Park Service Intermountain Region, Denver, CO

Lisa Thomas, Program Manager, Southern Colorado Plateau Network, Flagstaff, AZ

Mike DeBacker, Program Manager, Heartland I&M Network, Wilson's Creek National Battlefield, Republic, MO

Margaret Beer, Data Manager, National Park Service, Fort Collins, CO

Concurrent Session #13 • Broadway/Weidler • Panel Discussion

### **The National Parks Second Century Commission: Where We Are, and Where We're Going**

Chair: Loran Fraser, Executive Director, National Parks Second Century Commission, Washington, DC

More than one hundred years ago America invented the national park idea with the designation of Yellowstone as the first national park. Guided by that founding idea, this National Park Second Century Commission will examine the role of the national parks today and articulate a bold vision of a future where national parks continue to enrich and ennoble this nation and its citizens. Through



five meetings at National Parks, seven working groups, public testimony and extensive public comment, the Commission will gather a broad range of information and perspectives to develop a report with recommendations for release in the Fall of 2009. This session will update GWS2009 attendees on the Commission's progress.

Panelists: Deny Galvin, formerly Deputy Director, National Park Service, and current Commission Member  
Jon Jarvis, Director, Pacific West Region, National Park Service, and NPS Liaison to the Commission

Concurrent Session #14 • Hawthorne/Sellwood • Day-Capper

**The Next Decade of Science and Stewardship in the National Park Service: Meet the New Associate Director**

Chair: Elaine Leslie, Deputy Chief, Operations, BRMD, National Park Service WASO, Fort Collins, CO

The National Park Service has a new Associate Director of Natural Resource Stewardship and Science: Bert Frost, Ph.D. As the NPS enters into a new decade, we face many complex challenges. Conference attendees are encouraged to hear Dr. Frost's vision for the next century: "NRSS 20/20 Vision." As we move through this next decade to the year 2020, what are the challenges, what are the solutions? You can actively participate in ensuring that science and stewardship meet these challenges ahead! Bert Frost, his new Deputy Beth Johnson, and the Natural Resource Program Center Director and Division Chiefs will be available for an informal Q&A session. Some are new faces (some are old!)—but come and get acquainted or reacquainted!

Concurrent Session #15 • Ross Island/Morrison • Contributed Papers

**Wildlife Ecology**

Chair: Kate Kendall, Research Ecologist, USGS, West Glacier, MT

**Non-native Predators Implicated in Declines of Olympic Marmots**

Suzanne C. Griffin, Huxley College of the Environment on the Peninsula, Western Washington University, Port Angeles, WA

Julia J. Witzuk, Wildlife Biology Program, College of Forestry and Conservation, University of Montana, Missoula, MT

Mark L. Taper, Department of Ecology, Lewis Hall, Montana State University, Bozeman, MT

L. Scott Mills, Wildlife Biology Program, College of Forestry and Conservation, University of Montana, Missoula, MT

Olympic marmots, large, burrowing rodents endemic to Olympic National Park, have undergone declines in recent years. Multiple lines of evidence indicate that predation by non-native coyotes is driving the declines: From 2002–2006, survival of adult females was very low with coyotes responsible for 33–90% of the mortality; diet and DNA analysis of scat indicate that coyotes are present and prey on marmots in all studied regions of the park; and demographic models indicate that removing coyote predation would result in a growing marmot population. If these conditions continue, coyote control will be necessary to prevent catastrophic marmot declines. However, predation by coyotes was much lower in 2007–2008 than previous years. We speculate that coyote numbers had increased during years of low snowpack and have been depressed by consecutive years of relatively high snowpack, suggesting a synergistic relationship between climate change, an endemic herbivore, and a non-native predator.

**Riparian Wildlife Communities Prior to Restoration of Anadromous Fish in the Elwha River Ecosystem**

Kurt Jenkins, Research Wildlife Biologist, USGS Forest and Rangeland Ecosystem Science Center, Olympic Field Station, Port Angeles, WA

Nathan Chelgren, Ecologist, USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR

Kim Sager-Fradkin, Wildlife Biologist, Lower Elwha Klallam Tribe, Port Angeles, WA

Patricia Happe, Wildlife Biologist, Olympic National Park, Port Angeles, WA

Michael Adams, Research Ecologist, USGS, Forest and Rangeland Ecosystem Science, Corvallis, OR

Steven Perakis, Research Ecologist, USGS, Forest and Rangeland Ecosystem Science, Corvallis, OR

The removal of two hydroelectric dams from the Elwha River in Olympic National Park provides a unique opportunity to improve understanding of habitat change and cascading trophic effects associated with dam removal and anadromous fish restoration on riparian faunal communities of the Pacific Northwest. We conducted baseline studies of instream and streamside wildlife community composition, patterns of species occupancy, and ratios of marine-derived isotopes of nitrogen and carbon in selected wildlife species before dams are removed in 2011–12. We will present preliminary results on distribution and occupancy patterns of black bears, mesocarnivores, amphibians and small mammals in riparian zones of the Elwha River, 2006–2008, and will discuss potential uses of marine isotopes of carbon and nitrogen as a means of tracking the flux of marine nutrients in terrestrial food chains after the dams are removed.

**Implications of Elk Movements for Herd and Habitat Management in Midwestern Parks**

Glen Sargeant, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, Jamestown, ND

Michael W. Oehler, Senior Wildlife Biologist, Theodore Roosevelt National Park Medora, ND

Daniel E. Roddy, Biologist, Wind Cave National Park Hot Springs, SD

Duane C. Weber, Biological Science Technician, Wind Cave National Park, Hot Springs, SD

Chad L. Sexton, GIS Specialist, Theodore Roosevelt National Park, Medora, ND

Daily and seasonal movements have profound implications for management of elk in Midwestern parks but are poorly understood. We used GPS radio-telemetry collars to study movements of elk that wintered in Theodore Roosevelt National Park, North Dakota, and Wind Cave National Park, South Dakota, during 2003–2008. We acquired approximately 660,000 locations of 384 elk at intervals of 7-h (yearlong) and 15-min (selected sample dates), which we used to 1) map geographic extents of elk activity, 2) estimate the timing, locations, and durations of movements across park boundaries, and 3) estimate rates of egress for population subsets. When parks and state agencies with competing concerns share jurisdiction for wildlife populations, detailed knowledge of animal movements is essential. Results like ours provide for an objective description of lands and stakeholders most likely to be affected by elk and facilitate the development of complementary intra- and extra-park management strategies.

### **Tidal, Circadian, and Visitation Effects on Brown Bear Activity in a Meadow/Salmon Stream Complex**

Troy Hamon, Chief of Natural Resources, National Park Service, King Salmon, AK

Sharon Kim, Chief of Resources Management, Montezuma Castle, Montezuma Well, and Tuzigoot National Monuments, Camp Verde, AZ

At Geographic Harbor on the coast of Katmai National Park, park staff used solar-powered time-lapse cameras to document brown bear activity patterns throughout the summer season, including the effects of tide stage, time of day, and visitor activity. Geographic Harbor hosts salmon runs during mid-summer, attracting numerous brown bears which in turn attract visitors. Unlike traditional observational data, these time-lapse cameras provided bear activity data without confounding results with human presence. The resulting photos were then spatially analyzed to determine use patterns. The park plans to expand this methodology to other areas in the park to compare bear activity patterns in areas of high and low visitor use.

### **Historical Changes to Boreal Caribou (*Rangifer tarandus caribou*) Habitat in the Prince Albert Greater Ecosystem**

Maria Arlt, M.Sc.. Candidate, Department of Environment & Geography, University of Manitoba, Winnipeg, MB, Canada

Micheline Manseau, University of Manitoba, Natural Resources Institute, and Parks Canada, Western and Northern Service Centre, Winnipeg, MB, Canada

The Prince Albert National Park and Greater Ecosystem has historically been used by boreal caribou; however, recent use of the Park has been limited. To quantify changes to caribou habitat, we created land cover maps to represent the landscape in 1960 and 2000 using current and historic forest resources inventories, fire, logging, and roads data. Results indicated that mature coniferous stands increased throughout the study area whereas logging and linear features increased surrounding the Park. To assess how these changes have affected caribou habitat, we developed a resource selection function for the winter season using GPS telemetry data and generalized estimating equations. Results showed selection for treed muskeg and avoidance of hardwood and disturbance. The best model was applied to the 1960 and 2000 maps. Results showed high quality habitat distributed throughout the landscape in 1960 while in 2000, the high quality habitat is more clustered. To ensure caribou use of the range, habitat connectivity within and beyond Park boundaries should be maintained.

Concurrent Session #16 • Oregon • Contributed Papers

### **Sovereignty and Co-Management**

Chair: Sharon Franklet, Coordinator, Native Participant Travel Grant Program, George Wright Society, Ribera, NM

### **Working with Sovereign Tribal Nations**

Robert Miller, Professor, Lewis & Clark Law School; Chief Justice, Grand Ronde Tribe; Enrolled Citizen, Eastern Shawnee Tribe of Oklahoma, Portland, OR

American Indian Tribes are sovereign governments that predate the United States and do not acquire their sovereign powers and rights from the U.S. or state constitutions. Tribes and Indian people have religious and property rights and interests in public and private lands across the United States. Land managers need to understand basic principles of Indian law and the status of tribes in our American federalist society and need to learn how to work cooperatively with Indians and Indian Nations in developing and protecting America's natural resources. This paper and presentation will set out the basic principles of American Indian Law and suggest ways in which resource managers can work effectively with Indians and Indian Nations.

### **Empowerment in an Era of Self-Determination: The Case of the Washoe Tribe and U.S. Forest Service Co-Management Agreement**

Mary Adelzadeh, Sacramento, CA

Tribes and the U.S. Government have entered into co-management agreements to accommodate tribal interests in regaining access and reasserting traditional practices on ancestral lands that were lost during colonization. While some Native Americans have continued to fight court battles to regain ancestral lands, others have sought negotiated agreements wherein they serve as the principal managers and caretakers of public resources. One such agreement is between the Washoe Tribe and the U.S. Forest Service in the Lake Tahoe basin. The implementation of the co-management agreement allows not only access to ancestral sites but also the restoration of traditional uses, so it is more reflective of the Tribe's own needs and culture. The Tribe's goal is to help preserve its rich cultural heritage and historical relationship with Lake Tahoe, while reintegrating traditional ecological knowledge that evolved with this ecosystem for over 9,000 years. The research provides a multi-dimensional understanding of how the co-management agreement emerged, the negotiation process, and the end result. Further, it explores implementation of the agreement from the tribe's perspective to better understand what the co-management agreement provides to tribal members that they did not already have and how the Forest Service has changed local forest management and consultation practices with the tribe as a result of the agreement. Finally, this research examines what co-management does not change to better understand its limitations in addressing the needs of tribal communities.

### **Linking Sovereignty and Ecocultural Approaches in Water Resource Management and Restoration: The Port Gamble S'Klallam Tribal Initiatives**

Tracy Andrews, Professor, Anthropology Department, Central Washington University, Ellensburg, WA

Dave Fuller, Water Resources Manager/Hydrogeologist, Port Gamble S'Klallam Tribe, Kingston, WA

Paul McCollum, Natural Resources Director, Gamble S'Klallam Tribe, Kingston, WA

Challenges faced by the Port Gamble S'Klallam Tribe and its approaches to meeting them reveal how contemporary Native American resource management efforts are linked to sovereignty issues, and the critical importance of ensuring these resources are available for future generations. Our collaborative, interdisciplinary research project focuses on Port Gamble S'Klallam marine and freshwater resource issues, and approaches and partnerships developed by the tribe to protect and conserve their key cultural and natural resources. Many management practices are limited by addressing cultural and natural resources as separate categories, and by delaying addressing issues until remediation and restoration are the only remaining options. However, incorporating the "precau-

tionary principle” and traditional ecological knowledge can enhance management practices and policy development. Further, sovereignty rights exerted by the tribe serve both to protect and restore the limited traditional resources they have fought to retain, and to greatly enhance resource quality for the broader regional community.

#### **“The Land that We Keep For Us”: An Aboriginal Perspective on Conservation—The Case of Thaidene Nene/East Arm of Great Slave Lake**

Stephen Ellis, Lutsel K'e Dene First Nation, Lutsel K'e, NT, Canada

The Lutsel K'e Dene First Nation (LKDFN) has historically resisted the creation of a new National Park in the East Arm of Great Slave Lake (Thaidene Nene). Recently, this position has changed. Improved aboriginal engagement policies, increased industrial pressures, economic diversification needs, and the precedence of aboriginal and treaty rights have encouraged this turnaround. The LKDFN is currently working towards a partnership with Parks Canada for the shared stewardship of Thaidene Nene as a cultural landscape and as a mechanism to bring socio-economic benefit to the community of Lutsel K'e. It is in the spirit of renewal and reconciliation that the LKDFN has opened the door to discussions with Canada regarding the protection of Thaidene Nene. In return, Canada must demonstrate a willingness to explore new and innovative ways to share decision-making power, resolve land tenure issues, and increase community capacity.

#### **Co-management of Protected Areas: International Lessons on the Role of Indigenous Rights**

Sandra Pinel, Assistant Professor, Department of Conservation Social Sciences, College of Natural Resources, University of Idaho, Moscow, ID

Michael J. Evans, Senior Cultural Anthropologist and Chief of Ethnography, National Park Service Midwest Region, Omaha, NE

The World Parks Congress (2003) and IUCN advised nations to practice co-management, shared authority among national governments and local institutions when protected areas overlap ancestral lands or jurisdictions. The promoted benefits of co-management, such as conflict prevention and the incorporation of traditional management knowledge assume shared partner rights and authorities. Internationally, indigenous groups often lack self-governance authority, whereas in the United States, federal agencies may lack authority to share management with tribal and local jurisdictions. A growing body of international case study research indicates that ambiguous rights can promote conflict. Based on comparing a Philippine and U.S. case study of conflicting national mandates and indigenous goals, the paper argues that co-management is both promising and difficult in the U.S. legal context. Federal land managers should carefully consider their objectives, assumptions, and legal context before suggesting co-management with tribal governments.

Concurrent Session #17 • Alaska • Contributed Papers

#### **Visitor Perceptions of Protected Areas**

Chair: Elizabeth Halpenny, Assistant Professor, Faculty of Physical Education and Recreation, University of Alberta, Edmonton, AB, Canada

#### **Understanding Visitor Images of the Florida Suwannee River Wilderness Trail as a Tourist Destination**

Natalia Buta, Graduate Research Assistant, University of Florida, Gainesville, FL

Tinelle D. Bustam, Alumni Graduate Fellow, University of Florida, Department of Tourism, Recreation and Sport Management, Gainesville, FL

The Suwannee River Wilderness Trail is a 170-mile wilderness trail established as a joint effort of local environmental agencies and the communities of the Suwannee River Basin. The initiative emerged as a means to boost visitation to the area. The travel research literature identifies the image of a destination as a critical factor in tourist's destination choice process (Echtner and Ritchie, 1993) and revisit intentions (Tasci and Gartner, 2007). The purpose of this study was to provide exploratory examination of visitor perceptions associated with the Suwannee River Wilderness Trail, to assist in promoting the protected area as a tourist destination. Survey data was collected from 117 individuals who participated in an inaugural Paddle Florida event in March 2008. Inductive thematic analysis of open-ended responses revealed a high prevalence of psychological versus functional visitor perceptions in terms of destination image. Public land managers should integrate visitor images in developing effective planning strategies.

#### **Do Visitors Know or Care About Invasive Species in the NPS?**

Ryan Sharp, Graduate Assistant, University of Georgia, Warnell School of Forestry and Natural Resources, Athens, GA

Invasive species are an issue facing ecosystems throughout the world, and may be the number one threat to biodiversity across the planet. Invasive species have an adverse effect on America's natural and cultural identity and have the potential to destroy many of our native ecosystems. The National Parks of America are not exempt from this growing threat. The NPS ranks invasive species in front of air pollution, off-road vehicle usage, and visitation pressures as threats to many native ecosystems. And although there is an effort to inventory and better understand invasive species within the NPS, little has been done to understand how visitors perceive invasive species. Furthermore, little is known about the public's knowledge of and attitudes towards management regarding invasive species. This presentation will outline how to gain a better understanding of visitors' knowledge and attitudes towards invasive species and discussion will focus on how to utilize this information.

#### **The National Park System: Trends in Public Opinion towards Management and Preservation**

Yen Le, University of Idaho, College of Natural Resources, Moscow, ID

Eleonora Papadogiannaki, Ph.D. student, University of Idaho, College of Natural Resources, Moscow, ID

Ann Braak, M.S. student, University of Idaho, College of Natural Resources, Moscow, ID

Margaret Littlejohn, University of Idaho, College of Natural Resources, Moscow, ID

Steven Hollenhorst, University of Idaho, College of Natural Resources, Moscow, ID

An environmental movement, starting more than thirty years ago, is increasing in momentum today on a national as well as global level. But is this concern translating into action and changes in the way we want our natural resources protected? The National Park



Service provides opportunities for citizens to participate in decisions and actions. The Park Studies Unit (PSU) within the Department of Conservation Social Science within the University of Idaho has been conducting in-depth studies using surveys with consistent methodology since 1988. This paper utilizes content analysis methods of data from 17 surveys collected from 2003–2007 from various natural resource parks to examine if there is any change in the public's opinions toward management and preservation of natural resources. The study will also address how attitudes about management and preservation of National Parks differ between local “backyard” parks and “destination” parks. We hypothesize that “destination” parks and “backyard” visitors would be different in type as well as magnitude of natural resources preservation and protection.

### **Visitor Profiles and Knowledge of Kamchatka's Protected Natural Areas**

David Ostergren, Director, Graduate Program in Environmental Education, Goshen College, Wolf Lake, IN

A 2007–08 survey of visitors to Russia's Kamchatka Volcanoes World Heritage site reveals what potential, if any, to “save the nature through tourism.” The region has had a dramatic growth in visitation over the last decade. The area's natural amenities contribute immensely to the draw and quality of visitor experience. Sightseeing, rafting, fishing, heli-skiing or snowboarding, backpacking, bear watching and hot tub soaking attract thousands of visitors a year. Protected natural areas face daunting challenges such as poaching, permeable boundaries, resource extraction and gross underfunding (one preserve protects a million acres with 7 full time staff). This survey reports on visitor profiles and their knowledge and awareness of protected natural areas. the conclusion assesses the potential for tourism to contribute to preservation and protection.

### **Developing Normative Standards for Wildlife Viewing in Parks and Protected Areas**

Laura Anderson, Postdoctoral Associate, University of Vermont, Burlington, VT

Robert Manning, University of Vermont, Park Studies Laboratory, Burlington, VT

William Valliere, University of Vermont, Park Studies Laboratory, Burlington, VT

Jeffrey Hallo, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

Providing for wildlife viewing opportunities has become an increasingly important component of outdoor recreation planning and management. Using a structural norms approach, this study identified indicators and standards of quality for wildlife viewing in Denali National Park and Lake Umbagog National Wildlife Refuge. Data were collected through interviews and questionnaires during the summers of 2006 and 2007. At both locations, opportunities to interact with wildlife emerged as a key indicator of the quality of the visitor experience. Visitors to Denali found approximately four buses at wildlife stops, waiting times of five minutes, and a 25% chance of seeing a grizzly bear to be minimally acceptable, while minimum acceptable percentages of visitors to see wildlife at Lake Umbagog varied by species, ranging from 50% for moose to about 70% for waterfowl. These findings have potential implications for using structural norms to provide quality wildlife viewing opportunities at parks and protected areas.

Concurrent Session #18 • Idaho • Workshop

### **From the Stars to Underwater Depths and Sea to Shining Sea: LIVE Distance Education Programs**

Chair: Susan Teel, Director California Mediterranean Research Learning Center, National Park Service, Thousand Oaks, CA

The California Mediterranean Research Learning Center (CMRLC) and the High Performance Wireless Research and Education Network (HPWREN) will lead you on a virtual trip which showcases remote science sites via Live Interactive Virtual Explorations (LIVE). This LIVE demonstration will include visits to Palomar Observatory, Santa Margarita Ecological Reserve, California Wolf Center, Santa Monica Mountains National Recreation Area, and Cabrillo National Monument. Objectives of the HPWREN LIVE pilot project include: 1) exploration and understanding of hard-to-reach science sites and 2) preparation of students for field trips to such sites. The Sea to Shining Sea project led by the National Park Service and HPWREN, builds upon lessons learned from the LIVE pilot project by expanding programs to National Parks on both coasts. The StSS team is working with educational partner organizations to perfect the development and implementation of a LIVE backpack system for use at additional NPS sites.

Presenters: Kimberly Bruch, High Performance Wireless Research and Education Network, San Diego Supercomputer Center, La Jolla, CA

Richard Curry Ocean, Reef and Science Program Manager, Biscayne National Park, FL

Concurrent Session #19 • Three Sisters • Invited Papers

### **One Health: A Coupled System Approach to Improve Human, Animal, and Environmental Health**

Chair: Margaret Wild, Wildlife Management and Health Program Leader, Biological Resource Management Division, National Park Service, Fort Collins, CO

Session overview: The concept of One Health advocates cooperation between human and veterinary medicine to combat diseases that are shared between people and other animals (zoonotic diseases) to promote health of all species and the environment. Approximately 75% of recently emerging infectious diseases affecting humans are diseases of animal origin and about 60% of all human pathogens are zoonotic. Although the One Health (formerly One Medicine) concept was first introduced in the 1800s, it has only begun to be embraced in the last few years. With unprecedented challenges such as global climate change, habitat fragmentation, emerging pathogens, and explosive population growth, it is clear now more than ever that human, animal, and environmental health are inextricably linked. In this session we will explore the conceptual basis of One Health and introduce a broad range of disciplines and systems that can be integrated in a coupled system approach to promote health of all species.

### **One Health as an Approach for Integrated Health Management in the NPS**

Margaret Wild, Wildlife Management and Health Program Leader, Biological Resource Management Division, National Park Service, Fort Collins, CO

Charles Higgins Director, Office of Public Health, National Park Service, Washington, DC

Wildlife diseases are a growing concern worldwide. These diseases threaten wildlife populations and can also affect domestic and human health. The concept of One Health advocates cooperation between human and veterinary medicine to combat diseases that



are shared between people and other animals to promote health of all species and the environment. The National Park Service (NPS) is uniquely poised, through programs in public health and wildlife health, to serve a leadership role in conservation through implementation of One Health as a coupled-system approach to health management. The programs have collaborated on human case reports and wildlife disease outbreaks and, in October 2008, took a first step toward formalizing a process for collaboration through development of a Disease Outbreak Investigation Team. We will discuss further how broad conceptual aspects of One Health can be translated into discrete management actions and research initiatives to promote health in the NPS.

### **One Health, Many Priorities**

Todd K. Shury, Parks Canada, and Department of Veterinary Pathology, Western College of Veterinary Medicine, Saskatoon, SK, Canada

Emily Jenkins, Department of Microbiology, Western College of Veterinary Medicine, Saskatoon, SK, Canada

Ted Leighton, Canadian Cooperative Wildlife Health Centre, Western College of Veterinary Medicine, Saskatoon, SK, Canada

Stephen Woodley, Parks Canada, Gatineau, QC, Canada (presenting in lieu of Shury)

“One Health” is a concept dedicated to promoting, improving and defending the health of all species, but a functional definition for the practice of “One Health” remains elusive. “One Health” practitioners come from a variety of disciplines, and take an ecological approach to disease surveillance in animal reservoirs to proactively manage emerging and existing threats to health (human and animal). There is a need for a simple, applied definition of “One Health” that can spark public interest and appropriately direct limited resources. Recently emerging zoonotic diseases with wildlife reservoirs, including West Nile virus, avian influenza and hantavirus, have encouraged personnel from a diverse array of agencies and institutions in Canada to work together to manage single disease issues. Multiple disease/multiple host systems remain outside the limited mandates of many agencies, and prioritizing the distribution of resources remains a contentious and divisive issue impeding progress towards “One Health.” We review several high level initiatives that have recently attempted to bridge these gaps in Canada with a focus on the role of wildlife and ecosystem health.

### **Perceptions of Wildlife-associated Disease Risk: A Challenge for “One Health” in National Parks**

Daniel Decker, Professor and Director, Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY

Kirsten M. Leong, Program Manager, Human Dimensions of Biological Resource Management, Biological Resource Management Division, National Park Service, Fort Collins, CO

Darrick T.N. Evensen, Graduate Assistant, Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY

Perceptions of wildlife-associated disease risks can influence National Park visitation and visitor behavior, as well as staff, volunteer and neighbor relations. Understanding this human dimension of wildlife-associated disease from a coupled human-natural systems perspective is desirable for a One Health approach to wildlife-disease management in Parks. Conceptualizing direct and indirect human-wildlife interactions and resulting impacts as products of coupled-systems provides a focus for wildlife health management, where perceptions of risks associated with wildlife disease are as important as, or more important than technical assessments of risk in determining public reactions. We present key concepts of risk perception appropriate for One Health planning and communication in National Parks. The challenges to effective wildlife health management that are posed by under-estimation or amplification of risk are described and relevant insight from risk perception and communication disciplines are shared. Implications for One Health implementation in National Parks are explored.

### **Coral Diseases: A Threat to Reefs, Fisheries, and Island Nations**

Jeff Miller, Fisheries Biologist, National Park Service South Florida/Caribbean Network, St. John, VI

Erinn Muller, Florida Institute of Technology, Melbourne FL

Caroline Rogers, US Geological Survey, St. John, VI

Rob Waara, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Andrea J. Atkinson, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Matt Patterson, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Brian Witcher, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Ben Rutenberg, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Judd Patterson, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Coral reefs are among the most productive ecosystems on the planet. The livelihoods of many island nations are closely linked to coral reefs and their fisheries. Billions of dollars are generated annually by tourism, and millions through fishing in the Caribbean alone. Coral reefs are deteriorating worldwide, even within marine protected areas (MPAs) such as our marine National Parks from factors such as storms, overfishing and other anthropogenic effects. Coral diseases have become increasingly severe. In the late 1970s a coral epizootic devastated Elkhorn coral (*Acropora palmata*) in the Caribbean causing over 90% mortality and prompting recent listing under the US Endangered Species Act. More recently coral diseases were responsible for unprecedented losses (>50% in one year) of corals in the US Virgin Islands. While we’ve become very adept at measuring the losses of coral, very little is known about the pathogens, vectors and environmental stresses that cause coral diseases.

### **Plague Management in National Parks as an Example of “One Health” in Action**

Kevin Castle, Wildlife Veterinarian, National Park Service, Biological Resource Management Division, Fort Collins, CO

David Wong, Commander, U.S. Public Health Service, and Medical Epidemiologist, National Park Service, Office of Public Health, Albuquerque, NM

Plague is a zoonotic disease caused by *Yersinia pestis*. Since its introduction to the west coast of North America around 1900, plague has been reported from nearly every state west of the Mississippi River. Twenty-five NPS units in the western US have reported evidence of plague in wildlife, and many continue to report epizootic plague activity and high levels of wildlife mortality. Large-scale die offs within susceptible keystone species populations (e.g. prairie dogs) may have significant effects on ecosystem form and function. Biologists often investigate wildlife mortality events or disease outbreaks to understand the cause of death in individual ani-

imals and the effects on populations. The recent death of an NPS biologist from plague underscores the need for enhanced awareness/recognition of zoonotic diseases by anyone handling wildlife. We will discuss how management of zoonotic diseases in general, and plague specifically, can benefit human and wildlife health.

**Concurrent Session #20 • Mt. Bachelor • Invited Papers**

**CESU Cultural Resource Field Schools in National Parks**

Chair: A. Trinkle Jones, Cultural Resource Coordinator, Colorado Plateau Cooperative Ecosystem Studies Unit (CPCESU), National Park Service, Flagstaff, AZ

Session overview: Academic field schools within National Parks are an excellent example of the conference theme of “Many Hands Working Together, Joined in a Common Goal.” Field schools give students an opportunity for “real life” application of their field of study, and offer National Parks a cost-effective and collaborative approach to resource management; and both sides benefit from the exchange of ideas and perspectives. This panel explores this partnership model by highlighting a range of cultural resource field schools, as well as “lessons learned” and best practices. The presentations include the Warriors’ Project, which brings African-American and Indian students together on Buffalo Soldier projects, and disseminates that information through websites, publications and film; two cultural resource field schools in Hawaii Volcanoes National Park; a University of Montana field school that focuses on historic and prehistoric archeological resources in Yellowstone; and University of Arizona field schools that focus on architecture and planning.

**Historic Preservation Field School at Hawaii Volcanoes National Park**

Laura C. Schuster, Chief, Cultural Resources Division, Hawaii Volcanoes National Park, Hawai‘i National Park, HI

The field school at the park originated from a need to have access to locally trained individuals in historic preservation, to educate others in the language and preservation ethic of the National Park Service, and ultimately provide the park with assistance in completing documentation and inventories of historic properties. The Field School portion of the University of Hawaii’s American Studies Department, Certificate Program in Historic Preservation has been in existence for 18 years; the last three years provided 22 students from around the world a park experience and a learning experience in historic preservation. The remoteness of Hawaii requires innovation and cooperation; the CESU process at the University of Hawaii provided the NPS access to professional like-minded individuals to accomplish mutual goals. The cooperative agreement is a proven formula for getting work done in parks where other options are either too costly, or prove to be unworkable.

**The Montana-Yellowstone Archaeological Field School Project**

Douglas MacDonald, Assistant Professor, Department of Anthropology, University of Montana, Missoula, MT

Elaine Hale, Yellowstone National Park, WY

Ann Johnson, Yellowstone National Park, WY

The Montana Yellowstone Archaeological Project (MYAP) is a cooperative archaeological field school involving the University of Montana (UM) and Yellowstone National Park (YNP). With important funding from the Rocky Mountain CESU, Yellowstone archaeologists participate with university personnel to provide an outstanding archaeological field school experience for students. To date, 23 undergraduate and graduate students have been trained in archaeological field methods and six graduate students have gained experience in directing field projects. The field school decreases costs of cultural resource management projects for YNP while also providing important research for faculty and students from UM. MYAP identified more than 50 archaeological sites and excavated five sites during the 2007–2008 study near Gardiner, Montana. Among the excavated sites was Cinnabar, the Northern Pacific train stop for Yellowstone tourists from 1883–1903. In addition, the MYAP team excavated a Late Prehistoric camp site and stone circle site, both along the Yellowstone River.

**Archaeology and the Warriors’ Project: Exploring a Buffalo Soldier Campsite in the Guadalupe Mountains of Texas**

Eleanor King, Assistant Professor, Department of Sociology and Anthropology, Howard University, Washington, DC

During 2004–2006, the National Park Service and Howard University fielded an archaeological expedition as an extension of the “Warriors’ Project,” the purpose of which was to investigate a Buffalo Soldiers’ campsite in Guadalupe Mountains National Park with a joint team of Howard undergraduates and high school students, including participants from the Mescalero Apache Reservation. The site was originally thought to comprise a temporary encampment, periodically used by both 9th and 10th Cavalry soldiers. Survey revealed it to be a much more extensive, semi-permanent encampment covering some 40 acres of land. Excavations and surface collections in and around the hearths suggested that the primary occupation was by the 10th Cavalry in the late 1870s. Ovens, tent pads, and other semi-permanent structures attested to an important military presence at that time. In addition, however, we found the site had been occupied in numerous periods, both historically and prehistorically, by several different groups. The presentation also will highlight how information about the project has been shared via website, publications, and film.

**Kilauea Caldera: Sourcing an Explosive Eruption**

Jadelyn Moniz Nakamura, Integrated Resources Manager/Archeologist, Hawaii Volcanoes National Park, HI

In 2000 a wildland fire raged through parts of Kilauea Caldera within Hawaii Volcanoes National Park. Subsequent archeological survey in the burn area led to the discovery of over 270 basalt workshops spread across 1,000 acres. The basalt was a by-product of 300 years of explosive Kilauea eruptions. These rocks were ejected out of the caldera creating a unique quarry site, the material from which was later crafted into tools by Native Hawaiians. In the summer of 2007 an archeological field school, focusing on this site, was conducted through the Pacific Islands CESU. Participants were from Na Pua No’eau, The Center for Gifted and Talented Native Hawaiian Children. The field school trained them in basic archeological field and laboratory techniques, focusing on field survey and XRF analysis of artifacts from the quarry site as well as from household sites throughout the park. The results yielded significant data regarding procurement strategies, trade and change over time.

### **Forthcoming paper**

R. Brooks Jeffery, Associate Dean, College of Architecture and Landscape Architecture, University of Arizona, Tucson, AZ

Concurrent Session #21 • Mt. Hood • Invited Papers (Part 2 of 3-Part Track)

### **Burned Up or Burned Out? II • Fire Crosses Boundaries (Physically, Socially, Politically, and Internally)**

Chair: Richard Schwab, National Burned Area Rehabilitation Coordinator, National Park Service, National Interagency Fire Center, Boise, ID

### **Adapting Fire to Address Uncertainty in a Changing Climate**

Dick Bahr, Program Lead, Fire Science and Ecology, National Park Service, Fire Management Program Center, NIFC, Boise, ID

Wildland fire management from prescribed fire to wildfire is approaching new and changing climates. These climates include the meteorological, social, and political arenas. Fire and resource managers are faced with enormous challenges in trying to balance wildland and urban interface, natural areas, recreation, health, air quality, budgets, and values to be protected.

### **Fire and Climate Change: Managing in the Face of Escalating Risk and Uncertainty**

Nate Stephenson, Research Ecologist, USGS Western Ecological Research Center, Three Rivers, CA

As if fire and resource management weren't already difficult enough, we have now entered an era of rapid climatic changes. Future climate and ecosystem conditions will have no analog in the past, meaning we can't automatically use past conditions as a management target. Worse, at the local and regional levels most important to managers, the rate, magnitude, and even direction of climatic changes and consequent ecosystem responses are effectively unpredictable. We must therefore adopt approaches to fire and resource management that embrace risk and uncertainty as unavoidable; one such approach is scenario planning.

### **Fire Management in the Mediterranean Coast Network: Trying to Fit a Square Peg into a Round Hole**

Marti Witter, Fire Ecologist, Mediterranean Coast Network, Thousand Oaks, CA

Santa Monica Mountains National Recreation Area, northwest of Los Angeles, is the NPS's largest urban park with an extensive Wildland Urban Intermix (WUI) of extremely flammable shrublands and development. Fires in the Santa Monica Mountains have been among the most destructive in the nation. The dominant chaparral shrublands are a type IV fire regime where frequent prescribed burning or mechanical fuel reduction lead to type conversion and loss of community diversity, structure and function. Thus the SMMNRA does not conveniently fit the national fire plan model where hazard fuel reduction and habitat restoration projects are conveniently the same. We will discuss our fire management activities and how we attempt to reconcile the conflicting objectives to preserve the park's natural resources and to promote fire safe communities within its boundary.

### **Cultural Resources within Wildland Fire Incidents: Laurel Lake as a Case Study**

Jun Kinoshita, Fire Archeologist, Yosemite National Park, El Portal, CA

During the 2006 Frog Wildland Fire Use incident, an archeological site, CA-TUO-4818, was impacted by fire management actions. The ensuing damage assessment illustrated the challenges of managing cultural resources within wildland fire incidents. This work examines the event and outcomes, and proposes a strategy for successful communication of the cultural resource compliance process within fire management incidents.

### **Interface between Fire and Forests / Tree Management in the National Parks**

Brian Mattos, Park Forester, Yosemite National Park, Yosemite National Park, CA

Dan Buckley, Fire Use Specialist, NPS Fire Management Program Center, Boise, ID

Tom Warner, Park Forester, Sequoia-Kings Canyon National Park, Three Rivers, CA

Wildfires, management ignited prescribed fires, and mechanical fuels treatments in National Parks have resulted in unintended consequences. Thousands of trees along roadways and power lines have been damaged or killed by fires. Furthermore in 2007, 11738 NPS acres were mechanically treated under the National Fire Plan to protect park resources. Park Foresters will illustrate some outcomes and raise some as-yet unanswered questions about tree disposal, tree hazard prevention, and mitigation to include acceptable collateral damage or unacceptable safety hazards, and increased workload for park forestry crews. It will be pointed out that the National Park Service needs clear and coherent policy and direction on how to manage these forest resources including how to conduct biomass disposal and sales. We recommend that a Director's Order with an accompanying Reference Manual and a NPS Biomass Disposal Desk Guide be developed by Fire and Resource Management professionals for specific policy guidance to allow for the sustainable disposal of woody biomass.

(Track continued from Concurrent Session #10 and continues in Concurrent Session #32)

Concurrent Session #22 • Mt. St. Helens • Contributed Papers

### **Going with the Flow: Ground- and Surface-water Management**

Chair: Mary Ann Madej, Research Geologist, USGS Western Ecological Research Center, Redwood Field Station, Arcata, CA

### **Regional and Local-scale Evaluation of Surface- and Ground-water Resources at Great Basin National Park, Eastern Nevada**

Donald Sweetkind, Research Geologist, U.S. Geological Survey, Lakewood, CO

Russell Plume, Hydrologist, USGS, Carson City, NV

David Prudic, Research Hydrologist Emeritus, USGS, Carson City, NV

William Van Liew, Hydrologist, National Park Service, Fort Collins, CO

Water resources in Great Basin National Park could potentially be affected by large-scale ground-water withdrawals from adjacent Spring and Snake Valleys. Water from streams and springs within the Park maintains diverse biological communities, enhances scenic geologic features, and provides for park operations. A U.S. Geological Survey (USGS) assessment of surfacewater resources



near the Park suggests that areas potentially susceptible to ground-water withdrawals consist of reaches where streams (1) are in contact with permeable rocks or sediments, or (2) receive water from either spring discharge or ground-water inflow. A USGS assessment of regional ground-water resources defined regional water-budgets and likely ground-water flow directions, including significant interbasin transfer in the vicinity of the Park. However, considerable uncertainty exists regarding the relation of ground-water flow in basin-fill and carbonate-rock aquifers with surface-water resources in southern Snake Valley, sources of water emanating at springs, and the details of local and regional ground-water flow paths.

#### **Application of Regional Environmental Flow Assessments to Protected Areas**

Christopher Konrad, Research Hydrologist/River Science Coordinator, US Geological Survey/The Nature Conservancy, Seattle, WA  
Water resources are critical to the integrity of ecosystems in the National Park system, but can be difficult to protect in the face of their increasing use because of uncertainty about the ecological consequences. Large projects affecting well-known rivers can marshal support for thorough scientific investigations and public processes to assess impacts and determine acceptable management strategies. In these cases, an adaptive management framework can be used to reduce scientific uncertainty about site-specific ecological responses to hydrologic alteration and restoration. In many other cases, however, there are neither resources nor time to assess potential impacts from water resources development with site-specific information. For these cases, a regional approach to environmental flow assessment can provide a framework for rapid response to new proposals for water use. A framework for regional environmental flow assessments—Ecological Limits of Hydrologic Alteration (ELOHA)—was recently proposed by scientists and conservation practitioners from universities, The Nature Conservancy, and government agencies that may be instructive for managing water resources in protected areas. New scientific developments in ecological analyses of streamflow at regional-scales that were reviewed at recent workshop sponsored by US Geological Survey and The Nature Conservancy illustrate how many components of regional environmental flow assessments can be implemented.

#### **Impacts of Regulated Flow below Hetch Hetchy in Yosemite National Park and Potential Mitigation Measures**

James Roche, Hydrologist, Yosemite National Park, El Portal, CA

Greg Stock, Geologist, Yosemite National Park, El Portal, CA

Monica Buhler, Biologist, Yosemite National Park, El Portal, CA

We examine impacts of managed flows below Hetch Hetchy Reservoir on a 26.4-hectare riparian wetland complex called Poopenaut Valley. Flow alteration has reduced meadow inundation frequency (10–25%) with a greater concomitant reduction in shallow soil saturation duration necessary to support wetlands and meadow habitats. Groundwater elevations throughout the meadow only approach elevations within 0.5 meters of the ground surface, that level useful to wetland plants, during floods on the Tuolumne River. An experimental flood of 177 cm on May 26–27, 2008 revealed flood levels necessary to achieve substantial inundation of low lying meadow areas. Subsequent moderate flows revealed considerable heterogeneity in meadow soil transmissivity and hence response times to floods of a given magnitude. By combining this information with meadow and wetland vegetation distributions and characteristics, we intend to identify river flow magnitudes, timing, durations, and frequencies necessary to sustain or improve current meadow conditions in Poopenaut Valley.

#### **Using Science to Guide Development of Alternatives for the Stehekin River Corridor Implementation Plan**

Jon Riedel, Geologist, North Cascades National Park Service Complex, Marblemount, WA

Jack Oelfke, Chief, Resource Management, North Cascades National Park Service Complex, Sedro-Woolley, WA

The Stehekin River changes remarkably along its 25 mile length, from glaciers to Lake Chelan. This watershed appears particularly sensitive to climate change, with the timing of flooding shifting from spring to fall since the 1970s. Complicating management of the lower 10 river miles within the Lake Chelan National Recreation Area is a road network and mix of private and public lands. Three 100-year floods in the past 13 years have ravaged public and private infrastructure, adding urgency to development of a river corridor management plan. We are using a wealth of watershed scientific data to guide development of this plan, including gauging station records, multi-year log jam surveys, and detailed information on topography, sediment yield and river channel instability. We have used an interagency technical committee to help guide development of alternatives for managing logjams, transportation infrastructure, and acquisition of sensitive private property in a revised Land Protection Plan.

#### **Status versus Trends: Understanding Temporal Scales and Baseline Conditions in Trend Analysis**

Eric Dinger, Aquatic Ecologist, Klamath I&M Network, National Park Service, Ashland, OR

Daniel Sarr, Network Coordinator, Klamath I&M Network, National Park Service, Ashland, OR

One of the stated goals of the National Park Service Inventory and Monitoring program is to assess the status and trends of “Vital Signs.” The determination of ecosystem status can be accomplished by a single, specific measurement (for example, the comparison of watershed nutrient loads to government mandates). However, the calculation of trends is highly dependent upon the scale being examined—spatially and temporally. To illustrate this, we make use of a continuously monitored “Vital Sign” dating before the creation of the National Park Service to show the complexities of trend analyses, and the necessity of understanding the context and scale of assessments. We also demonstrate the reliance of trend analysis on the determination of status, and how the use of single-point status estimates to determine baseline conditions are problematic. Hence, understanding historical context and scale are necessary for managers to define “baseline” conditions.

#### **Tuesday Morning, March 3**

Concurrent Session #23 • Multnomah • Invited Papers (Part 1 of 3-Part Track)

#### **Navigating Terra Incognita: New Management Strategies in an Era of Climate Change I • Averages Belie the Extremes: Anticipated Changes and Effects in the Pacific Northwest**

Chair: Cat Hawkins Hoffman, Chief, Natural Resources Division, Olympic National Park, Port Angeles, WA

Session overview: Known for abundant rainfall, lush rainforests, rugged coastlines, salmon runs, fruit groves, agricultural fields, and rich



traditional cultures and lifeways, the Pacific Northwest encompasses some of the wettest ecosystems in the United States, and also some of the driest. Already subject to decadal variations in climate that push conditions from warm-wet, to cool-dry, the trend for the last century has been towards warmer and wetter conditions. Paradoxically, these conditions will likely reduce summer water supplies, while sea level rise consumes up to 90% of estuarine beaches in some areas. This session will describe anticipated effects of climate change on natural and cultural resources of the Pacific Northwest and discuss adaptation strategies being considered for these areas.

#### **Climate Change in Western National Parks: Adaptation Underway**

Kelly T. Redmond, Deputy Director, and Regional Climatologist, Western Regional Climate Center, Desert Research Institute, Reno, NV

Projections from climate models are for the Western United States to warm somewhat more than the eastern US. This warming should have commenced in earnest around the middle 1970s and be well under way by now. Direct and proxy observations appear to show such warming in most parts of the 11 westernmost contiguous states, though this has not yet been unambiguously attributed to greenhouse gasses. Regardless of cause, we have been unwittingly or unknowingly adapting to this recent warming for nearly 40 years. In addition, we have been refining our adaptation to the existing climate over the past century or two. Precipitation changes are expected to be much more difficult to detect because of very large inherent variability. This perspective seems to furnish a useful, practical and familiar framework for addressing adaptation. A set of new tools is needed to advance this activity.

#### **Uncertain Future: Climate Change Impacts on Northwest Salmon**

Nathan Mantua, Associate Research Professor, School of Aquatic and Fishery Sciences, Climate Impacts Group, Seattle, WA

What will global warming mean for Pacific Northwest salmon in the 21st century? It is well known that productive salmon rivers must have abundant flows of cool water during spawning, incubation, and rearing periods. Direct and indirect observations from recent decades also show important links between warm ocean temperatures and poor growth and survival for many northwest coho and chinook populations. Because the regional impacts of global warming are projected to include a general warming of streams and the upper ocean, this factor alone points to a reduced quality of freshwater and ocean habitat for some NW salmon populations. However, the wind-driven coastal upwelling process that makes our coastal ocean productive will continue to play a prominent role in shaping biophysical processes in our coastal ocean, and uncertainty in the future behavior of these winds leads to substantial uncertainty in future ocean conditions for NW salmon.

#### **Old-Growth Forests of Olympic National Park: Carbon Storage and Sensitivity to Climate**

Steven Perakis, Supervisory Research Ecologist, USGS, Forest and Rangeland Ecosystem Science Center, Corvallis, OR

Forests of the Pacific Northwest store more carbon per unit area than any other ecosystem, anywhere on Earth. This high capacity for carbon storage helps offset increases in atmospheric carbon dioxide that drive climate change, yet is likely to change in response to future climate. We are examining how precipitation controls carbon storage in forests, using sites in Olympic National Park arrayed across the widest precipitation gradient globally in the temperate zone. Our preliminary results indicate that forests cycle the greatest amounts of carbon at "intermediate" levels of precipitation (2–3 meters annually), but that wetter forests have the greatest capacity for carbon storage overall due to slower decay and less frequent fire. This work, which seeks to understand the functioning of protected ecosystems, can also inform land allocation decision-making that seeks to balance commercial forestry and carbon storage goals under future climate scenarios.

#### **Climate, People, and Environment: Understanding Effects of Climate Change on Cultural Resources**

Stephanie Toothman, Chief, Cultural Resource Management, Pacific West Region, National Park Service, Seattle, WA

Given current climate change scenarios, it is useful to understand not only how past environmental change affected cultures, but also how past cultures affected their environment. Because studies of past cultural change often examine climatic and environmental change, the Cultural Resource Program has the potential to inform natural resource stewardship by contributing understanding of past relations of cultural and natural systems. The impacts of climate change on cultural resources are likely to be highly variable, depending on cultural resource type and the environment in which the resource was created or is currently located. Additionally, the effects of climate change are predicted to be variable across the Pacific West Region, according to latitude, longitude, elevation and the physics of global climate patterns. The Pacific West Region Cultural Resources Program is developing a framework for response that can be immediately applied, and also refined in the future based on new scientific information.

#### **A Manager's Perspective: Adapting to Climate Change on Olympic National Forest**

Kathy O'Halloran, Natural Resources Staff Officer, Olympic National Forest, Olympia, WA

The Olympic National Forest (ONF), in partnership with the Pacific Northwest Research Station (PNW), examined options for adapting to climate change. This work provided a framework for thinking about land management in the face of impending change. The concepts developed through this effort have been peer reviewed and published and most can be readily applied by other managers. Climate change is teaching us that the past may no longer be a good predictor of the future, yet there are many concepts that still serve as a solid platform for making decisions. The ONF and PNW are continuing the partnership to examine ways to apply the concepts to the ground to better aid in managing for future generations.

(Track continues in Concurrent Sessions #34 and #45)

Concurrent Session #24 • Holladay • Panel Discussion

#### **Healthy Parks, Healthy People: Innovations from U.S. National Parks and Parks Victoria (Australia)**

Chairs: Sibdas Ghosh, Professor and Chair, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Mark Stone, Chief Executive, Parks Victoria, Melbourne, Victoria, Australia

Over the last decade significant evidence has emerged connecting a healthy environment and a healthy society, involving physical and

mental health related to social cohesion. Park management agencies across the world have been proactive in public awareness through education and driving management approaches to obtain funding for health initiatives extending beyond the protected area regime to include urban parks. Inevitably these initiatives require partnerships with the health industry and continued applied research. Our panel discussion will provide insight into the ways in which two major protected area organizations have and are using this evidence. They are repositioning themselves as providers of fundamental societal benefits above and beyond those traditionally associated with protected areas. To optimize outcomes requires a paradigm shift in thinking.

Panelists: Mark Stone, Chief Executive, Parks Victoria, Melbourne, Victoria, Australia  
Ernie Quintana, Director, Midwest Region, National Park Service, Omaha, NE  
Diana Allen, Coordinator, NPS Healthy Parks Initiative, National Park Service, St. Louis, MO  
James Gramann, Visiting Chief Social Scientist, National Park Service, Washington, DC  
Jonathan Jarvis, Director, Pacific West Region, National Park Service, Oakland, CA

Concurrent Session #25 • Broadway/Weidler • Contributed Papers

### **Achieving Restoration Goals in Protected Areas: Challenges and Obstacles**

Chair: Laura Hudson

#### **Beyond Boundaries: Partnerships for Condor Restoration at Pinnacles National Monument**

Daniel George, Condor Program Manager, Pinnacles National Monument, Paicines, CA

Jake Theyerl, Institute for Wildlife Studies, Arcata, CA

Pinnacles National Monument's California Condor Program has built diverse partnerships in order to reduce the primary threat to condor recovery: lead poisoning. While the Monument encompasses 40 square miles, the Pinnacles condors regularly range over an area of approximately 4200 square miles. Thus, the scavengers encounter carcasses that often remain on the landscape after hunting activities. Remains of animals shot with lead bullets regularly contain numerous lead fragments. Condors that inadvertently ingest these fragments absorb lead through digestion. Although California has outlawed the use of lead ammunition within the condors' range, reaching full compliance will require significant outreach to gain willing support. Because even one lead exposure may kill a condor, recovery efforts depend on non-lead ammunition becoming an integral part of hunting and ranching culture. Pinnacles has therefore worked to cooperate with hunting organizations, non-profit wildlife organizations, and university researchers to expand awareness of lead threats and their solutions.

#### **Restoring Estuarine Wetlands along the Lower Columbia River: A Case Study at Lewis and Clark NHP**

Micah Russell, Director, Columbia River Estuary Study Taskforce, Astoria, OR

Allan Whiting, Senior Ecosystem Planner, PC Trask and Associates, Inc., Portland, OR

David Szymanski, Superintendent, Lewis & Clark National Historical Park, Astoria, OR

In 2007, several partners restored approximately 53 acres of tidal marsh at Lewis and Clark National Historical Park, more than doubling the acreage of estuarine wetlands along the lower six miles of the Lewis and Clark River. Monitoring data suggests success: an increase in both the number of salmonid species and the number of salmonid individuals in the wetland. Successful execution of this project depended upon collaboration between watershed councils and organizations, land trusts, and local, state, and federal governments. In the years to come, scientists and managers will develop a restoration plan for the site. This plan could include modifying physical features, such as tidal channels and old drainage ditches, removing fill, or reintroducing native plant species, among other actions. Project partners also plan to use restoration activities at this site as part of a regional effort to engage the public in watershed protection.

#### **Declines in Yosemite's Bird Populations**

Sarah Stock, Wildlife Biologist, NPS, El Portal, CA

Rodney Siegel, Research Scientist, The Institute for Bird Populations, Point Reyes Station, CA

Yosemite National Park's meadow-associated landbirds are exhibiting population declines. Analyses from 15 years of data across a 1,000-meter elevation gradient reveal a 23% reduction in landbird abundance, including significant negative population trends for 13 species. Furthermore, seven of those declining species show low productivity, suggesting that factors on the breeding grounds in Yosemite may be driving their local population declines. We assessed landbird population trends and their likely demographic causes, explored climate change as a possible driver of demographic change, and where possible, suggested management approaches for reversing these population declines in Yosemite.

#### **Restoring and Protecting Yosemite's Declining Amphibians**

Heather McKenny, Aquatic Ecologist, Yosemite National Park, El Portal, CA

Steven Thompson, Branch Chief of Wildlife Management, Yosemite National Park, El Portal, CA

Amphibian populations have declined dramatically in many areas around the world, including the Sierra Nevada and Yosemite National Park. Nonnative species, loss of quality habitat and habitat fragmentation, climate change, airborne contaminants, and disease are among the factors attributed to the declines. In Yosemite National Park the Sierra Nevada yellow-legged frog (*Rana sierrae*), once ubiquitous to Yosemite's high country, has declined by 95% and the Yosemite toad (*Bufo canorus*) has declined by at least 50%. During spring 2008 the park embarked on the development of an aquatic resource management plan to address the declines of these species and to protect and enhance aquatic ecosystems within the park. Conservation strategies for these species considered during the development of this plan will be presented.

#### **Bark Beetles that Ate the West: Change a Good Thing or Bad?**

Jeff Connor, Natural Resources Specialist, Continental Divide Research Learning Center, Rocky Mountain National Park, Estes Park, CO

Doug Watry, Fire Management Specialist, Rocky Mountain National Park, Estes Park, CO

Millions of acres of forest throughout the west are dead due to bark beetles. Never before in the history of Rocky Mountain National Park was there a bark beetle outbreak as extensive as the present one. Bark beetles are currently having a bigger impact on forests than fires. Over a decade of warmer summers, milder winters, and drought are stressing older forests where fire use to occur about once every 300 to 500 years in spruce/fir and once every 100 to 150 years in lodgepole pine. Fire frequency within the park is still within the natural range of variability, but bark beetles could alter fire frequency in the future. Trees as old as 1,000 years are succumbing to beetles and drought. Approximately 100,000 acres of forest is impacted. Active forest management will not stop the spread of the current outbreak, but will protect some high-value trees. Hazard trees and threats from wildfire created by the beetles are threatening park infrastructure and Gateway Communities leading to some closures until trees are removed. Some wildlife populations are fluctuating due to changes in the landscape and food availability. Park managers are collaborating with other agencies and universities to implement research, and management plans.

Concurrent Session #26 • Hawthorne/Sellwood • Invited Papers

#### **Conservation in Mexico's Protected Areas System: Looking Ahead**

Ernesto C. Enkerlin-Hoeflich, National Commissioner, Comisión Nacional de Áreas Protegidas, México, D.F., México

Session overview: Protected areas have a tradition of about one hundred years in Mexico yet until recently most just stood as "paper parks" with limited abilities to enforce their conservation mandate. In the late 1980s a new environmental law was approved and further reinforced and the category system of protected areas in 1996. The first protected areas were implemented on the ground with increased resources and staff. In 2000 the National Commission for Protected Areas was created and today manages over 22 million hectares in 166 designated protected areas. The papers in this session explore and evaluate a Mexican perspective by scientists and practitioners on the current status of conservation in Mexico and proposed collaborative efforts in sister parks, continental connectivity, endangered species recovery, mainstreaming improved livelihoods and health, climate change adaptation, and monitoring and evaluation of conservation in protected areas.

#### **The Fund for Protected Areas: An Effective Public-Private Partnership**

Renée González Montagut, Directora de Conservación, Fondo Mexicano para la Conservación de la Naturaleza, México, D.F., México

Andrew John Rhodes Espinoza, Coordinador Central del FANP, Mexican Fund for the Conservation of Nature, México, D.F., México

A partnership between the Mexican National Commission for Protected Areas (CONANP) and a protected areas endowment within the private Mexican Nature Conservation Fund (FMCN) has increased funding and partnerships in 23 protected areas (PAs) in Mexico. In 1997, a grant from the Global Environment Facility (GEF) created the Natural Protected Areas Fund (FANP) within FMCN, which increased four-fold in 11 years. The PAs funded by the FANP and increasing concurrent fiscal funds have served as a showcase to attract a higher federal allocation each year. Starting in 2009 the FANP funds will be used for operation expenses, strategic projects in each PA and emergency funds to address disasters. Strategic projects will be executed by civil organizations thus strengthening the social capital required for the proper management of PAs. The results of the impact of this partnership on conservation are encouraging. Initial studies indicate that deforestation is proceeding at much slower rates inside most PAs than in their immediate surroundings, and that deforestation rates appear to decline significantly following the legal establishment and financial support of these PAs. Most populations of indicator species being monitored in each PA are stable showing no significant upward or downward trend. Incipient data suggest that financially supported PAs may be effective in conserving biodiversity.

#### **Deforestation, Natural Protected Areas, and Biodiversity Conservation in Mexico**

Víctor Sánchez-Cordero, Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F., México

Patricia Illoldi-Rangel, Section of Integrative Biology, University of Texas at Austin, Austin, TX

Tania Escalante, Facultad de Ciencias, Universidad Nacional Autónoma de México, México, D.F., México

Fernanda Figueroa, Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F., México

Gerardo Rodríguez, Instituto de Ecología, Universidad Nacional Autónoma de México, México, D.F., México

Miguel Linaje, Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F., México

Trevon Fuller, Section of Integrative Biology, University of Texas at Austin, Austin, TX

Sahotra Sarkar, Section of Integrative Biology, University of Texas at Austin, Austin, TX

Deforestation is one of the main factors negatively affecting the conservation of biodiversity. We assess the impact of deforestation on biodiversity in Mexico by quantifying its effect on (1) mammal species' distributions, (2) delineation of biogeographical regionalization, (3) the effectiveness of conservation area networks to prevent biologically deleterious land use/land cover change, and (4) area prioritization for biodiversity conservation. Deforestation has a significant impact on species' distributions with habitat loss ranging from 10–90%, leading in some cases to high risks of extinction. Significant changes also occur in the delineation of biogeographical provinces (bioregionalization) due to deforestation because several areas with unique fauna show high rates of natural habitat reduction, leading to potential ecological and biogeographical changes in species interactions and distributions. A variety of protected areas now show increasing pressures due to potential land use conversion from natural habitat to agriculture and urban settlements which threatens their biodiversity content. These trends urge immediate collaborative actions between academic, governmental, and NGO sectors to prevent and reduce further deforestation nationwide.

#### **Conservation With, For and By People: Protected Areas Contributing Improving Livelihoods of Indigenous and Rural Communities**

José Juan Arriola-Arroyo, Director de Actividades, Productivas Alternativas, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Ernesto Enkerlin-Hoeflich, National Commissioner for Protected Areas, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Protected areas around the world have frequently been held responsible for generating poverty and reducing opportunities for people to improve their well-being. In a country where 80% live in conditions of poverty, protected areas must play a role in improving livelihoods as they fulfil their primary mandate of ecosystem conservation. In 2001, the environmental program dealing with social

and economic development was transferred to the then newly created National Commission for Protected Areas. The PROCODES as it is currently called (Programa de Conservación para el Desarrollo Sostenible, or Conservation for Sustainable Development Program) rests on three pillars: 1. Alternative Productive Activities, 2. Synergy or mainstreaming with other Governmental Programs and 3. Organizing and strengthening communities. More than an aid program PROCODES is designed to allow social equity and reciprocity to communities that maintain ecosystem services and contribute to conservation and sustainability. The success of the program has generated expectations in communities and even though the budget grew from about 1.5 million dollars in 2001 to over 20 million dollars in 2009 today due to budgetary constraints only about 43% of qualifying communities are supported.

### **Species At Risk Conservation as a Tool to Integrate Protected Areas into Broader Landscapes**

Oscar Ramírez-Flores, Director de Conservación de Especies en Riesgo, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Mexico launched its first ever formal program targeted at species at risk conservation only in 2007. Named PROCER (Programa de Conservación de Especies en Riesgo) it will develop at least 30 PACEs, or Conservation Action Plans, by 2012 based on priorities set nationally by expert groups. Each PACE has a steering committee of mostly non-governmental participants that oversees implementation. It includes action taken within and outside of protected areas and in this way integrates protected areas into conservation at a scale of broader land and seascapes. They are organized around six lines of work: protection, management and restoration (or recovery) in direct conservation and knowledge, culture and administration in indirect conservation with SMART goals for every component. Some initial results for key species such as vaquita porpoise, Mexican wolf, leatherback turtle, pronghorn and jaguar will be presented. Opportunities for international collaboration will be discussed.

### **Vision 2020: Past, Present and Future of Protected Areas in Mexico**

Ernesto Enkerlin-Hoeflich, National Commissioner for Protected Areas, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Flavio Chazaro-Ramírez, Director General de Desarrollo Institucional y Promoción, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

David Gutierrez-Carbonell, Director General de Operación Regional, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Amaya Bernardez, Coordinadora de Innovación y Proyectos Estratégicos, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Rocio Esquivel-Solis, Directora Ejecutiva de Evaluación y Seguimiento, Comisión Nacional de Áreas Naturales Protegidas, México, DF, México

Over the last 15 years Mexico had a considerable turnaround from “paper parks” to a modern conservation that is humanistic and pragmatic sustained by a “multipartisan” public policy for protected areas and biodiversity and public participation particularly of civil society organizations and academic centers. Over this period budget and capacities have increased several fold and the extent of the protected areas system more than doubled. The Mexican modality of protected areas is derived from imposing regulation on land that is mostly not owned by government and therefore is more incentive-based than enforcement driven. The advantages and limits of this approach will be discussed and data presented on case studies from Los Tuxtlas, Montes Azules, Calakmul and Mariposa Monarca Biosphere Reserves and two National Parks. The current and emerging challenges of conservation and Mexico’s opportunities and contributions will be projected into the end of President Calderon Administration in 2012 and onwards toward 2020 that will mark the 20th anniversary of the creation of the National Commission for Protected Areas.

Concurrent Session #27 • Ross Island/Morrison • Contributed Papers

### **Science Education**

Chair: Judy C. Caminer, National Park Service (retired)

### **Real Science: Real Connection to the Parks**

Bill Zoellick, Program Development Director, Acadia Partners for Science and Learning, Winter Harbor, ME

Shannon Trimboli, Education Program Specialist, Mammoth Cave International Center for Science and Learning, Mammoth Cave, KY

Susan Sachs, Education Coordinator, Appalachian Highlands Science Learning Center, Lake Junaluska, NC

The values inherent in stewardship emerge from engagement and knowledge. Experiencing nature as a source of wonder helps build a rich connection between children and nature. The National Park Service’s network of Research Learning Centers (RLCs) creates new opportunities for connecting scientific research in the parks with teachers and students. This session brings together 3 RLCs that have taken distinctly different approaches to bringing teachers and scientists together around the research that the RLCs support. One RLC makes extensive use of summer workshops; another focuses on pairing scientists and teachers in summer internships; a third focuses on working with teachers during the school year. The programs differ in the breadth of the topics they address, what they deliver, and how they assess outcomes. This session will provide other researchers and educators with a variety of strategies for connecting teachers to park research.

### **Building Commitment to Parks through Service Integration: Creating a Park and University Learning Community**

Donald A. Rodriguez, Associate Professor and Chair, Environmental Science and Resource Management Program, California State University–Channel Islands, Camarillo, CA

Pilar Pacheco, California State University–Channel Islands, Camarillo, CA

Engaging university students with parks in a predominantly urban environment like southern California has been particularly challenging. The Environmental Science and Resource Management (ESRM) program at California State University Channel Islands has begun a unique partnership with the National Park Service that provides increasing levels of immersion from the freshmen through the senior year. Beginning their freshmen year with volunteer service experiences that are scripted into their coursework, ESRM



students culminate their increasing involvement with NPS in their senior capstone experience. Here students are required to make a substantive contribution to resource management at the park. This presentation will highlight this service based approach as a way to engage students and energize a resource management curriculum.

#### **Why Reinvent the Wheel? Sharing Lessons Learned from “A Forest For Every Classroom”**

Christina Marts, Resource Manager, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT

Six years ago, Marsh-Billings-Rockefeller National Historical Park and the NPS Conservation Study Institute partnered with the USDA Forest Service, National Wildlife Federation, and Shelburne Farms to create a professional development program for teachers called “A Forest for Every Classroom.” This program offers teachers a year-long intense place-based education training that integrates the study of natural and cultural history, civic engagement, and service learning. Through this program, teachers develop curriculum that connects their classes to the public lands in their community. The program is now being offered in Vermont, New Hampshire, Texas, Montana, and along the Appalachian Trail as a Trail to Every Classroom. Is such an intense investment in teacher training a worthwhile investment? What lessons can this program offer to other parks and protected lands interested in cultivating relationships with local teachers and schools? How can the value of this learning experience be leveraged by creating a network of sites interested in launching similar programs? This presentation will share the results of the last six years of independent program evaluation of A Forest For Every Classroom, review the program’s key elements for success, discuss how this learning is being used to create a national network of place-based education programs, and provide you with tools that you can use to enhance your place-based education program.

#### **Integrating Groundwater, Watersheds, Hydrographs, and Art into Hydrology Education at Congaree National Park**

David Shelley, Education Coordinator, Old-Growth Bottomland Forest Research and Education Center, Congaree National Park, Hopkins, SC

Theresa Thom, Director, Old-Growth Bottomland Forest Research and Education Center, Congaree National Park, Hopkins, SC

Whitney Wurzel, Education Ranger, Old-Growth Bottomland Forest Research and Education Center, Congaree National Park, Hopkins, SC

The Old-Growth Bottomland Forest Research and Education Center at Congaree National Park (CONG) has developed four hydrology education themes for K12 and university programs. These themes emphasize citizen science, science literacy, and water stewardship in support of CONG’s mission to preserve >24,000 acres of floodplain forest Wilderness. The “Congaree Observation Well Network” allows students to collect and plot actual well data. “Mud Lab” experiments use flumes, sediment, and water to demonstrate watershed concepts. “Congaree Plimirology” lessons introduce flood regime concepts and hydrograph analysis of actual park data. “Linking Ecology and Art of Floodplains” (LEAF) programs presented with the Columbia Museum of Art use studio projects to simultaneously reinforce art and science standards. K12 programs stress hydrology content, including park research, in the context of ecology, biology, geology, art and allied education standards, which increases school support for field-trips. During FY07–08, these themes involved 66 programs, 120 hours, and 1607 students.

#### **Concurrent Session #28 • Oregon • Panel Discussion**

##### **Sacred Natural Sites: Guidelines for Protected Area Managers**

Chair: Dorothy FireCloud, Superintendent, Devils Tower National Monument, Devils Tower, WY

In October, 2008, the IUCN Task Force on the Cultural and Spiritual Values of Protected Areas, in collaboration with UNESCO, introduced a set of guidelines for managers of protected areas that address the urgent need for culturally appropriate protection and management of sacred natural sites. Also, several federal agencies are currently developing internal policies that integrate sacred-site management into the larger context of land management. These new policies will establish standard practices for managing multiple uses while protecting religious freedom. Effective action in support of the preservation and management of sacred natural sites will have large impact on enhancing biodiversity conservation, as well as on the long-term vitality of the cultures that historically managed the sites. This panel will discuss opportunities for integrating the IUCN/UNESCO guidelines into management planning processes throughout the United States.

Panelists: Susan Johnson, Regional Tribal Relations Program Manager, US Forest Service, Region 2, Denver, CO

Toby McLeod, Project Director, Sacred Land Film Project, and Editor, Sacred Natural Sites Guidelines, La Honda, CA

#### **Concurrent Session #29 • Alaska/Idaho • Contributed Papers**

##### **Connecting Public Opinion with Management Decision Making**

Chair: TBD

##### **Changes in Public Attitudes toward U.S. National Park Service Policies**

Patricia A. Taylor, University of Wyoming, Laramie, WY

Burke D. Grandjean, University of Wyoming, Laramie, WY

James Gramann, Visiting Chief Social Scientist, National Park Service, Washington, DC

In 2000, the U.S. National Park Service conducted the first Comprehensive Survey of the American Public, a telephone survey designed to measure the attitudes of the U.S. public toward the park service and its policies and practices. Results of that survey were used to help direct the park service policies for the next five years. In 2008, the NPS undertook its second national survey of the U.S. public. The results of these two surveys will be compared to provide insight into the attitudes, as well as any changes in attitudes, toward the NPS. Additionally, changes in the demographic characteristics of visiting populations can be made between 2000 and 2008. Knowing both the attitudes and the characteristics of visitors will help the NPS provide the services and resources necessary consistent with its continuing mission.

### **Making the Most of the Annual Visitor Survey Card Results**

Jennifer Hoger Russell, Research Scientist, Director Visitor Survey Card Project, University of Idaho, Moscow, ID  
Steven J. Hollenhorst Director, Associate Dean for Outreach and Engagement, University of Idaho, College of Natural Resources  
Moscow, ID

Visitor Survey Card has been used by the National Park Service to evaluate its facilities and services in upwards of 330 units annually for the last 10 years. The survey was originally designed to fulfill the Park Service's obligation under the Government Performance and Results Act of 1993 to measure satisfaction among its visitors. Today the results of this annual information collection are used in a number of different ways beyond the legal requirements. Survey results have been used to focus management attention on areas of potential improvement and act as supporting materials when competing for additional funding. Park managers have become increasingly aware of the value of the open-ended responses generated by the survey. These responses have been the impetus for changing programs, hours of operation, increasing and altering the focus of interpretive materials. To insure a consistent high-quality program, a long-term sustainable collaboration has developed between the National Park Service and the Park Studies Unit at the University of Idaho. Some individual park units also have developed partnerships with volunteer groups and friends organizations to offset the time and financial costs of annual data collections. These ideas will be discussed in detail.

### **Conflict Management in the NPS: A Negotiated Rulemaking Case Study**

Lavell Merritt, Graduate Student, Texas A&M University, College Station, TX

Cape Hatteras National Seashore (CAHA) is engaging in a negotiated rulemaking process on visitor uses along its seashore. The rulemaking process involves group representatives participating in a collaborative decision making process on a rule that will manage Off-Road Vehicle (ORV) use at CAHA. This rulemaking process is based on achieving consensus (Cape Hatteras National Seashore: Negotiated Rulemaking Feasibility Report, 2006). This dissertation applies Senecah's (2004) conceptual framework Trinity of Voice (TOV) in a qualitative case study focused on analyzing the CAHA rulemaking process. Interviews with park staff and the negotiated rulemaking participants is purposed to reveal the affects of a collaborative rulemaking process on the perceptions of participants towards the park resources and management. An outcome of this research is to suggest to the National Park Service critical dimensions for achieving widespread social legitimacy, and to improve the likelihood that they will be able to achieve their goals.

### **The Importance of Public Influence in Decision Making: Elk Management at Rocky Mountain National Park**

Therese Johnson, Biologist, US National Park Service, Rocky Mountain National Park, Estes Park, CO

John Mack, Branch Chief for Natural Resources, Rocky Mountain National Park, CO

Ben Bobowski, Chief of Resource Stewardship, Rocky Mountain National Park, Estes Park, CO

An Elk and Vegetation Management Plan that resulted from seven years of research followed by a four year interagency planning process was recently completed for Rocky Mountain National Park. This presentation will consider the influence of public response in formulating and implementing the final plan. Many comments on the draft plan supported public hunting in the park, which had been considered but dismissed as a viable alternative, with focus on the perceived cost of culling carried out by agency staff or contractors and the potential role of qualified volunteers. Ensuing factors included a resolution by the Colorado Wildlife Commission encouraging the National Park Service to consider a public hunt to reduce the herd, a bill introduced by congressional representatives to allow the use of licensed hunters as volunteers, and a lawsuit citing failure to prohibit hunting under the organic act, based on the notion that controlled culling is hunting.

### **Yellowstone City Park: An Imbalance of Power between Cody, Wyoming, and the National Park Service**

Michael Yochim, Outdoor Recreation Planner, National Park Service, Yellowstone National Park, WY

Who runs Yellowstone National Park: the National Park Service or more powerful entities in Wyoming? Three times in the last fifty years, powerful Wyoming interests have substantially altered Yellowstone policy-making efforts. Reviewing these three case studies, this talk will argue that, at least in matters involving public access through the park's East Entrance or motorized public recreation on the park's east side, the balance of power in such issues resides not with the park's caretakers but rather with the city of Cody, the county in which it sits (Park), and the state of Wyoming. Collaborating on any policy matters with such disproportionately powerful neighbors is difficult at best, making the NPS more likely to compromise and accept impacts on the resources it is mandated to preserve.

Concurrent Session #30 • Three Sisters • Contributed Papers

### **Large-Scale Inventory and Monitoring**

Chair: Lewis Sharman, Ecologist, Division of Resources Management and Research, Glacier Bay National Park and Preserve, Gustavus, AK

### **Assessing Trends in Streamflow: A Critical Element of Vital Signs Monitoring**

Mary Ann Madej, Research Geologist, U.S. Geological Survey Western Ecological Research Center, Arcata, CA

The National Park Service has 32 "Vital Signs" Networks developed to determine the status and trends in ecosystem condition. Such monitoring and analysis allow managers to make decisions based on the best available scientific information. Streamflow is an important indicator in many park ecosystems because of its influence on aquatic, riparian and estuarine biota. Many aspects of streamflow are relevant to biological processes, such as the timing, magnitude, frequency, duration, and range of variability. An examination of 55 years of streamflow data from Redwood Creek in Redwood National Park illustrates how streamflow attributes have changed through time, and provides a template to analyze other streamflow datasets. Although this is an unregulated river, the 7-day low flow and 7-day high flow have significantly decreased since 1954. Redwood National Park's watershed restoration program began in 1979 at the beginning of one of the wettest periods on record, but is presently operating in one of the driest periods of record. This trend has implications for the success of revegetation following erosion control activities.

### **Airborne Lidar Remote Sensing Applications in Inventory and Monitoring for Coastal Resource Management**

Amar Nayegandhi, Remote Sensing Specialist / Computer Scientist, US Geological Survey, St. Petersburg, FL

Topographic information, a basic element of regional and local geomorphologic studies, and a key variable for investigations of sedimentary processes, hydrology, and botany, can now be rapidly and accurately acquired at fine spatial scales by laser altimetry. Airborne laser altimetry, inclusive of both topographic and hydrographic surveying, is a type of remote sensing generally known as “Light Detection and Ranging” (lidar) that has undergone rapid development during the last two decades. Numerous recent studies have verified that current lidar systems, often coupled with passive optical imaging, can contribute to a wide range of coastal scientific investigations. The broad applicability of airborne topographic lidar surveying to coastal studies and resource management stems from the capability of this newly emerged remote sensing method to map “bare Earth” land surfaces under vegetation in studies of geologic framework and hydrology, and to determine the vertical structure of forest canopies. High-resolution topographic and bathymetric information available through these airborne lidar surveys and scientific analyses of the resultant data can provide the NPS Inventory and Monitoring Program with highly relevant information to manage both natural and cultural resources in coastal areas.

### **Modeling Future Forest Conditions**

Bruce Larson, Professor, Faculty of Forestry, University of British Columbia, Vancouver, BC, Canada

Regina M. Rochefort, North Cascades National Park, Sedro Woolley, WA

Mariano M. Amoroso, Faculty of Forestry, University of British Columbia, Vancouver, BC, Canada

Sarah K. Braun, Faculty of Forestry, University of British Columbia, Vancouver, BC, Canada

Using basic forest inventory data future forest conditions can be modeled; highlighting opportunities and potential problems. We used the Landscape Management System (LMS) to predict how forested areas of the San Juan National Park are likely to change in the future with and without some different effects, such as “fire proofing” thinning in some areas. Forest growth models are very useful, but are easily misused. In this paper we discuss some of the data collection choices we made, some of the problems encountered, and some of the different ways to structure the model. We used previous work on forest disturbances in the Park to both investigate some different future scenarios and to organize the input data. Finally we discuss how modeling efforts, such as using LMS, can assist in the design of monitoring systems. Monitoring combined with modeling can verify forest development pathways and better predict future forest conditions.

### **The CAKN Flowing Waters Program: A Multi-tiered Approach to Ecological Monitoring in Alaskan National Parks**

Trey Simmons, Aquatic Ecologist, Central Alaska Network, National Park Service, Fairbanks, AK

The Central Alaska Network (CAKN) of the NPS Inventory and Monitoring Program covers 22 million acres of essentially roadless parklands. Tens of thousands of miles of streams and rivers flow through this huge landscape. Accordingly, development of a robust stream monitoring program presents significant challenges. The CAKN is taking a multi-tiered approach utilizing three types of monitoring sites. Intensive sites will be instrumented for continuous data collection and sampled multiple times per year. Sentinel sites will be monitored less intensively, but sampled annually. Synoptic sites will be sampled on a multi-year rotation, and have been selected using a GRTS survey design. We will discuss the overall design of this program, including the development of biological water quality assessment tools designed to inform management of aquatic resources in these parks, and present some preliminary data. Since 2005, the network has sampled 58 unique sites and conducted 92 total sampling visits.

Concurrent Session #31 • Mt. Bachelor • Contributed Papers

### **New Approaches for Documenting and Managing Cultural Landscapes**

Chair: Bonnie Halda, Chief, Division of Preservation Assistance, National Park Service, Northeast Region, Philadelphia, PA

### **Finding a Common Vision for Fort Hill, Cape Cod National Seashore**

Margaret Brown, Senior Project Manager, Preservation Planning, National Park Service, Olmsted Center for Landscape Preservation, Boston, MA

Jan Haenraets, The National Trust for Scotland, Edinburgh, Scotland, UK

Bill Burke, Cultural Resources Program Manager, Cape Cod National Seashore, Wellfleet, MA

Located in Eastham, Massachusetts, Fort Hill offers panoramic views of Nauset Marsh and the Atlantic Ocean and is frequently the first stop for visitors coming to Cape Cod National Seashore. Listed on the National Register as a Rural Historic District and part of a National Landmark archeological district, notable features include a Native American sharpening rock, long stone walls delineating agricultural fields, and an adjacent Captain's house. Also rich with natural resources, the area is frequented by the rare grasshopper sparrow, box turtles and migrating monarch butterflies. The Olmsted Center collaborated with a team of natural and cultural resource professionals to develop a sustainable treatment approach for the 100-acre landscape. Using a combination of controlled burns alternating with seasonal mowing, the park initiated a five-year open fields management plan to preserve natural resources and protect significant cultural resources associated with the landscape. This paper presents a methodology for a successful collaboration.

### **A Genealogy of Place: Land Use Legacies at Rural Plains/Totopotomoy Creek Civil War Battlefield**

Tonia Horton, Facility Management Specialist, Richmond National Battlefield, National Park Service, Richmond, VA

Added to Richmond National Battlefield Park in 2006 as a 124-acre site, “Rural Plains” represents an extraordinary study in cultural, landscape, and environmental history. While not conforming to the conventional definition of a traditional cultural property, Rural Plains remained in the hands of a single Virginian family, the Sheltons, from its settlement in 1725–26 to 2006. During this time, the site witnessed not only the historical events critical to its interpretation, such as the Totopotomoy Creek Civil War battlefield (1864) and the colonial marriage of Patrick Henry and Sarah Shelton, but also the evolution of land use patterns that reflect the prevailing settlement patterns and practices persisting 280 years to the current day. The legacy of these environmental (anthropogenic) patterns—agriculture use from the 1720s to the present and commercial horticulture, 1927–2005—is richly textured.



This paper will explore the Park's comprehensive efforts to document, evaluate, and manage these integrated legacies.

### **Collaborative Planning for Historic and Ecological Resource Restoration at Saugus Iron Works NHS, Massachusetts**

Marc Albert, Stewardship Program Manager, Saugus Iron Works National Historic Site, Boston, MA

Following the historical restoration of the 17th-century Saugus Iron Works in the 1950s, a dam breach deposited contaminated sediment into the Saugus River at the Iron Works site, creating a brackish marshland that became dominated by invasive plant species, and severing the interpretive link between the park's historic waterfront and the reconstructed iron works. The NPS established a goal to restore the historic open water landscape and waterfront structures. A comprehensive planning and environmental compliance strategy built cooperative relationships within NPS, across the regulatory community, and with community stakeholders, resolving numerous issues and ultimately moving the project forward as a combined historic and ecological restoration. Major restoration activities were completed in 2007 and 2008, and a 5-year monitoring program begun. This collaborative planning process can serve as a model for complex management projects integrating cultural and natural resource values.

### **Public Use, Private Meaning: A Study of Two New England Summer Communities**

Emily Donaldson, Landscape Historian, National Park Service, Washington, DC

Out on the tip of Cape Cod, melting and shifting against the crashing waves of the Atlantic, lies a sweeping expanse of dunes that rise and fall, sheltering endangered piping plovers, cranberry bogs, and, here and there, a wooden shack. Though this last discovery may come as a surprise to many, people have inhabited and regularly visited these buildings for over a century. Yet, for almost as long, many such dune dwellers have been squatting on someone else's land. Most now lease shacks they have used for decades from the National Park Service, which acquired the property in 1961. Comparing these dune dwellings with a privately-owned summer community on the island of Isle au Haut, Maine, illuminates the nuance of cultural meaning in landscapes associated with summer use, escape, and strong personal attachment. In so doing, it raises important concerns for future park stewardship of similarly unique and isolated places.

Concurrent Session #32 • Mt. Hood • Invited Papers (Part 3 of 3-Part Track)

### **Burned Up or Burned Out? III • Innovations in Fire Management**

Chair: Richard Schwab, National Burned Area Rehabilitation Coordinator, National Park Service, National Interagency Fire Center, Boise, ID

### **Raiding the NIFC Data Pantry**

Bill Yohn, Fire Planner, NPS Fire Management Program Center–NIFC, Boise, ID

Gladys Crabtree, Fire Information Resources Manager, NPS Fire Management Program Center–NIFC, Boise, ID

There are several standardized datasets and map products that have been developed or improved in recent years by the wildland fire community that may provide valuable information for other resource management activities. This panel discussion will provide resource managers a brief product overview, possible uses, and ways to obtain of the following datasets: Wildland Fire Management Information (WFMI): reporting all fire incidents in the newest evolution of the old DI-1202 database Monitoring Trends in Burn Severity (MTBS): using remote sensing to map burn severity and perimeters of fires spanning 1984–2010 Fire Effects Monitoring and Inventory Protocol (FIREMON): evaluating the effects of fire on critical ecosystem characteristics Fire Monitoring Handbook (FMH), Fire Ecology Assessment Tool (FEAT), and FEAT/FIREMON Integration (FFI): monitoring fire effects Burned Area Reflectance Classification (BARC): remote sensing and modeling to predict post-fire watershed response Landscape Fire and Resource Management Planning Tools Project (LANDFIRE): developing maps and data describing vegetation, wildland fuel, and fire regimes across the entire US.

### **Revisiting Spatial Patterns of Lightning Strikes and Fires in Yosemite National Park**

Kent van Wagtenonk, Geographer, Yosemite National Park, El Portal, CA

In 2008, California experienced a dry lightning episode on June 21st that produced over 1,000 ignitions. During that time Yosemite National Park had one start which was suppressed. In early July, as California was experiencing smoke impacts from the June fires, Yosemite received 11 lightning ignitions over a five day period. A decision was made to suppress all but 2 of these fires, despite originating in the Fire Use Unit, due to air quality and resource availability concerns. This investigation provides an update to the spatial and temporal analysis performed by Jan van Wagtenonk (1993) using current fire data to show contributing factors in the size and complexity of fires in Yosemite. The results can be used to assist land managers to assess the value of allowing natural fire to remain on the fire adapted landscape of the Sierra Nevada in the face of global change and Appropriate Management Response.

### **Modeled and Actual Impacts of Fire Management on Carbon Sequestration in Yosemite National Park**

Leland Tarnay, Physical Scientist/Air Resources Specialist, Yosemite National Park, El Portal, CA

Brett Davis, GIS Specialist, Aldo Leopold Wilderness Research Institute, Missoula, MT

Jan van Wagtenonk, U.S. Geological Survey, El Portal, CA

How permanent is the carbon stored in fire-adapted forests of the Sierra Nevada? Can fire management affect carbon storage? Fire emissions are one of the greatest sources in uncertainty in greenhouse gas budgets of forested landscapes in the Sierra Nevada. Using site-specific fire severity, post-fire vegetation succession models, and fire spread modeling, this work outlines a potential framework that accounts for fire processes and distinguishes between transient vs. permanent fire emissions on fire-adapted landscapes. Such tools will be necessary for managers to quantify the permanent carbon stored on their landscapes as well as the magnitude of that landscape's potential greenhouse gas emissions under different fire management strategies.

### **Fuel and Vegetation Modeling Utilizing Plots, Burn Severity, and Time Since Fire in Denali National Park & Preserve**

Jennifer Allen, Fire Ecologist, National Park Service, Alaska Regional Office, Fairbanks, AK

Larry Weddle, Assistant Fire Management Officer, Denali National Park & Preserve, Denali Park, AK



Spatially explicit fire behavior modeling tools require fuels and/or vegetation GIS information. Fuels and vegetation maps atrophy over time and become less relevant, particularly in fire prone areas, with each passing fire season due to burned areas no longer representing the appropriate vegetation or fuel types. Currently in development is a predictive model of wildland fire effects on vegetation communities that can be used to update spatial vegetation information over time. In July of 2007, 55 fire/vegetation plots were installed in Denali NP/P in Alaska. Plot locations were based on the 2002 burn severity plots (CBI) established on 4 fires in Denali that burned in 2000 and 2001. The purpose was to determine 5 yr succession patterns under varying burn severities. The data will be used to develop a landcover change matrix for vegetation and fuels mapping purposes.

### **Using Research to Guide Fire and Resource Management at Mount Rushmore**

Cody Wienk, Fire Ecologist, National Park Service, Omaha, NE

Peter M. Brown, Director, Rocky Mountain Tree-Ring Research, Ft. Collins, CO

Mount Rushmore National Memorial in the Black Hills of South Dakota is known worldwide for its massive sculpture of four of the United States' most respected presidents. The Memorial landscape also is covered by extensive ponderosa pine forest that has not burned in over a century. NPS has begun a process of restoring the landscape to its historical condition and reintroducing surface fires. To provide a scientific basis for restoration, we compiled dendroecological and forest structural data and used fire behavior modeling to reconstruct the historical fire regime and forest structure and compared these to current conditions. Shifts we found from historical to current forest structure and the increased likelihood of crown fire today relative to surface fire in the past justify the need for forest restoration before a catastrophic wildfire occurs and adversely impacts the ecological and aesthetic setting of the Mount Rushmore sculpture.

(Track continued from Concurrent Sessions #10 and #21)

### **Concurrent Session #33 • Mt. St. Helens • Workshop**

#### **Integrating Biological and Human Dimensions to Manage Human-Wildlife Habituation: The Opportunity for Interdisciplinary Collaboration**

Co-Chairs: Kirsten Leong, Human Dimensions of Biological Resources Program Manager, Biological Resource Management Division, NPS, Fort Collins, CO

Dan Decker, Professor and Director, Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY

This workshop will advance understanding of the management challenges of human-wildlife habituation in and around protected areas. A steering committee of U.S. National Park Service wildlife biologists working on this issue identified a need to integrate perspectives and management tools of various disciplines to address this phenomenon effectively. This workshop begins to address this need. The first half of the workshop will be a panel discussion introducing the unique management challenges associated with human-wildlife habituation faced by various disciplines. Panelists from different disciplines will explore ways that discipline-specific management efforts, when coordinated, may work together to improve a park's ability to manage habituation. Audience members then will ask questions, share their experiences, and contribute their perspectives to explore further and refine ideas introduced by panelists. Participants also will contribute to identification of management/research needs and help determine priorities.

We encourage participation of non-biologists who are tackling this management issue.

Presenters: Dan Foster, Superintendent, Niobrara/Missouri National River, Valentine, NE

Bill Merkle, Wildlife Ecologist, Golden Gate National Recreation Area, San Francisco, CA

Kathy Brown, East District Naturalist, Rocky Mountain National Park, Estes Park, CO

Frank Young, Chief of Maintenance, National Capital Parks-East, Washington, DC

Chuck Young, Chief Park Ranger, Mount Rainier National Park, Ashford, WA

### **Tuesday Early Afternoon, March 3**

#### **Concurrent Session #34 • Multnomah • Invited Papers (Part 2 of a 3-Part Track)**

#### **Navigating Terra Incognita: New Management Strategies in an Era of Climate Change II • Confronting Climate Change in Everglades and South Florida**

Jeffrey Cross, Chief, Ocean & Coastal Resources Branch, Water Resources Division, National Park Service, Fort Collins, CO

Session overview: Everglades National Park is part of the greater Everglades, a 100-mile long, 50-mile wide shallow, freshwater "River of Grass" that historically flowed south from Lake Okeechobee through the freshwater sloughs and prairies to the Gulf of Mexico and Florida Bay. It is an interlinked complex of natural and human ecosystems that is unique, complex, and irreplaceable. During the last 130 years, the Everglades have been put in peril by a series of water management projects that were conceived with good intentions, but with little understanding of the ecosystem. Already suffering from loss of fresh water, the area now faces the additional threat of climate change and associated impacts. How does climate change interact with existing environmental stressors in the Everglades and south Florida ecosystem? What are the actions that can be taken now to protect the life-sustaining resources of this fragile system?

#### **Impacts of Climate Change on Resources, Infrastructure, and Visitor Experience at Everglades National Park**

Dan Kimball, Superintendent, Everglades and Dry Tortugas National Parks, Homestead, FL

Everglades National Park is very vulnerable to climate change, especially the effects of sea level rise. The entire park lies at or close to the level of the sea. Sixty percent of the park is less than three feet above mean sea level. Sea level rise will likely push salt water into the Everglades, threatening the viability of fresh water supplies—for both the Everglades ecosystem and the people of South Florida. Sea level rise could also impact park buildings, trails, roads, campgrounds and camping platforms (chickees), docks, historic sites, recreational opportunities, and visitor experience. Climate change is also expected to result in changes in precipitation, temperature, and the intensity of hurricanes. The park is undertaking many actions to respond to these threats, including adapta-

tion, monitoring and assessment, mitigation, and outreach and education. Examples of these efforts will be highlighted.

### **Sea Level Rise on the Southern Florida Coast: Past, Present, and Future Trends**

Harold Wanless, Professor, Geological Sciences, University of Miami, Coral Gables, FL

Sea-level rise had important effects on Florida Bay and the lower Everglades over the past century and may have even greater effects in the future because there is a high probability that global warming will increase the rate of eustatic sea-level rise. This will affect sedimentation, the degree of saline intrusion in the eastern Bay and northern transition zone, and the ability of mangroves and wetlands in the estuaries to maintain themselves in the face of marine transgression. Sea-level changes should be made a more explicit part of Florida Bay research and restoration and management strategies. For example, managing wetlands in order to maximize their accretion of plant and mineral soils will be key to sustaining them in the face of rising sea level.

### **Vegetative Changes in Southern Florida Ecosystems as a Result of Climate Change, Restoration, and Hurricanes**

Kevin R.T. Whelan, South Florida / Caribbean Network Coordinator, National Park Service, Palmetto Bay, FL

Sea level rise and Everglades Restoration are expected to bring significant changes to coastal wetlands of south Florida. With climate change, mangroves forests are expected to expand into more upland ecosystems. With Everglades restoration (more freshwater flow through the system) the mangrove ecosystem should be held back from expanding into the upland communities. In addition, hurricanes are major disturbance agents that force the mangrove ecosystem as well and possibly change the outcome. This presentation will focus on research to document and forecast these changes.

### **Coral Reef Monitoring: Tracking the Tropical Pulse of Global Climate Change**

Matt Patterson, South Florida / Caribbean Network Coordinator, National Park Service, Palmetto Bay, FL

The South Florida/Caribbean Inventory and Monitoring Network (SFCN) coordinates Vital Signs monitoring for the four parks in South Florida and three in the U.S. Virgin Islands (USVI). SFCN has several Vital Signs that will help track climate change effects. The highest ranked Vital Sign for the SFCN is Marine Benthic Communities, monitoring coral reefs and seagrass. Coral reefs are declining globally, with significant declines in South Florida and the USVI in recent years. Coral reef monitoring will help the SFCN identify changes that potentially are caused by global climate change. SFCN was able to show that bleached corals were highly susceptible to coral disease. Rising seawater temperatures, increased ocean acidification, possibility of increased tropical storm activity, along with increased coastal development pressure will impact coral reef ecosystems. With a robust monitoring program, the SFCN hopes to identify impacts and possible management prescriptions to hopefully reduce coral reef declines over time.

### **Submerged and Littoral Archeological Sites: Management Challenges in Light of Global Climate Change**

David L. Conlin, Deputy Chief, Submerged Resources Center, National Park Service, Santa Fe, NM

For more than 30 years the National Park Service's Submerged Resources Center (SRC) has tackled the issue of site preservation and site stability for submerged, emergent and littoral archeological sites head-on. The impending rise in global sea-level, coupled with the likely intensification of ocean based storms that will accompany it, will have a diverse effect on some of the best preserved and important archeological resources within the National Park Service's management mandate. While many would argue that sea-level rise will have an across the board detrimental effect on archeological resources, our experience tells us that this is not necessarily the case. Using examples from our past research this paper will discuss some possible scenarios for environmental impacts on submerged, littoral and emergent sites in National Parks system-wide.

(Track continued from Concurrent Session #23 and continues in Concurrent Session #45)

Concurrent Session #35 • Holladay • Workshop

### **The Future Shape of the National Park System**

Co-chairs: Warren Brown, Consultant (formerly Chief, Park Planning and Special Studies, National Park Service (retired), Annapolis, MD

Mike Soukup, Consultant (formerly Associate Director for Natural Resources and Science, USNPS)

For the past century the National Park System has grown without the benefit of a clear plan or vision. How might a system be designed for the next century that is more successful in representing the ecological regions in the nation and telling the story of America's diverse cultural experience? What new roles might the national park service play to create a more effective network of protected areas? This workshop will begin with a brief introduction to questions about the future shape of the national park system being addressed by the national parks second century commission including: a vision for the system, what gaps exist, how those gaps might be filled, how boundaries might be adjusted, implications of climate change, and what new tools and techniques might be used. Presentations will be brief with emphasis on discussion and new ideas about how issues can be addressed with both short and long range actions.

Presenters: Denis Galvin, retired (formerly Deputy Director, USNPS)

Brenda Barrett, Director, Pennsylvania State Bureau of Recreation and Conservation

Destry Jarvis, President, Outdoor Recreation and Park Services, LLC

J. Michael Scott, Unit Leader, US Geological Survey and University of Idaho, Idaho Cooperative Fish and Wildlife Research Unit, Moscow, ID

Stephanie Toothman, Chief, Cultural Resources, Pacific West Region, USNPS

Concurrent Session #36 • Broadway/Weidler • Contributed Papers

### **Effective Marine Protected Areas**

Chair: Suzette Kimball, Acting Director, U.S. Geological Survey, Reston, VA

### **Coral Recruitment Dynamics in Hawaiian National Parks and Marine Protected Areas: Are Reefs Recruitment Limited?**

Larry Basch, Marine Ecologist, Science Advisor, National Park Service, Cooperative Ecosystems Studies Unit, University of Hawaii Manoa, Honolulu, HI

James White, Cooperative Ecosystems Studies Unit at University of Hawaii Manoa, Honolulu, HI

Angela Leemhuis, c/o Cooperative Ecosystems Studies Unit at University of Hawaii Manoa, Honolulu, HI

William Walsh, Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, Kailua-Kona, HI

Maintenance of adequate levels of juvenile coral settlement and recruitment is vital to sustain resilience of living coral reefs. This study is a large scale, multi-year effort to measure recruitment of corals along the west coast of Hawai'i Island in support of long-term benthic monitoring and marine protected area management. Most taxa showed spatial variation in recruitment at the 1–10-km scale (between sites). The northernmost site had significantly higher densities of juvenile corals with recruitment among sites decreasing appreciably toward the south. Peak recruitment of coral larvae consistently occurred across years in summer (approximately April–September) in all taxa. The north to south pattern in recruitment suggests oceanographic processes at different scales may be driving settlement-recruitment dynamics at any one location. Knowledge of recruitment dynamics at both regional and interannual scales is therefore critical to understanding coral recruitment, and hence, benthic community condition, resilience and persistence at the site level.

### **Depth Matters: Differential Coral Mortality at Tektite Reef in US Virgin Islands after Coral Bleaching**

Andy Davis, Biological Science Technician, NPS I&M South Florida/Caribbean Network, St. John, VI

Erinn Muller, Graduate Student, Florida Institute of Technology, Melbourne, FL

Caroline Rogers, Coral Reef Ecologist, US Geological Survey, St. John, VI

Jeff Miller, Fisheries Biologist, NPS I&M South Florida/Caribbean Network, St. John, VI

Rob Waara, Biological Technician, NPS I&M South Florida/Caribbean Network, Palmetto Bay, FL

Andrea Atkinson, Quantitative Ecologist, NPS I&M South Florida/Caribbean Network, Palmetto Bay, FL

Brian Witcher, Data Manager, NPS I&M South Florida/Caribbean Network, Palmetto Bay, FL

Ben Rutenberg, Ecologist, NPS I&M South Florida/Caribbean Network, Palmetto Bay, FL

Judd Patterson, GIS Specialist, NPS I&M South Florida/Caribbean Network, Palmetto Bay, FL

Coral disease following a bleaching event associated with unusually high water temperatures in 2005 led to devastating coral cover loss in the U.S. Virgin Islands. *Montastraea annularis* complex (Macx), the dominant corals, declined by 51%. Macx mortality response was differentiated by depth at Tektite Reef, one of seven coral reef sites monitored at national parks in the Virgin Islands. Tektite Reef had the largest depth gradient, 6–19m among 20 permanent random sample transects, allowing for a comparison of coral responses over the depth gradient. A non-parametric statistical test showed the ten shallower transects had greater Macx cover loss than the ten deeper transects. Preliminary results also suggest different bleaching responses, with more bleaching occurring in shallower water. The results obtained demonstrate the ability to track coral bleaching and associated mortality, thus providing managers with a useful tool to better allocate resources during similar events in the future.

### **Assessing the Efficacy of Marine Protected Areas in American Samoa**

Dillon Brown, Marine Ecologist, National Park Service, Pago Pago, AS

Marine protected areas (MPAs) are of great interest throughout the world as fisheries stocks dwindle and global fish populations plummet. In American Samoa, a remote US territory in the South Pacific, the status of the nearshore coral reef fish populations has recently been intensely studied. Two federal MPAs can be found on the main island of Tutuila, the National Park of American Samoa and Fagatele Bay National Marine Sanctuary. The efficacy of these two differently managed MPAs is reviewed both in comparison to one another and relative to the rest of the unmanaged areas of the island. There is little enforcement capacity or political will to protect fisheries in this remote location and the realities of an unenforced MPA are discussed.

### **Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area**

David Hallac, Chief, Biological Resources Branch, Everglades and Dry Tortugas National Parks, Homestead, FL

John Hunt, Florida Fish and Wildlife Conservation Commission, Marathon, FL

Douglas Morrison, Everglades and Dry Tortugas National Parks, Homestead, FL

Bill Sharp, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL

Robert Johnson, Everglades and Dry Tortugas National Parks, Homestead, FL

Recent Dry Tortugas National Park (DTNP) coral reef fisheries assessments concluded that many gamefish species are overfished. To restore and protect marine resources, DTNP is implementing a no-fishing, no-anchoring marine reserve, termed the Research Natural Area (RNA), covering 46% of the park. DTNP and the Florida Fish and Wildlife Conservation Commission, with the assistance of other scientists, have partnered to develop a science plan for assessing the conservation efficacy of the RNA. The plan has six major objectives: quantify changes in the abundance and size-structure of exploited species within the RNA relative to adjacent areas; assess net emigration of targeted species from the RNA; monitor changes in catch rates of exploited species outside the RNA; evaluate the effects of RNA implementation on marine benthic communities; assess the reproductive potential of exploited species by evaluating egg production and larval dispersal; and appraise the socioeconomic effects of RNA implementation.

### **National Parks in Hawaii and the US Virgin Islands: Effective Marine Reserves for Fish Assemblages?**

Eric Brown, Marine Ecologist, Kalaupapa National Historical Park, Kalaupapa, HI

Sallie Beavers, Marine Ecologist, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

Jim Beets, Professor, University of Hawaii-Hilo, Hilo, HI

Alan Friedlander, Fishery Ecologist, NOAA/NOS/NCCOS/CCMA/Biogeography Branch and the Oceanic Institute, Waimanalo, HI

Jeff Miller, Fisheries Biologist, NPS I&M South Florida/Caribbean Network, St. John, VI

Caroline Rogers, Coral Reef Ecologist, US Geological Survey, St. John, VI

Reef fish assemblages were assessed at Kalaupapa National Historical Park (KALA) and Kaloko-Honokohau National Historical Park (KAHO) in Hawaii and at Virgin Islands National Park (VIIS) in the Caribbean. Benthic habitat maps and transects were used to



evaluate fish assemblage characteristics inside and outside park boundaries. Each park differed in geographic remoteness and level of enforcement. KALA is geographically the most remote park compared to KAHO which is adjacent to a major harbor. VIIS has intermediate accessibility. The Hawaii parks have no legal jurisdiction in state coastal waters in contrast to VIIS which has limited regulations and modest enforcement. KAHO had the greatest number of fish species observed, but KALA had the greatest abundance and biomass. VIIS had the lowest assemblage characteristic values. Results indicated that remoteness was more important than legal protection suggesting that many parks do not function as effective conservation areas.

Concurrent Session #37 • Hawthorne/Sellwood • Invited Papers

#### **An Integrated Study of Visitor Capacity for the Denali Park Road**

Philip Hooe, Assistant Superintendent, Center for Resources, Science and Learning, Denali National Park and Preserve, Denali National Park, AK

Session overview: Denali is one of the most heavily visited subarctic national parks, and most of this use is concentrated on the 90-mile Denali Park Road. Visitors are required to ride park buses to access most of the road, and the park's 1986 General Management Plan limited vehicle trips to 10,512 annually. However, continuing increases in visitation have prompted a reevaluation of this limit and the scientific rationale for it. A multidisciplinary, integrated program of research and planning is now being conducted, and this session describes this work and its findings. Major components of the project include 1) a study of wildlife behavior in relation to bus traffic, 2) surveys of visitors to determine indicators and standards of quality for the park experience, 3) a computer simulation model of vehicle use, and 4) a series of Before-After-Control-Impact (BACI) studies.

#### **Using Multidisciplinary Modeling and an Experimental Approach to Adaptive Management to Inform a Controversial Issue**

Philip Hooe, Assistant Superintendent, Center for Resources, Science and Learning, Denali National Park and Preserve, Denali National Park, AK

Laura Phillips, Ecologist, Denali National Park and Preserve, Denali National Park, AK

Tom Meier, Wildlife Biologist, Denali National Park and Preserve, Denali National Park, AK

Managers at Denali National Park will soon be faced with the decision to place a park closed sign on the 6.8 million acre park that generates as much as 35% of Alaska's tourism revenue. At this point, the capacity of buses allowed under the 10,512 vehicle limit on the park's only access road will have been reached. Faced with this impending crisis, managers designed a multidisciplinary approach bringing together studies on park wildlife with social science data on visitor experience and a detailed understanding of traffic logistics. These studies were used to create a capacity model that explores different alternate management scenarios to understand the true capacity of the park road to either defend or revise how access is managed. The park has begun the Environmental Impact Statement to examine these alternative scenarios and will take an experimental approach to adaptive management using a Before-After-Control-Impact (BACI) design.

#### **Grizzly Bear Movements and Habitat Use in Denali National Park Relative to the Park Road**

Richard Mace, Wildlife Biologist, Montana Fish, Wildlife and Parks, Kalispell, MT

Laura Phillips, Ecologist, Denali National Park and Preserve, Denali National Park, AK

Tom Meier, Wildlife Biologist, Denali National Park and Preserve, Denali National Park, AK

Pat Owen, Wildlife Biologist, Wildlife Biologist, Denali National Park and Preserve, Denali National Park, AK

National Park managers are faced with the challenge of balancing the protection of park resources while assuring they are available for the enjoyment of people. In Denali, managers must protect wildlife, tundra ecosystems, and mountain scenery while maintaining opportunities for visitors to view and enjoy these resources. A study of grizzly bear (*Ursus arctos*) movements relative to the park road is one component of a larger road capacity study examining the potential impacts of vehicle traffic on wildlife behavior and visitor experience in Denali. It is important to determine whether grizzly bears are displaced along the Denali park road before park managers make decisions regarding traffic levels and increased human activity along the park road. This paper summarizes the distribution, movement patterns, habitat use, and daily activity patterns of grizzly within the park road corridor. Spatio-temporal relationships among these ecological parameters and traffic patterns along the road corridor are discussed.

#### **Indicators and Standards of Quality for the Denali Park Road Experience**

Robert Manning, Professor, University of Vermont, Burlington, VT

Jeffrey C. Hallo, Assistant Professor, Clemson University, Clemson, SC

How does the level and type of vehicle use on the Denali Park Road affect the quality of the visitor experience? To help answer this and related questions, this study identified indicators and standards of quality for the visitor experience. Indicators of quality are measurable, manageable variables that affect the quality of the visitor experience, and standards of quality define the minimum acceptable condition of indicator variables. An initial series of qualitative interviews were conducted with park visitors to identify potential indicator variables, and a second quantitative survey of park visitors was conducted to measure standards of quality for selected indicators, including number of buses seen along the road, number of buses at wildlife stops, and number of buses at rest stops. Where appropriate, visual simulations of alternative standards of quality were incorporated into the survey.

#### **Modeling Traffic Impacts on the Visitor Trip Experience and on Wildlife on the Denali National Park Road**

Ted Morris, Laboratory Manager, University of Minnesota, Minneapolis, MN

John Hourdos, Minnesota Traffic Observatory, ITS Institute, University of Minnesota, Minneapolis, MN

Max Donath, Director, ITS Institute, University of Minnesota, Minneapolis, MN

Visitors access and experience the Denali National Park by riding buses that provide an unparalleled wildlife viewing experience as well as provide transportation for campers and hikers. The unique nature of the park road and the fact that the majority of the traffic involves buses impose constraints that traditional traffic or transit planning tools cannot handle. For these reasons, this study employs a microscopic traffic simulator customized to emulate location and vehicle specific driving behaviors. The traffic model has two objectives: to assess the current impact on visitor experience and wildlife, and to predict the impact of proposed road oper-



ational strategies. The traffic model incorporates driver behavior, traffic interaction with wildlife sightings, as well as scheduling and logistics for bus and vehicle operations. In this first phase, alternative bus schedule scenarios were examined in order to gain insight into the quality of the visitor experience and impacts on wildlife.

#### **An Experimental Approach to Adaptive Management Designed to Protect Important Park Wildlife and Visitor Resources**

Laura Phillips, Ecologist, Denali National Park and Preserve, Denali National Park, AK

Philip Hooge, Assistant Superintendent, Center for Resources, Science and Learning, Denali National Park and Preserve, Denali National Park, AK

Tom Meier, Wildlife Biologist, Denali National Park and Preserve, Denali National Park, AK

In 2006, Denali National Park began a multidisciplinary study to determine best management practices for vehicle use of the park's only access road. The study relies on a traffic simulation model to determine vehicle capacity and scheduling on the park road while incorporating standards for visitor experience and wildlife movement. While the model is designed to protect important indicators, results of this study and previous research in the park have outlined additional indicators that the park must ensure are not negatively impacted by changes to the transportation system. Indicators such as visitor satisfaction, wildlife sightings, and Dall's sheep and grizzly bear distribution and behavior will be evaluated in the Environmental Impact Statement and as part of an adaptive management strategy should an alternate transportation system be applied on the Denali park road. Managers would implement the preferred alternative in an experimental fashion that would allow for spatial and temporal controls.

Concurrent Session #38 • Ross Island/Morrison • Panel Discussion

#### **The Pacific Northwest Preservation Field School, Fifteen Years Old in 2009: What the Future Holds**

Chair: Hank Florence, External Program Lead, National Park Service, Pacific West Region, Seattle, WA

Marking its fifteenth year as a field school to a varied audience, the Pacific Northwest Preservation Field School has focused on both the hands-on and philosophical aspects of historic preservation at sites throughout the Northwest. Operating under a cooperative agreement among its partners (National Park Service, University of Oregon, Oregon State University, State Historic Preservation Offices and State Park Offices in Idaho, Washington and Oregon), the schools activities have expanded beyond the yearly field school itself, to other historic preservation activities for its partners and others. This session will examine the successes and challenges of the past fifteen years with discussions on the various agreements that enable the partners to operate collaboratively, aspects of preparation and execution for a successful program, and case studies of the types of work accomplished in both the classroom and in the field. Lessons learned will provide directions for the future for this field school and other similar programs.

Panelists: Don Peting, Professor Emeritus, Historic Preservation Program, University of Oregon, Eugene, OR

Suzi Pengilly, Deputy SHPO, Idaho State Historical Society, Boise, ID

Jan Wooley, State Historian III, California Department of Parks and Recreation, Sacramento, CA

Gerry Tays, Preservation Planner, Washington State Parks and Recreation Commission, Olympia, WA

Concurrent Session #39 • Oregon • Invited Papers (Part 2 of 2-Part Track)

#### **BioBlitzes and ATBIs: Citizens and Scientists in Biodiversity Conservation II • ATBIs and BioBlitzes: Where the Rubber Meets the Road**

Chair: Niki Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA

Session overview: All Taxa Biological Inventories (ATBIs) and BioBlitzes celebrate biodiversity and public involvement in resource conservation through research and participation. However, the specific goals of these inventories can range widely. And accordingly, methodologies and targeted participants vary extensively. This session will examine different lessons learned from several National Park Service inventory events including discussions on the molecular analysis of prokaryotic and eukaryotic organisms from Yellowstone Lake, a hybridization of the ATBI and BioBlitz concept in order to inventory invertebrates, the efforts required to carry out an insect inventory, and inventories of arachnid fauna in a floodplain ecosystem.

#### **Hidden Biodiversity: A Molecular ATBI within Yellowstone Lake**

Ann Rodman, GIS Coordinator, Yellowstone National Park, Yellowstone National Park, WY

This Molecular All-Taxa Biodiversity Inventory (MATBI) is a large scale, interdisciplinary study of the complexity of life in Yellowstone Lake. A main focus of the study is to understand the effect of environmental selection factors on genetic diversity. To perform the study, a team of geologists and microbiologists collect a series of lake samples, at different locations and depths, using a submersible vehicle controlled by researchers in the boat. Both prokaryotic and eukaryotic organisms, along with viruses, are being identified through genetic analysis. The results, together with the geochemical analysis of the sites, will be used to construct a complete environmental profile of the lake and create a basis for understanding the park's largely hidden biodiversity. Some scientists think the earth's tiniest inhabitant—microorganisms—affect virtually every level of the earth's food chain, and researchers believe that the same may be true, at a smaller scale, for Yellowstone Lake.

#### **Blitzing the Acadia Way**

David Manski, Chief, Division of Resource Management, Acadia National Park, Bar Harbor, ME

Since 2003, the National Park Service has been hosting annual events to inventory invertebrates at Acadia National Park. These park collecting activities (a hybrid of BioBlitz and ATBI models) were conducted over a weekend, were taxonomically focused, limited to one section of the park, and attended by 35–65 professional and amateur entomologists, a majority of whom have been repeat participants. As part of our events, we've also included a half-day workshop for the general public to learn about invertebrates. This presentation will describe how, with only limited staff and funding, the park has organized and run these events, found taxonomists willing to participate and lead in the identifications, gotten specimens identified, managed collected data, dealt with voucher specimens, and remained in contact with past blitz participants.

### **ATBI Specimen Classification Strategies**

Jerry Freilich, Research Coordinator, Olympic National Park, Port Angeles, WA

Planning for “All Taxa” or “BioBlitz” activities requires us to consider some mind-boggling numbers. If 700 bird species in North America sounds like a lot of diversity, who can truly comprehend that there are more than 3000 American weevil species? And that weevils are only a single Family in the Order Coleoptera? Insects make up more than 75% of all known animal species. From collection through sorting, curation, and species identification, the sheer volume of specimens and species requires careful triage. This talk will discuss the effort in time, dollars, people, and space required to process insects. Regardless of the methods used, more specimens will likely be collected than can be identified. Strategies for dealing with this material, for organizing citizen assistants, and for dividing the workload have been developed with considerable success in the Great Smoky Mountains ATBI. The Smokies model and other potential approaches will be discussed.

### **SpiderBlitz Inventories at Congaree National Park, South Carolina**

Theresa Thom, Director/Research Coordinator, Old-Growth Bottomland Forest Research and Education Center, Congaree National Park, Hopkins, SC

David Shelley, Education Coordinator, Old-Growth Bottomland Forest Research and Education Center, Congaree National Park, Hopkins, SC

BioBlitzes provide important contributions to systematic inventory and monitoring programs, and can provide basic data needed for resource protection and conservation. As part of on-going research and inventory efforts at Congaree National Park, the Old-Growth Bottomland Forest Research and Education Center hosted SpiderBlitzes in 2006 and 2007 to target arachnid fauna. Spiders are ecologically important, and are potentially sensitive indicator species in the floodplain ecosystem. Dr. Robert Wolff from Clemson University led the programs with the assistance of Park staff. A total of 90 citizen scientists donated over 300 hours as they learned about, collected, and examined spiders. Citizen scientist teams collected spiders in various habitats during morning, afternoon, and evening sessions. Specimens were examined under dissecting microscopes at the Research and Education Center. Preliminary results indicate over 150 species were collected, with over 40 new species records for the park, including one new Family and several new county records.

### **Boston Harbor Islands All Taxa Biodiversity Inventory: A Model for Small Urban Parks**

Jessica Rykken, Research Associate, Harvard University, Cambridge, MA

All taxa biodiversity inventories (ATBIs) in small urban parks pose unique challenges and opportunities. These parks do not typically represent “hotspots” of biodiversity and may not draw in large numbers of scientists eager to find endemic species. However, it is precisely because their biodiversity is of a manageable scale that we may realistically hope to catalog much of it within a relatively short time frame. By definition, urban parks also have large numbers of people nearby, and this affords many opportunities for collaboration, public participation, and education. Critical to the success of the Boston Harbor Islands ATBI have been collaborations between the National Park Service, Harvard University and other nearby universities, non-profit organizations, landowners, Boston public schools, citizen scientists, park volunteers, and many other groups. Our ATBI presents a model for how such collaboration effectively facilitates the integration of rigorous science, curriculum-based education programs, engaging outreach, and tools for resource management in a small urban park.

(Track continued from Concurrent Session #6)

Concurrent Session #40 • Alaska/Idaho • Contributed Papers

### **Connecting Science to Management: Case Studies in Coordination**

Chair: Charles van Riper III, Senior Research Ecologist, USGS, Tucson, AZ

### **From Archeology to Zoology: Creating a Comprehensive Resource Stewardship Strategy at Point Reyes National Seashore**

Marie Denn, Aquatic Ecologist, Pacific West Region, Point Reyes, CA

Natalie Gates, Wildlife Biologist, Point Reyes National Seashore, Point Reyes, CA

Jane Rodgers, Socio-Cultural Group Lead, Grand Canyon National Park, Grand Canyon, AZ

William Shook, Chief of Natural Resources Management, Point Reyes National Seashore, Point Reyes, CA

Gordon White, Chief of Cultural Resources Management, Point Reyes National Seashore, Point Reyes, CA

The National Park Service is creating a new structure for establishing and communicating resource management goals—the Resource Stewardship Strategy (RSS). Ideally, RSS documents will illuminate connections between fundamental park values and resource management activities, identify actions needed to maintain park resources in desired conditions, and evaluate whether or not management activities are effective. Point Reyes National Seashore—one of eight parks piloting the draft RSS process—is nearing completion of its draft strategy. The process has engaged park managers from all divisions and disciplines to identify desired conditions for park resources; detail which attributes of park resources must be managed and tracked to attain those desired conditions; and create a comprehensive strategy to accomplish that goal over the next twenty years. The Point Reyes RSS team is considering methods for incorporating adaptive management responses to climate change into long-term strategic resources management planning for the park.

### **Incorporating Science into a Proposed Visitor-Focused Marine Reserve at Biscayne National Park**

Elsa Alvear, Chief of Resource Management, Biscayne National Park, Homestead, FL

Vanessa McDonough, Fishery and Wildlife Biologist, Biscayne National Park, Homestead, FL

Benjamin Ruttenberg, Marine Ecologist, South Florida/Caribbean Network, National Park Service, Palmetto Bay, FL

Matt Patterson, Coordinator, South Florida/Caribbean Network, National Park Service, Palmetto Bay, FL

Biscayne National Park is in the planning stages of its General Management Plan. Multiple alternatives include proposed marine reserves designed to afford visitors to the largest marine park in the NPS the opportunity to experience unfished coral reefs. With no standard planning guides for the DOI regarding marine reserves, the park identified the factors that would lead to enhanced visitor

experience (fish diversity, abundance, and large size, and coral diversity and health). Fortunately, a number of these types of datasets already exist for BISC. The planning team used data from CESU cooperators (University of Miami, University of North Carolina-Wilmington), NPS SFCN Inventory and Monitoring Network, NOAA, and the park in order to plan the size, shape, and location of the reserve(s), as well as propose long-term monitoring in and out of the reserve(s) in order to evaluate the effectiveness in increasing or maintaining the parameters that contribute to visitor enjoyment.

#### **Applying Tools to Evaluate Management Effectiveness: Where Science Meets Management**

Tony Varcoe, Manager, Research and Management Effectiveness, Parks Victoria, Melbourne, Victoria, Australia

A systematic approach to the evaluation of management effectiveness based on adaptive management principles can assist park managers at a range of management scales from local to whole of parks network. Parks Victoria is one of several park agencies in Australia and elsewhere that is developing a comprehensive program to evaluate effectiveness of its park management programs. The paper will outline Parks Victoria's approach to evaluating management effectiveness including how it is using the WCPA Management Effectiveness Framework, the connections between scientifically based monitoring programs and network-scale evaluations (e.g. State of the Parks), and the development and application of a range of additional ME tools to assist more objective resource allocation.

#### **Tools for Better Resource Management: A Learning Model that Connects Managers to Researchers**

Giselle Mora-Bourgeois, Science Education Coordinator, Urban Ecology Research Learning Alliance, NPS National Capital Region, Washington, DC

Diane S. Pavek, Research Coordinator, Urban Ecology Research Learning Alliance, NPS National Capital Region, Washington, DC

Congress mandated that the National Park Service improve resource management and protection through science-informed decision making. This will only be realized when on-the-ground managers gain better understanding of the resources and have access to new knowledge acquired through research. A training model developed by the National Capital Region's Research Learning Center supports resource managers' learning and improves resource protection by linking science and research to managers through researcher-led workshops. The one-day workshops provide managers with basic resource information, update managers on research results, improve their field skills, and become a regional forum for discussing threats, restoration, and monitoring. Workshops are focused on resources, such as mushrooms or lichens, or ecological systems, such as seeps and grasslands. We present our learning model, provide examples of workshops held, and discuss their implications for resource management, natural resource staff professional development, and sustained long-term relationships with researchers.

#### **Lessons Learned from Two Decades of Training: CSU's Intensive Five-Week Field Course for Protected Area Managers**

Ch'aska Huayhuaca-Frye, M.S. student, NSF-GK12 Fellow, Colorado State University, Fort Collins, CO

George Wallace, Professor, Colorado State University, Warner College of Natural Resources, Fort Collins, CO

Since 1989, The Center for Protected Area Management and Training at Colorado State University has conducted an annual 5-week, intensive US-based field course for PA managers and their NGO counterparts from Latin America. Using a mixed-methods approach, 200 past participants (representing 16 different cohorts) were surveyed for their perceptions about both the Colorado course and elements they would include in a similar base course being developed for Latin America. The study probed topics ranging from course structure and learning environment to personal utility and current involvement in PA management. Quantitative and qualitative data from this longitudinal study provide a rare opportunity to evaluate the long-term value of specific field-based training components and to facilitate a discussion about training effectiveness for protected area managers.

Concurrent Session #41 • Three Sisters • Contributed Papers

#### **Wilderness Past, Wilderness Future**

Chair: Garry Oye, Chief, Wilderness Stewardship and Recreation Management, National Park Service, Washington, DC

#### **The History of National Park Service Indecision about Wilderness**

John Miles, Professor of Environmental Studies, Huxley College, Western Washington University, Bellingham, WA

The NPS has walked the much-discussed tightrope between "providing for the enjoyment of" and "leave them unimpaired" in its management of national parks for nearly a century. At times the agency has taken a stance opposed to "zoning" parks so as to designate wilderness. This led to outright opposition to the Wilderness Act, to a tortuous review of candidate areas for wilderness designation after passage of the Act, and to a conflicted and halting approach even today toward wilderness management and planning. Factors that lead to this situation are examined and analyzed.

#### **Indian Lands and the National Wilderness Movement**

Diane Krahe, Assistant Research Professor, Department of History, University of Montana, Missoula, MT

While serving as chief forester of the Indian Office in the 1930s, the charismatic wilderness advocate Bob Marshall designed a federal policy to preserve the roadless character of certain scenic areas on Indian reservations across the American West—without tribal consultation or consent. Marshall's decree kept nearly five million acres of reservation lands free from roads and motorized vehicles until the 1950s, when Indians successfully protested both their roadless restrictions and the proposed inclusion of their lands in a national wilderness system. By the time the Wilderness Act passed in 1964, only one reservation roadless area remained. In time, some tribes elected to protect the natural conditions of portions of their defunct roadless areas on their own terms. My 2005 dissertation (Washington State University) details this history. As a sideline from my current work of writing NPS administrative histories, I soon will be revising my dissertation for publication.

#### **"True" Wilderness Preservation: Looking Forward to a Better Nature**

Jonathan Voos, Trail Crew Leader, Olympic National Park, Seattle, WA

Wilderness management needs to adopt a new philosophy in order to better manage the lands as they were meant to be. Today's wilder-

ness areas are dominated by values that oppose those originally set forth within the Wilderness Act of 1964. Management has been confounded by its own severe lack of humility and restraint, both of which have been further encouraged by advancements in the science of landscape-scale management. The United States' wildernesses are on a downward trend as the symbolic value, wilderness character, wildness, naturalness, and untrammeled values continually diminish with intentional, hands-on, intensive management. In order for this problem to be solved, our current wilderness management system needs to adopt the recommendations within true wilderness preservation. The creation of a new starting place, partnered with a forward-looking, diachronic approach, will guide wilderness management in maximizing the potential for these special areas to epitomize the above stated values through hands-off management before any more intentional manipulation, and thus degradation, continues.

#### **Tools in the Wilderness: Institutionalizing R&D and Optimizing Relevance**

Lewis Sharman, Ecologist, Glacier Bay National Park & Preserve, Gustavus, AK

Ian Barlow, Wilderness Specialist, U.S. Forest Service Research and Development Program, Missoula, MT

Effective administration of Congressionally-designated wilderness often includes (for example) scientific research and trail/structure maintenance, activities for which the use of motorized tools and mechanized access is generally precluded by law and regulation. Non-motorized/mechanized tools and conveyances exist but are often rejected in favor of administrative waivers because "primitive" methods are generally considered to be unacceptably arduous, inefficient, and time-consuming. These assumptions can be successfully challenged, however, when the application of careful technique, appropriate use of technology, and rigorous training are brought to bear. An example of this is the development of custom crosscut saw technology for use in sampling ancient wood in the early stages of petrification, as an alternative to chainsaws. This wood, found in sediment deposits in the wilderness of Glacier Bay, Alaska, provides for paleoclimate reconstruction and a better understanding of contemporary climate change. With proper perspective and planning there is great potential for the R&D invested in a discrete wilderness-appropriate tool to be applied more broadly to address multiple needs. For example, the technology used to develop crosscut saws capable of sampling pre-petrified wood can be used in other non-motorized tools to cut rock and metals in wilderness settings. Developing and distributing such technology in a deliberate way can help wildland administrators accomplish management objectives while preserving wilderness resources and values.

#### **Negotiating a New Wilderness Proposal at Sleeping Bear Dunes National Lakeshore**

Tom Ulrich, Deputy Superintendent, Sleeping Bear Dunes National Lakeshore, Empire, MI

In 1981, the Lakeshore forwarded a wilderness proposal of 30,903 acres to the Department of Interior (DOI). The DOI never officially sent it to Congress, but in 1982, Congress passed a law requiring that the proposed areas be administered to "maintain their presently existing wilderness character until Congress determines otherwise." The proposal was retained in all preliminary alternatives in a General Management Plan (GMP) begun in 1999. Because of public opposition to the potential loss of road access, and other perceived wilderness/access issues, the GMP was stopped by the DOI in 2002. In 2006, the Lakeshore began a new GMP and new Wilderness Study. This new GMP was signed early in 2009 and the associated wilderness proposal actually *increases* the acreage to over 32,000. This presentation will discuss how the Lakeshore was able to restore community relations and resolve the wilderness issue in a manner that has broad public support.

Concurrent Session #42 • Mt. Bachelor • Panel Discussion

#### **The Future of Working Cultural Landscapes: Parks, Partners and Local Products**

Chair: Rolf Diamant, Superintendent, Marsh-Billings-Rockefeller NHP, Woodstock, VT

This session reports on the workshop The Future of Working Cultural Landscapes: Parks, Partners and Local Products, held recently at Cuyahoga Valley National Park. Over 50 participants representing teams of parks and their partners from across the National Park System convened to share innovation and identify opportunities and challenges for managing cultural landscapes. This session will provide an update of the current status of this work and discuss next steps for an emerging network of park managers, non-profit organizations, cooperating associations, concessioners, and producers working to protect landscape character and promote sustainability.

Panelists: John Debo, Superintendent, Cuyahoga Valley National Park, Brecksville, OH

Nancy Nelson, Superintendent, Minute Man National Historical Park, Concord, MA

Laura Rotegard, Superintendent, Grant-Kohrs Ranch National Historic Site, Deer Lodge, MT

Lucy Lawliss, Lead, Cultural Resource Management Program, National Park Service, Richmond, CA

Concurrent Session #43 • Mt. Hood • Invited Papers (Part 1 of 3-Part Track)

#### **Protecting Natural Sounds I: Current Issues in Soundscape Management**

Vicki McCusker, Outdoor Recreation Planner, National Park Service, Fort Collins, CO

Session overview: This session will provide an overview of current soundscape management issues in national park units. National park units are increasingly seeking technical and planning assistance from the Natural Sounds Program for issues such as transportation noise, motorized recreation, impacts to wilderness character and values from various noise sources, and the positive psychological benefits of hearing natural sounds. The presenters in this session will discuss how these issues are being addressed at the park level, what are the concerns of resource managers, and current research efforts.

#### **Transportation Noise in National Parks**

G. (Randy) Stanley, Acoustician, Natural Sounds Program, National Park Service, Fort Collins, CO

Transportation is probably the most significant noise source experienced by visitors to the national park system. Common sources of transportation noise will be covered, along with information on how transportation noise varies. Transportation noise is affected by road surfaces, road condition, road design/use, and posted speed limits. Park-specific examples of transportation noise reduction efforts will be provided, along with general strategies that parks can adopt to help reduce such noise.



### **Noise in Wilderness; or, “Can You Hear Me Now?”: Managing Noise Sources at Zion National Park**

Jock Whitworth, Superintendent, Zion National Park, National Park Service, Springdale, UT

Zion National Park contains over 145,000 acres of backcountry. Most of these lands are within recommended wilderness and must be managed to protect wilderness characteristics and values, including outstanding opportunities for solitude. Over 2.5 million people visited Zion NP in 2006, along with attendant noise sources associated with humans (voices, radios, etc) as well as numerous other sources of mechanized noise including a variety of aircraft types flying at various elevations; wheeled vehicles including autos, busses, motorcycles, motor homes and RVs, and trucks; and snowmobiles during the winter. The sources and levels of noise take on significance depending upon the location at which the noise is audible and which could affect wilderness characteristics and values in Zion NP. Managers at Zion NP have employed a variety of strategies and practices to minimize noise from both land and air sources.

### **The Nationwide Survey of Acoustical Environments in Parks**

Lelaina Marin, Outdoor Recreation Planner, Natural Sounds Program, National Park Service, Fort Collins, CO

In Fall 2008, the Natural Sounds Program released the “Nationwide Survey of Acoustical Environments in Parks” to all park managers.

The purpose of this survey was to provide us with more information about the total acoustical resources present at each park, sources of noise, major issues and conflicts associated with noise, and possible mitigation techniques that could be used to minimize impact to the acoustical environments in parks. This information will help us to develop a broader understanding of the management issues in parks and strengthen the support our program can offer for managing acoustical resources and soundscape. During this session, we will provide a summary of the findings of this survey and what they mean for future management of park soundscapes.

### **Motorized Recreation: Planning and Technical Challenges for Soundscape Impact Assessment**

Vicki McCusker, Outdoor Recreation Planner, Natural Sounds Program, National Park Service, Fort Collins, CO

National Park units are increasingly requesting technical assistance from the Natural Sounds Program regarding motorized recreational vehicles. Motorized recreational vehicles present technical and planning challenges in terms of how to measure and assess the impacts to soundscapes. While some impacts from motorized vehicles can be characterized as local, noise from motorized recreational vehicles can carry for long distances and impact wildlife communication and visitor experience. The Natural Sounds Program is assisting Cape Hatteras National Seashore, Lake Meredith National Recreation Area, and Everglades National Park with acoustic measurement of the soundscape and various motorized recreational vehicles. Previous planning efforts have used a qualitative approach for assessing noise impacts from personal watercraft, motorboats, off-road vehicles, etc. Ways of assessing impacts quantitatively will be discussed as well as developing impact thresholds.

### **Effects of Natural and Mechanical Sounds on Laboratory Performance**

Jacob Benfield, Postdoctoral Fellow, Department of Psychology, Colorado State University, Fort Collins, CO

Paul A. Bell, Professor, Department of Psychology, Colorado State University, Fort Collins, CO

Lucy J. Troup, Assistant Professor, Department of Psychology, Colorado State University, Fort Collins, CO

Robert Jakubowski, Department of Psychology, Department of Psychology, Colorado State University, Fort Collins, CO

David McCabe, Assistant Professor, Department of Psychology, Colorado State University, Fort Collins, CO

Nicholas Soderstrom, Department of Psychology, Colorado State University, Fort Collins, CO

Laboratory research has shown that high levels of sound affect several areas of physiological, psychological, and cognitive function. The impact of lower sound levels or complex soundscapes remains largely unexplored. In conjunction with the National Park Service Natural Sounds Program, laboratory research is examining the relationships between natural or human-influenced soundscapes and both physiological responses and cognitive function. Participants completed two separate research sessions in which they were exposed to a control condition or a sound condition. During each session, measures of heart rate and galvanic skin response were taken while participants completed six tasks related to working memory, speed of processing, and fluid intelligence. Outcomes are compared under the following conditions: natural sounds at normal sound levels, natural sounds at elevated levels, and human mechanical sounds at normal sound levels.

(Track continues in Concurrent Sessions #65 and #109)

Concurrent Session #44 • Mt. St. Helens • Contributed Papers

### **Managing Protected Areas Against a Background of Conflict**

Chair: Brent A. Mitchell, Vice President, Stewardship, QLF Atlantic Center for the Environment, Ipswich, MA

### **Peace, War and Protected Areas: The Opportunity and Need for “Swords to Plowshares” Conservation**

Gary Machlis, Professor and Visiting Senior Scientist, University of Idaho and National Park Service, Moscow, ID

This paper examines one of the emerging grand challenges for the conservation movement—the current and future role of protected areas in the fate of peace, war and human security. The growing field of warfare ecology suggests that war preparations, violent conflict, and post-war restoration are all powerful influences on (and influenced by) protected areas around the world. The conversion of military sites to conservation purposes (“swords to plowshares conservation”) has significant opportunity. Careful and creative collaboration between protected area managers, conservation scientists, military and humanitarian professionals is necessary. Specific examples (from the Presidio, California, to Vieques, Puerto Rico, to the Condor-Kutuku conservation corridor in South America and the marshes of Iraq) provide both illustration and lessons learned in achieving such collaboration. The broader roles (and specific options) of protected areas in supporting civil stability, restoration of postwar conditions, and creative peacemaking are described.

### **Modernization of “Multiple-Use”: A Forest Resource Protection Concept in Bosnia and Herzegovina**

Geoffrey Middaugh, retired (formerly Deputy Director, National Landscape Conservation System, Bureau of Land Management), Bellingham, WA

After an assessment of certain forested landscapes in Bosnia and Herzegovina, it becomes clear how important it is to understand the bio-physical environment concurrently with understanding how settlement and history influences the day to day lives of ordinary people, and ultimately their government. Understanding should focus on how human rural and urban settlement interfaces with the natural environment both for utilitarian needs and for the protection of natural values. I concluded that the traditions of multiple use must move to the modernization of “multiple-use.” The modernization of multiple use can be a new approach to providing policy support to economic development and resource protection in present day Bosnia and Herzegovina (BiH).

### **Peacemaking through Forest Conservation: Conflict Transformation in the Maya Biosphere Reserve**

Michael Yadrick, Lake Tapps, WA

The Maya Biosphere Reserve (RBM) in northern Guatemala ostensibly meets the desire of conservation interests to protect biodiversity while supporting local communities through sustainable forest livelihoods, which contrast with regimes that focus on managing the natural environment exclusive of human involvement. Given the historic conflict over land reform and search for political representation in the country, the decentralized management of the biosphere reserve model serves to promote local people as the stewards of the forest resources. This paper examines the changing nature of resource access and the institutional relationships in the RBM that develop from the mixture of negotiation, advocacy, and force utilized to maintain or claim use of resources. It concludes that in order to transform asymmetric struggles a harmonizing analysis is required, one that recognizes the discrete mechanisms of local access as well as institutional accountability in order to judge whether reforms localize decision-making to meet conservation goals.

### **Rethinking Protected Areas in the Making of New Nepal**

Sudeep Jana Thing, Research and Documentation Coordinator, Community Development Organization (CDO), Strategic Direction on Governance, Communities, Equity and Livelihood in Relation to Protected Areas (TILCEPA), CEESP/WCPA, IUCN, Kathmandu, Nepal

In the aftermath of unprecedented sociopolitical changes, Nepal is undergoing state restructuring and societal transformation. A New Nepal is in the making today. Given the 20 percent coverage of terrestrial protected areas in Nepal, these are of national and global significance, they require adequate attention and support to tap this historic opportunity. Nepal offers some of the key innovations on participatory conservation to the world. This paper critically traces exemplary and innovative experiences of co-managed/collaborative protected areas in different ecoregions of Nepal. It synthesizes some of the key lessons to that end, and analyzes strengths and challenges of protected areas from a people and civil society perspective. The paper also attempts to capture key contemporary debates and public discourse to chart out the future direction of protected areas in a New Nepal.

### **Managing Conflict in an Era of Climate Change: The Evolution of Tribal Consultation**

Linda Moon Stumpff, Professor, Tribal Governance Graduate Program and Graduate Program on the Environment, Evergreen State College, Olympia, WA

The nature of climate change impacts relationships between tribes and federal agencies. Ecosystem management and external impacts to the parks and to tribes brought closer collaboration in the past. As boundaries are blurred and rights are clarified, consultation processes move from notification to meaningful participation and beyond. The Salish Gathering, a traditional gathering of Puget Sound Tribes across borders, exemplifies tribal initiatives that impact federal agencies. Green energy, particularly wind energy, is under development by Tribes, producing concerns about avian species, right-of-ways and visual impacts. Agreements and collaboration as water and water rights are impacted is key. Tribal concerns for the impacts of species migration and loss of cultural uses will grow. This paper explores the kinds of agreements and consultation processes that can be useful under these changing environmental conditions.

## **Tuesday Late Afternoon, March 3**

Concurrent Session #45 • Multnomah • Invited Papers (Part 3 of 3-Part Track)

### **Navigating Terra Incognita: New Management Strategies in an Era of Climate Change III • Building the Bicycle While Riding It: Examples of How Managers are Preparing**

Chair: Cat Hawkins Hoffman, Chief, Natural Resources Division, Olympic National Park, Port Angeles, WA

Session overview: Ecosystems and species will change as climate changes, forcing managers to consider new strategies for resource protection. What are the best strategies to adopt in the face of these kinds of changes? How do we protect an area if the species for which it was established can no longer survive? This session is designed to follow the previous two concurrent sessions on climate change impacts to Pacific Northwest and Southern Florida ecosystems. Speakers will present examples of approaches and actions that are currently being used for climate change adaptation and will foster discussion of challenges and opportunities for resource management.

### **Adapting to Climate Change through Science-Management Partnerships**

Dave Peterson, Research Ecologist, USDA Forest Service, Pacific Northwest Research Station, Seattle, WA

Developing appropriate management options for adapting to climate change is a new challenge for land managers, and integration of climate change into management and planning on U.S. national forests is just starting. Science-management partnerships on the Olympic and Tahoe National Forests are the first efforts to develop adaptation options for specific national forests. We employed a focus group process to establish the scientific context necessary for understanding climate change and its anticipated effects, and to develop specific options for adapting to a warmer climate. General adaptation strategies developed by national forest managers include: (1) reduce vulnerability to climate-induced stress by increasing resilience at large spatial scales, (2) consider tradeoffs and

conflicts that may affect adaptation success, (3) manage for realistic outcomes and prioritize treatments that facilitate adaptation to a warmer climate, and (4) manage dynamically and experimentally. Science-based adaptation options were also developed to guide on-the-ground management.

#### **What Can Be Done in a Park to Adapt to Climate Change?**

Lara J. Hansen, Chief Scientist and Executive Director, EcoAdapt, Washington, DC

Adapting to climate change represents a significant challenge but is also an opportunity. The time has come for action and National Park Service managers have the creativity and expertise to find innovative solutions. Some examples of adaptation to climate change will be presented, with an emphasis on coastal and marine systems. Actions that can be taken toward building the capacity to effectively respond to climate change and impacts to resources will be discussed.

#### **Climate Change Scenario Planning: A Tool for Structured Decision Making in an Era of Uncertainty**

Leigh A. Welling, Climate Change Coordinator, National Park Service, Natural Resource Stewardship and Science, Fort Collins, CO

Management success in the future requires flexible responses to changing conditions. Scenario planning is a tool for evaluating alternative futures and the actions and events that may lead to them. Scenario planning does not require precise future predictions, but explores a range of predictions to allow us to begin thinking through what appropriate responses might be. By helping to envision alternative futures, scenarios can be used as a tool to identify policies and actions that will lead to various outcomes. Major benefits of this approach are (1) increased understanding of key uncertainties, (2) incorporation of alternative perspectives into conservation planning, and (3) improved capacity for adaptive management. Use of scenarios to plan for changing fire regimes and sea level rise will be presented with examples from national parks. Implications for regional interdisciplinary planning will be explored.

#### **The Future Ain't What It Used To Be**

Jim Lopez, Deputy Chief of Staff, Office of King County, Seattle, WA

Climate change is on everyone's minds these days. It's in the press, it's in the board room, and it's beginning to show up in government policy and plans. King County, Washington, has shown leadership in developing and implementing an initial road map for local governments with information, analysis, and ideas to anticipate, mitigate, and adapt to climate change. Examples will be given for the following sectors: agriculture, coastal areas, fish and shellfish, flooding, stormwater and wastewater, forestry, hydropower, and water supply.

(Continued from Concurrent Sessions #23 and #34)

Concurrent Session #46 • Holladay • Panel Discussion

#### **The Urban File**

Chair: Barbara MacDonald, Lead Specialist, Public Outreach Education, Parks Canada, Gatineau, QC, Canada

Protected area managers face the challenges of an increasingly urbanized and diversified population. How do we make national parks, historic sites and marine areas relevant to urban populations and help develop a sense of connection to protected areas that leads to support for their protection and presentation? This panel will present challenges and opportunities of urban outreach and provide opportunities to discuss strategies to facilitate public awareness, learning and engagement including: positioning urban parks and historic sites as community resources and gathering places; collaborating in a concerted and sustained fashion with urban stakeholders, venues and events to create complementary learning opportunities with long term impact; sharing the leadership and mobilizing urban stakeholders, such as the arts community, to become engaged in support of the protection and presentation of the natural and cultural heritage of protected areas. Format: Three presentations followed by a facilitated discussion leading to the identification of success factors in urban outreach.

Panelists: Kevin Strange, Senior Advisor of Conservation Outreach, Calgary Zoo, and Canadian Association of Zoos and Aquariums (CAZA), Calgary, AB, Canada

Tony Varcoe, Manager, Research and Management Effectiveness, Parks Victoria, Melbourne, Victoria, Australia

Barbara MacDonald, Lead Specialist, Public Outreach Education, Parks Canada, Gatineau, QC, Canada

Concurrent Session #47 • Broadway/Weidler • Panel Discussion

#### **Sharing Science Using Research Learning Center Models**

Chair: Christie Anastasia, Research Learning Center Coordinator, Denali National Park and Preserve, Denali National Park, AK

In order to take the best care of our natural and cultural resources, national parks draw on the results of scientific research. New scientific information helps managers make the right decisions, and sharing this information can help students and members of the general public understand and support these decisions. This concurrent session utilizes NPS Research Learning Center models to guide participants in planning educational activities and products that will help students and other audiences understand key messages related to resource issues in national parks. This will ultimately lead toward increased resource stewardship and protection. Presenters will focus on educational endeavors involving air quality research, cold weather data collecting, and water quality collaboration.

Panelists: Kristen Friesen, Education Specialist, Denali National Park and Preserve, Denali National Park, AK

Susan Sachs, Research Learning Center Education Coordinator, Great Smoky Mountains National Park, Lake Junaluska, NC

Wendy Smith, Great Lakes Research and Education Center Research Learning Center Education Coordinator, Indiana Dunes National Lakeshore, Porter, IN

Sarah Melena, Education Specialist, NPS Natural Resource Information Division, Fort Collins, CO

Concurrent Session #48 • Hawthorne/Sellwood • Panel Discussion

**Bison Restoration Collaboration between Native Entities and Parks Canada/U.S. National Park Service**

Chair: Kristine Reed, Wildlife Biologist, InterTribal Bison Cooperative, Rapid City, SD

Bison have always held great meaning for Tribes. In the 1800s, the settlers recognized the reliance Tribes had on them. Thus began the systematic destruction of the buffalo to try to subjugate the tribal nations dependent on them. The slaughter of over 60 million buffalo left only a few hundred buffalo remaining. At that time, tribes began to sign treaties with the U.S. Government in an attempt to protect the land and the buffalo for their future generations. The Intertribal Bison Cooperative incorporated as a non-profit 501(c)(3) Tribal organization in 1992 and is currently made up of 57 Tribes spanning 18 states. The role of ITBC is to act as a facilitator in coordinating education/training programs, developing marketing strategies, coordinating the transfer of surplus buffalo from public lands (federal/state) to tribal lands, and providing technical assistance to its membership. Panelists will discuss differing protocols/guidelines/policies for bison management between agencies.

Panelists: Jim Stone, Executive Director, Intertribal Bison Cooperative, Rapid City, SD

Brady Grant, Director of Natural Resources, Turtle Mountain Band of Chippewa/Intertribal Bison Cooperative Member, Belcourt, ND  
Ervin Carlson, ITBC President/Blackfeet Nation, Browning, MT

Concurrent Session #49 • Ross Island/Morrison • Invited Papers

**Things Look Different Here: Cultural Resource Planning and Design in Oregon**

Chair: Kathy Schutt, Planning Manager, Oregon State Parks and Recreation Department, Salem, OR

Session overview: Taking a cue from Oregon's motto, we will explore how cultural resource planning and design manifests in a place where the natural environment is king. Oregon's cultural resources are often nestled into grand native environments possessing their own conservation challenges. The interplay between these resources often leads to symbiotic solutions and distinctive challenges. We will profile four projects that tell the story of cultural resource planning in Oregon—from the Columbia River Gorge to Golden and Silver Falls to the first hazelnut farm in the United States. We'll highlight innovative methods, new approaches to blending cultural and natural resource planning, and discuss how preservation is enriching these iconic places to make them resonate for the people in our community.

**Integrating Cultural Resource Stewardship into Management and Development Plans at Oregon State Parks**

Mark Davison, Master Planning Coordinator, Oregon Parks and Recreation Department, Salem, OR

Oregon Department of Parks and Recreation (OPRD) is using an innovative method to protect cultural resources at two sites: Silver Falls State Park and Golden Townsite State Heritage Site. The method applied to these sites uses a Suitability Ranking System to assess cultural resources while working on master plans or development concept plans for state parks. For Silver Falls, the method was applied at a large scale to aid in master planning and to guide a \$20 million development program for the park. At Golden, the method was used at a detailed scale to guide preservation and design guidelines for the site. The successes and failures of the Suitability Ranking System and its application will be discussed, as well necessary changes in method application resulting from the differing scales used at each site.

**A Taste of Oregon: Cultural and Natural Resource Planning at Dorris Ranch**

Laurie Matthews, Historical Landscape Architect & Project Manager, MIG, Portland, OR

Dean Apostol, Senior Landscape Architect and Restoration Ecologist, MIG, Portland, OR

Oregon's history is rooted in agricultural landscapes surrounded by natural features such as rivers, woodlands and meadows. Today, few places remain that embody this aspect of our collective heritage, and even fewer remain that are open to the public. Dorris Ranch, the first commercial hazelnut farm in the United States, is one of those places. Listed on the National Register for the significant and innovative contributions that George Dorris made to the agricultural industry, Dorris Ranch remains a working hazelnut farm and public park surrounded by rare and prized native oak and riparian habitat. Based on significant outreach to cultural and natural resource experts, the community, and park planners we developed a master plan that effectively blends preservation of cultural resources, conservation of natural resources, and enhances the visitor's recreational and educational experience.

**The Historic Columbia River Highway Reconnection Project**

Magnus Bernhardt, Landscape Architect, Oregon Department of Transportation, Portland, OR

Kristen Stallman, Columbia River Gorge Scenic Area Coordinator, Portland, OR

This project explores the preliminary feasibility and cost to reconnect 12 miles of the Historic Columbia River Highway as a trail through the Columbia River Gorge. When completed the 12 mile multi-use trail will connect 73-miles of pedestrian and vehicular sections of the Historic Highway, from Troutdale to The Dalles, along the southern side of Oregon's Columbia River Gorge National Scenic Area. The trail alignment, which has been determined to be feasible, will provide access to undeveloped, currently inaccessible Oregon Parks and Recreation Department property and its unique features. The trail use should also increase and provide economic benefits to local communities.

Concurrent Session #50 • Oregon • Contributed Papers

**Risky Behavior: Assessing and Managing Risks Associated with Visitor and Employee Activities**

Chair: John Shultis, Associate Professor, University of Northern British Columbia, Prince George, BC, Canada

**Improving Efficacy of Visitor Education in Haleakala National Park Using the Theory of Planned Behavior**

Nathan Reigner, Graduate Research Assistant, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA

Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA, and Resource Systems Group Inc., White River Junction, VT

Karen Hockett, Faculty Research Associate, College of Natural Resources, Virginia Tech, Blacksburg, VA



Brett Kiser, Faculty Research Associate, College of Natural Resources, Virginia Tech, Blacksburg, VA  
Salli Dymond, Graduate Student, College of Natural Resources, Virginia Tech, Blacksburg, VA  
Marilyn Parris, Superintendent, Haleakala National Park, Makawao, HI  
Kerri Cahill, Outdoor Recreation Planner, Denver Service Center, National Park Service, Denver, CO  
Naaman Horn, Management Assistant, Haleakala National Park, Makawao, HI

Exploring the 'Ohe'o Pools has become a popular activity in Haleakala National Park, and is the centerpiece of many Maui, Hawaii, tourism brochures. While visitors are allowed to explore the pools (except during high water), they are discouraged from doing so for reasons related to visitor safety, resource protection, and the nature of visitors' experiences. The National Park Service (NPS) relies exclusively on onsite signage and interpretative information in the Visitor Center to dissuade visitors from exploring the pools. Despite the NPS's efforts, many visitors choose to explore the pools. This study applies the Theory of Planned Behavior (TPB) to evaluate and enhance the efficacy of visitor education messages used by the NPS to discourage visitors from exploring the pools. Results of the study provide a basis for assessing whether indirect management alone is sufficient to manage visitor use of the pools, or if direct management is needed.

### **Operational Leadership: An Employee-Centered Approach to Managing Risk and Achieving Professional Excellence**

Mary Hinson, Operational Leadership Program Manager/Chief Park Ranger, Lake Mead National Recreation Area, Boulder City, NV  
Jon Jarvis, Director National Park Service Pacific West Region, Oakland, CA  
Mike Snyder, Director, National Park Service Intermountain Region, Lakewood, CO

How do we prevent ordinary field work from exposing employees, volunteers and partners to extraordinary risks? Resource managers and scientists have begun to integrate Operational Leadership (OL) in sound field practices. An emerging grass roots initiative, OL is designed to engage individuals at all organizational levels in assessing and managing risk. Tending to safety leadership is exceptionally important within the resource management and science world, where much work within park boundaries is accomplished by others in complex environments. The cornerstones of OL are 7 leadership principles that empower employees to be assertive about their safety and the safety of their team, encourage each to participate in making risk management decisions, and understand how to mitigate the chain of decisions that can lead to injuries and accidents. To succeed safely, each employee must be able to inspire, influence, and guide other—the essence of leadership.

### **Park Resource Protection Planning through Comprehensive Threat Analysis and Risk Assessment**

Troy Hamon, Chief of Natural Resources, Katmai National Park, King Salmon, AK  
Neal Labrie, Chief Ranger, Katmai National Park, King Salmon, AK

Natural, cultural, facility and visitor-based resources each present challenges to park management when it comes to applying park staff time, money and efforts for their protection. Common practices regarding protection of these various resources rely on subjective understanding of past practices and are regularly based on historic practices. Park science and research are often only included and utilized for planning documents and report-based analyses. Katmai National Park is utilizing a resource risk analysis tool known as the Field Observation Recording Tool (FORT) to objectify the resource risk analysis procedures. By applying a common assessment scale based on scientific knowledge of risks to park resources, parks can optimize staff time and funding. The FORT process requires input from all divisions and results in an interdisciplinary protection plan that identifies unique risks to individual resources, gaps in staffing and funding abilities, and risk-based decisions for park programs.

### **Perceptions of Risk and Crowding on the Half Dome Cables Route in Yosemite National Park**

Adam Gibson, Graduate Research Assistant, Colorado State University, Fort Collins, CO  
Peter Newman, Associate Professor, Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, CO  
Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA, and Resource Systems Group Inc., White River Junction, VT

Nathan Reigner, Graduate Research Assistant, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA  
Bret Meldrum, Branch Chief of Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Mark Fincher, Wilderness Specialist, Yosemite National Park, El Portal, CA

Lauren Abbott, Student, College of Natural Resources, Colorado State University, Fort Collins, CO

The Half Dome rock formation in Yosemite National Park is both iconic and inspiring. Because of this, Half Dome is one of the most sought after summits in the park. However, recent use levels of the cables have raised concern as to the continued quality of visitor experience that the hike provides. Furthermore, Half Dome's popularity results in levels of visitor use that potentially conflict with the area's wilderness designation and threaten wilderness values. This study employed an on-site visitor questionnaire administered to Half Dome hikers to examine their perceptions of risk and crowding on the cables route. In addition, visitors were asked their opinions regarding potential management actions that could be used to address safety and crowding issues. Thus, results are expected to help inform managers' decisions about the acceptability of management actions designed to improve visitor safety and protect wilderness values on the cables route.

### **Modeling Relationships among Visitor Use, Safety, and Crowding on Half Dome's Cables, Yosemite National Park**

Nathan Reigner, Graduate Research Assistant, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA  
Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA, and Resource Systems Group Inc., White River Junction, VT

Bret Meldrum, Branch Chief of Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Lauren Abbott, Student, College of Natural Resources, Colorado State University, Fort Collins, CO

Peter Newman, Associate Professor, Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, CO

Adam Gibson, Graduate Research Assistant, Colorado State University, Fort Collins, CO

The hike to the summit of Half Dome is perhaps the most iconic and popular backcountry excursion in Yosemite National Park. The

hike culminates by ascending the last 400 feet of Half Dome via a cable system. Most visitors ascend, and subsequently descend, the Half Dome summit between its two parallel cables. However, some visitors travel outside the cables, incurring increased exposure to potential risks on the granite dome. Occurrence of this behavior, coupled with recent safety incidents on the cables, has made crowding and risk management top priorities for the park. This study models relationships among visitor use, visitor behavior, and crowding on the cables. Results are evaluated in tandem with findings from a companion study of visitors, perceptions of safety and crowding on the cables to help inform development of management options for the Half Dome Trail.

Concurrent Session #51 • Alaska/Idaho • Panel Discussion

**Managing Your Wild and Scenic River: The Next Forty Years**

Chair: William (Bill) Hansen, Supervisory Hydrologist, National Park Service, Water Resources Division, Fort Collins, CO

The 40th anniversary of the Wild and Scenic Rivers (WSR) Act just passed on October 2, 2008. This panel discussion will provide an opportunity for wild and scenic river managers and others interested in river management an opportunity to talk to members of the NPS Wild and Scenic Rivers Steering Committee about the challenges of managing designated and study rivers over the next forty years. Discussions will focus on recent WSR litigation, the new National Park Service WSR program, distinctions between designated rivers, planning challenges for WSRs, clarifications about river classification, the need for Section 7 evaluations and other concerns raised by the audience. Format: 45 minutes for presentations, 75 minutes for discussions.

Panelists: Joan Harn, Rivers and Hydro Leader, National Park Service, Conservation and Outdoor Recreation Program, Washington, DC

Jamie Fosburgh, Rivers Program Manager, National Park Service, Northeast Regional Office, Boston, MA

Cassie Thomas, Regional Wild and Scenic Rivers Coordinator, National Park Service RTCA Hydropower Assistance Program, Anchorage, AK

Sue Jennings, Environmental Compliance Specialist, Mount Rainier National Park, Ashford, WA

Concurrent Session #52 • Three Sisters • Panel Discussion

**Nunaq Igtuq: Protecting Yup'ik Traditions and Nationally Significant Resources in a Changing World**

Heather Rice, Outdoor Recreation Planner, NPS Rivers, Trails, and Conservation Assistance Program, Anchorage, AK

In rural Alaska, all-terrain vehicles (ATVs) are the main mode of transportation due to the absence of roads. Near the coastal village of Hooper Bay, on the Yukon-Kuskokwim Delta, land is rich in subsistence resources, including migratory birds, that residents depend on for their traditional way of life. Unfortunately, the unmanaged use of ATVs has caused severe damage to plants and wildlife in the area. This session tells the story of how residents of this Native Alaskan (Yup'ik) village united with multiple and diverse partners to address this problem. Solutions included constructing a single improved ATV trail across wetland tundra and creating an ATV education program highlighting Yup'ik conservation values to encourage use of the trail. This project received a 2008 Department of Interior Cooperative Conservation Award, and is an inspiring model for other communities and protected areas nationwide that are dealing with ATV use and related resource issues.

Panelists: William Naneng, General Manager, Sea Lion Corporation, Hooper Bay, AK

Ryan Maroney, Coordinator, Lower Kuskokwim Resource Conservation & Development Program, USDA Natural Resource Conservation Service, Bethel Field Office, Bethel, AK

Brian McCaffery, Education Specialist, U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Bethel, AK

Lisa Holzapfel, Alaska Program Manager, NPS Rivers, Trails, and Conservation Assistance Program, Anchorage, AK

Kevin Meyer, Trails Specialist and Soil Scientist, National Park Service, Alaska Region, Anchorage, AK

Concurrent Session #53 • Mt. Bachelor • Panel Discussion

**Applying Cooperative Agreements for All-Hazards Emergencies: Two Examples**

Chairs: Ann Hitchcock, Curator/Senior Advisor for Scientific Collections and Environmental Safeguards, National Park Service, Washington, DC

Barrett Kennedy, Professor, Louisiana State University School of Architecture, Baton Rouge, LA

Cooperative agreements can be effective emergency preparedness and response tools. In a preparedness example, Louisiana State University and the National Center for Preservation Technology and Training collaborate to develop techniques for rapid documentation of heritage resources using Spatial Video Documentation (SVD) to capture geospatial data and video imagery of cultural landscapes and historic communities in Louisiana's high-risk coastal zone. The presentation includes explanation of the SVD approach and examples of current fieldwork in Louisiana. In a response example, NPS and the University of Georgia, partners in the Piedmont South Atlantic Coast Cooperative Ecosystem Study Unit (CESU), describe a pilot project to enhance federal emergency response capability for natural and cultural resources and improve coordination with non-federal responders. CESU cooperative agreements can facilitate rapidly deploying needed experts when federal agencies lack sufficient responders or technical expertise for response on federal lands or to FEMA-coordinated responses in states under Presidentially-declared disasters.

Panelists: Ray Albright, National Park Service CESU Coordinator, Piedmont-South Atlantic Cooperative Ecosystem Studies Unit, Knoxville, TN

James M. Sweeney, Associate Dean, Research and Service, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

Andy Ferrell, Chief, Architecture and Engineering, National Center for Preservation Technology and Training, National Park Service, Natchitoches, LA

Concurrent Session #54 • Mt. Hood • Invited Papers

**Kaloko Honokohau: An Emerging Case History of Integrated USGS Research Meeting Park Needs**

Chair: David Foote, Ecologist, U.S. Geological Survey, Pacific Island Ecosystems Research Center, Hawaii National Park, HI

Session overview: In 2006, the U.S. Geological Survey's Hawaii Ridge-to-Reef Program received the Survey's regional Innovation in Integrated Science Award for multidisciplinary research in the Hawaiian Islands. This interdisciplinary team has been working together to explain how changing tropical watersheds are affecting coral reef ecosystems and coastal habitats. The speakers in this session illustrate how holistic studies of watershed "ridge-lo-reef" processes can be applied emerging threats, such as the impacts of existing and proposed groundwater withdrawal near Kaloko Honokohau National Historical Park. At stake are unique anchialine pools that form a rare mixohaline ecosystem where groundwater and seawater mix. These pools are significant living-cultural resources and provide habitat for candidate endangered crustaceans and aquatic insects. Presentations by scientists and park managers from across a range of disciplines illustrate how science information can be gathered and assimilated for use by the National Park Service to help respond to a rapidly changing world.

#### **Protecting a Rare Brackish-Water Ecosystem from Rapidly Emerging Threats**

Elizabeth Marrack, Marine Habitat Research Specialist, University of Hawaii-Hilo Cooperative Ecosystems Studies Unit, Kailua Kona, HI

Sallie Beavers, Marine Ecologist, National Park Service, Kaloko-Honokohau National Historical Park, Kailua Kona, HI

Mariska Weijerman, Marine Habitat Research Specialist, University of Hawaii-Manoa Cooperative Ecosystems Studies Unit, Kaloko-Honokohau National Historical Park, Kailua Kona, HI

Scott R. Santos, Assistant Professor, Department of Biological Sciences, Auburn University, Auburn, AL

Rare worldwide, anchialine pools are brackish-water ecosystems found in coastal permeable substrates where groundwater flow interfaces with tidally influenced, subsurface seawater. Kaloko-Honokohau National Historical Park contains approximately 20% of Hawaii's anchialine pools. These pools are significant living-cultural resources and provide habitat for candidate endangered species, as well as genetically isolated populations of other organisms. Anchialine pools are threatened by multiple anthropogenic activities that include alterations to ground-water quality and quantity by increasing land development activities, alien species, and climate change. Because anchialine pools connect marine and aquifer processes, and sustain complex biological systems, an interdisciplinary approach is needed to understand and protect this resource. The National Park Service, through partnerships with the U.S. Geological Survey and universities, is building a body of defensible data that includes current-condition assessments of physical and biological parameters, population structure, hydrology, sea level processes, and ecosystem thresholds to manage pools from rapidly emerging external threats.

#### **Numerical Modeling of the Ground-Water-Flow System in and near Kaloko-Honokohau National Historical Park**

Delwyn Oki, Hydrologist, U.S. Geological Survey, Pacific Islands Water Science Center, Honolulu, HI

Gordon W. Tribble, Director, U.S. Geological Survey, Pacific Islands Water Science Center, Honolulu, HI

Paula Cutillo, Hydrologist, National Park Service, Water Resources Division, Water Rights Branch, Fort Collins, CO

Kaloko-Honokohau National Historical Park (KAHO) on the western coast of the Island of Hawaii includes culturally important aquatic habitats used by endemic, threatened, endangered, and candidate species that are dependent on ground water. Nearby rapid urbanization and escalating ground-water development have the potential to adversely affect KAHO's aquatic resources. KAHO's water resources may be vulnerable to increased ground-water withdrawals, proposed injection of reverse osmosis concentrate, and non-point source pollution associated with urban activities and land use. A three-year ground-water modeling study was recently initiated to evaluate the effects of selected anthropogenic and natural factors on salinity and water levels in and near KAHO. The numerical model developed by this study will be used to evaluate threats to ground-water dependent aquatic habitats and develop effective management strategies for protection of KAHO's aquatic resources.

#### **Biological Communities Associated with Anchialine Pools in Hawaii's National Parks**

David Foote, Ecologist, U.S. Geological Survey, Pacific Island Ecosystems Research Center, Hawaii National Park, HI

Lori Tango, Research Project Specialist, Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii National Park, HI

Cynthia King, Research Project Specialist, Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii National Park, HI

Meredith Acly, Research Project Specialist, Pacific Cooperative Studies Unit, University of Hawaii at Manoa, Hawaii National Park, HI

Karl Magnacca, Entomologist, Pacific Cooperative Studies Unit, University of Hawaii at Manoa, Hawaii National Park, HI

Inventories of invertebrates associated with anchialine pools were conducted at 10 pool complexes within National Parks on the island of Hawaii. A total of approximately 142 pools were surveyed with the primary goal of documenting endemic and introduced arthropod fauna. Native crustaceans, including two species of anchialine pool shrimp, comprised approximately 25% of the fauna, followed by mollusks. The dominant native invertebrate group present was aquatic insects. Native diptera (flies) and odonates (dragonflies and damselflies) comprised 53–70% of the fauna at the 10 pool complexes. The rarest native pool arthropod was the endemic orangeblack damselfly, *Megalagrion xanthomelas*, a candidate endangered species. Seventy-nine percent of orangeblack damselfly sightings were at 3 pools (mean of 42 sightings per pool). Differences in habitat preferences among anchialine pool fauna may reflect important differences in underlying tolerances for the shifting physical environment of the pools, including changes in temperature and salinity.

#### **Process Studies of the Flux, Fate, and Importance of Submarine Groundwater Discharge to Kaloko-Honokohau National Historical Park, Hawaii**

Eric Grossman, Geologist, U.S. Geological Survey, Pacific Science Center, Santa Cruz, CA

Karen Lisa-Knee, Department of Geological and Environmental Sciences, Stanford University, CA

Adina Paytan, Department of Earth & Marine Sciences, University of California, Santa Cruz, CA

S. Beavers, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

L. Marrack, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

P. Cutillo, National Park Service, Natural Resources Program Center, Ft. Collins, CO

Fresh and cool submarine groundwater discharges along the west Hawaii coast support rare coastal habitats for endemic and culturally important species. Recent studies indicate that future groundwater use accompanying Kailua-Kona's rapid urbanization since the mid-1970s has the potential to decrease groundwater flux to the coast by 50%. During the same time, nearshore nutrient concen-



trations have increased significantly. The importance of submarine groundwater discharge to coastal ecosystems is poorly understood. However, both freshwater and marine communities may be dependent on specific levels of groundwater inputs. To address the increasing need to predict the cumulative impacts of urbanization and climate change on groundwater-fed ecosystems and the Kaloko-Honokohau National Historical Park mission of perpetuating Hawaiian culture, an interdisciplinary team of scientists is quantifying submarine groundwater discharge, coastal water quantity and quality, and determining its importance to ecosystems and human well being.

#### **Applications of Holistic Science to Meet National Park Service Information Needs**

Loyal Mehrhoff, Director, U.S. Geological Survey, Pacific Island Ecosystems Research Center, Honolulu, HI

Gordon W. Tribble, Director, U.S. Geological Survey, Pacific Islands Water Science Center, Honolulu, HI

Michael E. Field, Geologist, USGS Pacific Science Center, Santa Cruz, CA

In 2006, the U.S. Geological Survey's Hawaii Ridge-to-Reef Program received the Survey's regional Innovation in Integrated Science Award for multidisciplinary research in the Hawaiian Islands. This team of hydrologists, biologists and marine geologists has been working together to explain how changing tropical watersheds are affecting coral reef ecosystems and coastal habitats. Recent research at Kaloko-Honokohau illustrates how holistic studies of watershed "ridge-to-reef" processes can be applied emerging threats, such as the impacts of existing and proposed groundwater withdrawal near the park. Modeling and key resource monitoring enable tracking of environmental indicators linked to changes in water quality and facilitates adaptation and mitigation efforts by park resource managers. The USGS, with its partners, is uniquely suited to understanding and predicting changes in park ecosystems by using an ecosystems approach that integrates traditionally separate disciplines of biology, geology and hydrology.

Concurrent Session #55 • Mt. St. Helens • Panel Discussion

#### **Can Noninvasive Research Methods for Wildlife Improve Our Understanding and Management of Wilderness?**

Michael Schwartz, Conservation Genetics Team Leader, US Forest Service Rocky Mountain Research Station, Missoula, MT

Wilderness areas can be challenging places to conduct wildlife research. This is partially due to landscape remoteness, logistical constraints imposed by wilderness regulations, and even because the tools used for research can be seen as antithetical to preserving wilderness characteristics. Recently the field of wildlife biology has embraced a suite of non-invasive and non-intrusive tools that can provide new data on remote wildlife populations. These include the use of non-invasive genetic and endocrine sampling technologies, remote sensing from satellites, micro-GPS technology, and remote camera stations. In this talk we describe some of these tools, illustrate the information that they can provide, and discuss the importance of understanding and monitoring wildlife populations that live in wildernesses, as it is these populations that, not only provide baseline data, but may become the last remaining populations of a species as the climate changes. To accomplish our goals we invited researchers actively using non-invasive techniques to research and monitor wildlife, managers who use this information, and ecologists who focus on how we can maintain wilderness.

Panelists: Peter Landres, Ecologist, US Forest Service Rocky Mountain Research Station, Missoula, MT

David Parsons, Project Leader, US Forest Service Rocky Mountain Research Station, Missoula, MT

Katherine Kendall, Research Biologist, USGS NOROCK, West Glacier, MT

### **Wednesday Morning, March 4**

Concurrent Session #56 • Multnomah • Panel Discussion

#### **Monitoring and Reporting Landscape Change in and around Protected Areas: From Good Science to Operational Monitoring and Reporting Systems**

Chair: Stephen Woodley, Chief Scientist, Parks Canada, Gatineau, QC, Canada

The NPS I&M Program and the Parks Canada Agency (PCA) Monitoring and Reporting Program are developing landscape monitoring protocols that are based on strong science and that can be made operational at the site level. This session will present results from some of these RS-based monitoring projects, with a focus on (1) using state of the art science; (2) ensuring methods will provide relevant information at the site level, and (3) addressing limited resources and operational constraints. Site-level challenges include developing clear monitoring objectives that resonate with parks staff, partners, and stakeholders; identifying and capturing locally relevant ecological issues with generic methodologies; and operational issues such as data management capability, science communication, reporting schedules, and the ability to acquire necessary imagery or other data. The session will finish with an overall summary of key lessons from the presentations and group discussion on a path forward for the two agencies.

Panelists: Andy Hansen, Ecology Department, Montana State University, Bozeman, MT

John E. Gross, Ecologist, Inventory and Monitoring Program, National Park Service

Concurrent Session #57 • Holladay • Invited Papers (Part 1 of a 2-Part Track)

#### **Transportation in Parks I**

Chair: Jeffrey Hallo, Assistant Professor, Clemson University; Dept. of Parks, Recreation and Tourism Management, Clemson, SC

Session overview: Transportation is a vital component of parks. However, transportation systems raise many potential issues for managers and visitors of parks. This session is the first of a two-session track of papers, whose purpose is to provide a forum for communicating results and 'best practices' from a variety of park transportation projects. In this session, papers are presented that examine (1) transportation planning partnerships that enhance park gateway communities, (2) the carrying capacity and service quality of a scenic road at Acadia National Park, (3) incentives and disincentives for day visitors' use of transit services at Acadia National Park, and (4) benefits, examples, and challenges of bicycle transportation networks on federal lands.



### **Transportation Planning Partnerships to Enhance National Parks and Gateway Communities**

Katherine Turnbull, Associate Director, Texas Transportation Institute, College Station, TX

Transportation has been an integral part of visits to many national parks—from horses to railroads, to open-topped touring coaches, to automobiles, to scenic roadways, and to hiking and biking. Congested roads, overcrowded parking lots, exhaust fumes, and vehicles blocking scenic vistas all detract from the park experience. Recently, the National Park Service (NPS) has been working with state departments of transportation, metropolitan planning organizations, and other agencies to address these concerns. New shuttle bus services, intelligent transportation systems, off-site parking facilities, and roadway improvements represent just a few examples of recent projects. Planning these and other transportation improvements is more challenging given the diverse agencies and stakeholder groups involved. This paper will highlight recent examples of transportation partnerships among various agencies, local communities, and the NPS to implement new bus services and other improvements. The role of private non-profit groups, local businesses, and national corporations will also be discussed.

### **The Carrying Capacity of a National Park Scenic Road**

Jeffrey Hallo, Assistant Professor, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

Robert Manning, Professor, University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT

Most visitors experience national parks using personal vehicles, but what is the capacity of park roads to accommodate this use? An empirically-based simulation model of Acadia National Park's primary scenic roadway—Ocean Drive—was built to explore capacity and service quality of roads in the context of a national park. Current and potential future vehicle use levels were compared in the simulation (for both existing and alternative vehicle management regimes) against visitor-reported standards for crowding/congestion. Social carrying capacities for Ocean Drive were derived from the simulation model results—both with and without an alternative management approach applied. These social carrying capacities suggest that traditional transportation planning concepts need to be reevaluated when applied to scenic or experiential roads. Also, tests of an alternative approach to managing vehicle use on Ocean Drive showed that congestion could be reduced substantially by altering existing parking policies.

### **Incentives and Disincentives for Day Visitors' Use of Transit Services at Acadia National Park**

F. Matthew Holly, Graduate Research Assistant, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

Jeffrey Hallo, Assistant Professor, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

Acadia National Park, located on Maine's Mount Desert Island (MDI), attracts over two million visitors each year. With the vast majority of these visitors traveling by automobile, traffic congestion is frequently encountered during the peak use season. This negatively impacts the quality of the visitor experience. A fare-free bus service called the Island Explorer currently provides public transportation throughout MDI. In 2008 the Island Explorer transported the most visitors in its 10-year history. To expand this service, a transportation hub called the Acadia Gateway Center is currently planned to open three miles north of MDI in 2012. The center will provide island day visitors with a central location to park and ride the bus. This presentation will examine incentives and disincentives for day visitors to use this center and the Island Explorer. Results are presented and discussed from both interviews and surveys conducted with day visitors during the 2008 use season.

### **Bicycling on Federal Lands: A Win-Win Investment**

Rebecca Gleason, Research Engineer, Western Transportation Institute, Bozeman, MT

Susan Law, Alternative Transportation Systems Planner, Federal Highway Administration, Lakewood, CO

Transportation systems on Federal lands, including units of the National Park Service, National Forests, National Fish and Wildlife Refuges, and Bureau of Land Management lands can greatly benefit from incorporating bicycling facilities and programs. Increasing numbers of automobiles in some areas have led to congestion, poor air quality, damage to natural resources, and degraded visitor experience. Increased fuel costs and climate change have spawned efforts to reduce fuel consumption and minimize the "carbon footprint" of Federal land agencies. Sixty-one percent of adults in the United States are overweight or obese and childhood obesity rates are soaring. Bicycling networks are one part of the solution to these issues. This guide is a resource for Federal land managers that presents benefits of bicycling, successful bicycling program examples, policies that support bicycling, issues and challenges, and useful resources. Bicycle transportation networks have significant positive impacts for the environment, health and visitor experience on Federal lands.

### **Visitor Experience and Transportation Systems in Yosemite National Park**

Dave White, Associate Professor, Arizona State University; School of Community Resources and Development, Phoenix, AZ

The National Park Service (NPS) is increasingly concerned about the relationship between park transportation systems and the quality of the natural environment as well as visitors' experiences. The objectives of the study are: to determine patterns of transportation use for Yosemite National Park visitors; to identify the importance of various transportation modes and satisfaction with each mode; to examine perceptions of the qualities of alternative and traditional transportation; and to identify preferences for transportation management. We collected data via on-site questionnaire from a random sample of Yosemite National Park visitors (N=533; acceptance rate 76%) during August 2007. The findings revealed three dimensions of visitors—transportation experience: freedom and access, environmental responsibility, and stress and conflict. Visitors more strongly associated freedom and access and stress and conflict with private automobiles. On the contrary, visitors associated alternative transportation with environmental responsibility. The implications of the findings for transportation management are discussed.

(Track continues in Concurrent Session #79)

**Water Allocation: The Right Amount of the Right Type**

Chair: Joe Meyer, Chief, Physical Science and Geographic Information Systems Branch, Yosemite National Park, El Portal, CA

**Groundwater Withdrawal: How Will It Affect Small Mammals?**

Bryan Hamilton, Wildlife Biologist, Great Basin National Park, Baker, NV

For national parks in the arid West, the interaction between human, biological, and hydrological resources is a significant issue. Groundwater pumping is planned by the Southern Nevada Water Authority from valleys adjacent to Great Basin National Park (GRBA). This pumping could reduce or eliminate stream flows in areas susceptible to groundwater withdrawal. I sampled small mammal communities near two susceptible streams and contrasted these with a non-susceptible community. Susceptible small mammal communities were distinct from non-susceptible communities in evenness, similarity indices, and species composition. Small mammal diversity in susceptible areas is a unique park resource maintained by the contrast between xeric uplands and mesic riparian habitats. Increases in xeric adapted small mammals and decreases in riparian dependent species may indicate changes in community structure due to groundwater withdrawal. These results suggest that groundwater pumping may reduce small mammal diversity in park ecosystems through changes in riparian areas.

**Water Chemistry Trends in Big Rivers of the Northern Colorado Plateau**

David Thoma, Hydrologist, NCPN Inventory and Monitoring Program, Springdale, UT

Dusty Perkins, Program Manager, National Park Service, Northern Colorado Plateau Network, Biology Department, Mesa State College, Grand Junction, CO

Large rivers on the Colorado Plateau are not entirely within the management realm of park managers, yet the quality of water in these rivers can profoundly influence aquatic biology, aesthetics and human health. Resource managers need to understand the status and trends in water chemistry and potential impacts so they can manage activities in parks to mitigate impacts and advocate for water quality outside park boundaries when opportunities arise. A powerful tool in this regard is the recent compilation of historic water chemistry data completed by USGS in support of basic water quality monitoring being conducted by the NPS Inventory and Monitoring Program. The database contains over 2 million results extending back to 1919 for the earliest record. An evaluation of status and trends for selected chemical parameters will be discussed for main stems of the big rivers on the Colorado Plateau.

**Delaware River Water Allocation for Municipal and Ecological Demands**

Alan C. Ellsworth, Regional Hydrologist, Northeast Region, National Park Service, Troy, NY

A flexible flow management program (FFMP) was enacted for the Delaware River system in water year 2008 to allocate water for municipalities and provide flows to protect aquatic species. The National Park Service works closely with the US Fish and Wildlife Service, US Geological Survey, the Delaware River Basin Commission (DRBC) and other groups to insure water is allocated to meet life requirements within the basin. Protection of the federally endangered Dwarf Wedge Mussel (*Alasmidonta heterodon*) is paramount in this endeavor. The FFMP includes an adaptive management process that is being refined to integrate ecological flow need information as it becomes available. Assessments of flow prescription efficacy for the 2008 water year and inclusion of current research findings is presented.

**Fear and Loathing along the Colorado River**

Sami Seeb, Archeologist, NPS Submerged Resources Center, Santa Fe, NM

David Choate, Archeologist, NPS Submerged Resources Center, Santa Fe, NM

Daniel Lenihan, Archeologist, NPS Submerged Resources Center, Santa Fe, NM

The Colorado River is the lifeblood of the American southwest. Its watershed contains forty units of the National Park System of which thirteen are directly on the River. Those thirteen areas encompass 63% of the total length the river and experienced more than twenty-three million visitors in 2007. An unintended consequence of the rush to set aside parklands on the Colorado River has been to embroil the NPS in some of the greatest land management issues of our time. As drought and climate change continue to impact river resources, affected parks are increasingly expected to serve in the roles of natural laboratories and classrooms. We will examine how recent submerged sites work at Lake Mead has become one focus of this new dynamic.

**Water Science from the U.S. Geological Survey in Support of Park Management**

Glenn Patterson, Research Associate, Colorado State University/National Park Service, Allenspark, CO

In partnerships with the National Park Service and other agencies, the U.S. Geological Survey (USGS) Water Resources Discipline (WRD) provides science and data to help resource managers make informed decisions. Data on streamflow, water quality, and water levels for rivers and aquifers, many in national parks, are available from the USGS National Water Information System at <http://waterdata.usgs.gov/nwis>. Other collaborations involve studies of the quality and quantity of surface and ground water. Examples include: Predictions of suspended sediment transport following dam removal on the Elwha River, Olympic National Park, Washington; Endocrine disruption in Lake Mead National Recreation Area, Nevada; Microbiological water quality in relation to water-contact recreation, Cuyahoga Valley National Park, Ohio; Sensitivity of lakes and streams to acidification from atmospheric deposition in Yellowstone, Grand Teton, and Shenandoah National Parks; Ground-water flow direction, water quality, recharge sources, and age, Great Sand Dunes National Monument, Colorado.

**Cultural Landscape Approaches to Interpreting Difficult History**

Chair: Rebecca Conard, Professor of History/Public History, Middle Tennessee State University, Murfreesboro, TN

Session overview: Cultural history is often difficult history to interpret because American society is pluralistic and because any geographical space holds layers of history, yet historical parks typically are set aside to preserve one particular aspect or a limited range of a multilayered past. As parks seek new audiences and as park management challenges become more complex, the scholarly approaches of historical and cultural geography offer new ways of “seeing” and interpreting historical parks without losing the

“core” story. Similarly, a cultural landscape approach can be useful for associating significant intangible or ephemeral manifestations of culture and history with specific places to differentiate a particular thread of the past from the contemporary landscape.

### **Toward Whole History at Stones River NHB**

Carolyn Powell, Graduate Student, Department of History, Middle Tennessee State University, Murfreesboro, TN

Elizabeth Goetsch, Department of History, Middle Tennessee State University, Murfreesboro, TN

Elena DiGrado, Department of History, Middle Tennessee State University, Murfreesboro, TN

This paper will be presented in three parts by three graduate students at Middle Tennessee State University. In collaboration with Stones River NHB, a team of students is developing an interpretive exhibit concept/model that covers the history of the battlefield area from the end of the Civil War to the present. Using a cultural landscape approach, the storyline weaves through 140 years of a changing landscape. Place-based stories integrate natural and cultural resource interpretation, embrace the history of a semi-rural African American community displaced when the battlefield park was created c. 1930, and address contemporary issues of urban encroachment. Paper 1a, Carolyn Powell—Stones River NHB: Resource Management Needs and Challenges; Paper 1b, Elizabeth Goetsch—Reinterpreting the Civil War: A Cultural Landscape Approach to Understanding “Consequences”; Paper 1c, Elena DiGrado—Toward Whole History at Stones River NHB: A Cultural Landscape Interpretive Concept.

### **Interpreting the Cultural Landscape of “the Blues” through Film: “Refuse to Fold”**

Brian Dempsey, Provost Dissertation Fellow, Center for Historic Preservation, Murfreesboro, TN

The NPS, in collaboration with other entities, has been studying the feasibility of a Delta Heritage Area for the past decade. In the meantime, the State of Mississippi appointed a commission to create a statewide blues heritage trail, documenting relevant historic sites and regions through the use of highway markers as a way to stimulate economic development through tourism. State legislation to create a designated heritage area is currently under consideration. “Refuse to Fold” is a documentary film about a juke joint called the Blue Front Café in Bentonia, Mississippi. In 2007, the Blue Front received a Blues Heritage Trail Marker, thus solidifying its historic status within the ever-expanding Mississippi blues heritage economy. By focusing on the personal narrative of owner Jimmy Duck Holmes, the film examines issues related to the use of blues culture in heritage tourism efforts in Mississippi, such as shared authority, cultural appropriation and commodification, and constructed place identity.

### **From History to Storyline: Media and Mediating the Message**

Angela Smith, PhD Research Assistant, Department of History, Murfreesboro, TN

This presentation will examine the challenges of interpreting complex, layered history for public audiences. It will compare and contrast the storyline and interpretive strategies that evolved in developing the exhibit concept for Toward Whole History at Stones River NHB and the film, *Refuse to Fold*. How does one reconcile historical integrity with gaps in the historical record? How does one reconcile the indefinite nature of cultural traditions with constructing place identity? How much information can visitors absorb? What gets left out? It also will examine the interpretive challenges posed by constraints of physical space [Stones River NHB], on the one hand, and, on the other, “placing” oral tradition and intangible cultural history on the contemporary landscape.

### **Hawaiian Storied Place Names: The Journey from Un-naming to Re-placing**

Renee Louis, Consultant, Hawaii Board on Geographic Names, Hilo, HI

“We live in a time of un-naming, in a time when old names for the land, names given in honor, happiness, and sorrow have been set aside for marketing jingles that commemorate little more than a desire for sales, for ka mea poepoe, the round thing, money” (DeSilva, 1993). Hawaiians place names are storied symbols reflecting Hawaiian spatial and environmental knowledge. Performed in daily rituals they were a conscious act of re-implacing genealogical connections, re-creating cultural landscapes, and re-generating cultural mores. This presentation highlights the sensuous nature of Hawaiian place names, examines the processes by which they are incorporated into the cultural landscape, investigates cultural conflicts and problems involved with naming places in the post-contact/modern-colonial era including the standardization of place names, and advances trans-modern solutions that re-place the old names DeSilva refers to without fueling existing cultural conflicts.

### **Indigenous Geography: A Case Study of Shared Authority**

Amy Van Allen, Outreach Manager, Smithsonian, National Museum of the American Indian, Washington, DC

Shannon Quist, Program Assistant, Smithsonian, National Museum of the American Indian, Washington, DC

Sunnie K. Hu’e, Program Director, Neighborhood Place of Wailuku, Wailuku, HI

Indigenous Geography / Geografía Indígena, a bilingual English/Spanish electronic initiative of the National Museum of the American Indian (NMAI), welcomes visitors to a virtual world where they are introduced to environmental and geographic origins of cultures, in the words of indigenous community members. Through an innovative model that allows communities to tell their own stories to a worldwide audience, the NMAI partners with communities to share authority in the development of the website. The museum provides training in media and documentation, editing and translation, and the site infrastructure; the community decides what information they wish to share and develops all content materials. Learn about the process and the partnership—and results from having this information online—from key staff and one community host, whose traditional community lands encompass Park Service lands, state lands, and private holdings.

Concurrent Session #60 • Ross Island • Contributed Papers

### **Engaging New and Diverse Communities**

Chair: Rebecca Stanfield McCown, Graduate Research Assistant, University of Vermont, Burlington, VT

### **Involving Gateway Community Youth in Protected Areas Social Science Research**

Andrew Ackerman, Research Assistant/Recreation Tech, University of Idaho/Yosemite National Park, Moscow, ID

Bret Meldrum, Branch Chief, Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park,



El Portal, CA

Kathy Dimont Branch Chief, Education Services and Interpretation Division, Yosemite National Park, El Portal, CA

During the summer of 2008, social scientists at Yosemite National Park collaborated with the Student Conservation Association (SCA) in order to work with six high school students from communities surrounding the park. Park staff involved the six teens and two SCA Project Leaders in the collection of field data that is now being used to inform park management on existing conditions throughout the historically and ecologically significant Mariposa Giant Sequoia Grove. The project focused on engaging local teenagers in social science research via direct involvement with park scientists. The study collected data that will be applied towards future efforts by the park to improve the types of experiences visitors may have in the Grove while minimizing human impacts to this unique ecosystem. Collaborative projects of this type with gateway community-based youth provides an opportunity for the students to become better acquainted with the significant natural and cultural resources that are present in their "own backyard"—an integral part in developing a sense of place and stewardship. Skills learned and experiences had during the three week project could likely foster a desire for additional learning about Yosemite and protected areas in general as the teens move forward with their education and development as adults.

### **Identifying Indigenous Community Visitor Needs at Bandelier National Monument**

Michael Kelly, Faculty, Social Research Laboratory, Northern Arizona University, Flagstaff, AZ

Fred Solop, Chair, Department of Politics and International Affairs, and Senior Scientist, Social Research Laboratory, Northern Arizona University, Flagstaff, AZ

Shawn Newell Project Manager, Social Research Laboratory, Northern Arizona University, Flagstaff, AZ

Meghan McDowell, Research Assistant, Social Research Laboratory Northern Arizona University, Flagstaff, AZ

Sara Rinfret, Research Assistant, Social Research Laboratory, Northern Arizona University, Flagstaff, AZ

Researchers from the Social Research Laboratory at Northern Arizona University conducted focus groups and interviews examining the values, beliefs, and attitudes from several Rio Grande Pueblo communities surrounding Bandelier National Monument (BAND) in Northern New Mexico. This project was designed to inform managers at BAND how to make that park service unit more relevant to neighboring indigenous populations. Research findings detail how tribal populations perceive BAND and explore past and present visitation patterns. Information emerging from the research clusters around several themes, including backcountry access to the park, resource harvesting, quality of interactions with NPS staff, employment and vending opportunities and NPS policy regarding park unit entry fees for pueblo people. The data suggest that a consequence of reduced visitation is loss of the part of pueblo culture communicated through songs and stories prompted by spatial memories recalled when the teller or singer is in a particular location at BAND.

### **Welcome to a Native Place**

Martin Earring, Cultural Information Specialist, National Museum of the American Indian, Washington, DC

In 2007 the number of indigenous people working at the National Museum of the American Indian (NMAI) was on a decline, retaining those individuals that successfully navigated the rigorous application process was difficult. This research paper explores the importance of recruiting and retaining indigenous employees in the Cultural Interpreter and Visitor Services Programs of the NMAI. The paper reflects upon the experiences of past and present employees; culminating with the author's three major recommendations for refining NMAI policies and procedures to ensure maximum effectiveness in recruitment and retention. This data will prove not only useful to the National Museum of the American Indian but to all museums with an indigenous population that seek to affirm and build upon their commitment to including the Native voice in their educational and visitor services programs.

### **Branching Out: An Exploration in Landscape Management for Boston-area Youth**

Robert Page, Director, Olmsted Center for Landscape Preservation, National Park Service

The Olmsted Center for Landscape Preservation has initiated a new program connecting youth to national parks and the role of landscape management. "Branching Out" provides Boston-area youth (grades 9–12) with a broad overview of landscape maintenance practices through a series of educational workshops and hands-on field experiences. As participants progress through the sequenced educational program, they gain knowledge and field applicable skills in landscape maintenance and management. The program offers summer work options and a variety of educational sessions during the school year. Throughout the course of the program, participants explore opportunities for educational scholarships and career placement in the field of landscape management. This paper will describe how the program exposes participants to the National Park Service and associated sites in the Boston-area; forges connections between youth and local landscapes; provides landscape maintenance support to National Park Service sites in the region; and fosters opportunities for participants to pursue employment and/or further education in the field of landscape management.

Concurrent Session #61 • Oregon • Contributed Papers

### **Getting from Conflict to Resolution: Case Studies**

Chair: Judy Alderson, Wilderness/NNL Regional Program Coordinator, National Park Service, Anchorage, AK

### **The Timbisha Shoshone and Death Valley National Park**

Theodore Catton, Associate Research Professor, University of Montana, Missoula, MT

The Timbisha Shoshone Homeland Act of 2000 transferred into trust for the Timbisha Shoshone Tribe 313.99 acres in the heart of Death Valley National Park. Further, the act designated a large area of the park in which tribal members are authorized to pursue low impact, ecologically sustainable, traditional practices under a management plan mutually agreed upon by the Tribe and the NPS. While the act boldly redefined the role of indigenous people within this protected area and put the long-troubled relationship between the Tribe and the NPS on a new footing, the act rested on years of difficult negotiations between tribal members and their representatives and federal officials. My paper will summarize a report I am preparing for the NPS that documents the administrative history behind the act. At issue is what ultimately led the Tribe and the NPS to a mutually satisfactory new framework.



### **From Sabotage to Sandwiches: The Transformation of Conflict in the Clackamas River Watershed**

Wesley Wong, Restoration Biologist, Mt. Hood National Forest, and Graduate Student, Conservation Biology, University of Michigan School of Natural Resources and Environment, Estacada, OR

I examine a surprising transition from conflict to collaboration and the dynamics of civic engagement on public forests in this case study. Having exhausted legal procedures to halt a logging project on Mt. Hood National Forest, direct action environmentalist protestors attracted national attention in 2000. Cascadia Forest Alliance members occupied trees to protect what they called the “Eagle Creek Free State.” Yet, an innovative US Forest Service team had carefully designed this timber sale supporting ecosystem-based management principles. Nevertheless, FBI crisis negotiators, congressmen, and a scientific expert panel eventually intervened in this polarized standoff. In the same watershed seven years later, environmental litigants did not appeal any Forest Service timber sales. Environmentalists and other parties began cooperating for stewardship of forest ecosystems and the local economy. What were the institutional “bricks” and interpersonal “mortar” that allowed adversaries in a contentious political landscape to find common restoration goals?

### **Values in Conflict: Native American Access to Morro Rock**

Elise Wheeler, Associate State Archaeologist, California State Parks, San Luis Obispo Coast District, San Simeon, CA

John W. Burch, Traditional Lead, Salinan Tribe of Monterey and San Luis Obispo Counties, Atascadero, CA

Morro Rock, on the central coast of California, is part of Morro Bay [California] State Park. It is an ecological reserve, a nesting area for the once listed Peregrine falcon, and a California State Historical Monument. It is also a Native American sacred site. The status of Ecological Reserve means that access to the site is restricted, while the California Public Resources Code guarantees that Native Peoples will be allowed access to places they hold sacred. Collaboration between California State Parks and the Salinan Tribe of Monterey and San Luis Obispo counties beginning in 2000 has resulted in public support for access where there had been resistance and the signing of a Memorandum of Agreement between all parties in 2006. This paper will examine how we arrived at that point, where we are now, and what is planned for the future.

### **Thinking Like a Watershed: Working Together to Expand Nahanni National Park Reserve**

Laura Pitkanen, Dehcho First Nations, Fort Simpson, NT, Canada

Jonas Antoine, Dehcho First Nations, Fort Simpson, NT, Canada

Steve Catto, Manager, Resource Conservation, Nahanni National Park Reserve, Fort Simpson, NT, Canada

David Murray, Senior Planner, New Northern Parks, Park Establishment Branch, Parks Canada, Gatineau, QC, Canada

Parks Canada and Dehcho First Nations (DFN) have been working together to expand Nahanni National Park Reserve since signing a Memorandum of Understanding in 2003. The Nahanni Expansion Working Group (NEWG), with two members from DFN and two from Parks Canada, has managed the research program, public consultations, and boundary options analysis. NEWG's work culminated in a boundary recommendation made to the CEO of Parks Canada and the Grand Chief of the Dehcho First Nations in December 2007. The recommended expansion would bring the park from less than 5,000 square kilometres to about 30,000 square kilometres to protect most of the watershed of the South Nahanni River. We discuss the project, the major hurdles, challenges from the mining sector and others, and the collaborative approach employed by DFN and Parks Canada.

### **Managing Climbers in Denali National Park: The Role of Science and Calamity in Conflict Resolution**

Frank Norris, Historian, National Trails System, National Park Service, Santa Fe, NM

An age-old question of park managers is “how much should mountain climbers be managed?” For many years, the climbing community vociferously fought against any regulation, both at Denali National Park and elsewhere. Park staff have been interacting with climbers since 1932, and until the postwar period, they had a hands-off attitude toward Mount McKinley climbers. But beginning in the late 1940s, the role of science in climbing forced park managers to get involved. And by the 1960s, climbing disasters—rare but well-publicized—brought additional pressure for a management presence. From the late 1960s through the early 1980s, the level of management presence on the mountain was a hotly argued topic, both among park managers and by climbers themselves. But the growing popularity of mountain climbing, and the attendant growth of guided climbs, has resulted in a park presence that, in recent years, has proved to be relatively uncontroversial.

Concurrent Session #62 • Alaska • Contributed Papers

### **Trends in and Constraints on Recreation**

Chair: Angeles Mendoza Sammet, Ph.D. Candidate, Faculty of Environmental Design, University of Calgary, Calgary, AB, Canada

### **Declining National Park Visitation: Perceived Causes, Assumptions, and Research Needs**

John Shultis, Associate Professor, University of Northern British Columbia, Prince George, BC, Canada

After nearly five decades of growth in national park visitation in most Western nations, user numbers in many national park systems have begun to decline. In reviewing recent policy statements and public documents from the National Parks Service (USA) and Parks Canada, several commonalities in the perception and response to these declines are identified. Equivalent perceived causes for the declines have been independently assessed by these park agencies, mainly revolving around the concern that so-called “videophilia” has limited youth's interest and use of nature in general and national parks specifically. Strong similarities are also found in variables that are not mentioned by these agencies (e.g., increased user fees, crowding). Similar agency operational responses to declining visitation are also identified and discussed. The paper also identifies the key assumptions inherent in agency responses, gauges current literature's assessment of these issues, and highlights the future research needed to support or reject these assumptions.

### **Understanding Visitors' Intention to Visit State Parks: An Application of Theory of Planned Behavior**

Suresh Shrestha, Ph.D. Student, West Virginia University, Morgantown, WV

Robert C. Burns, Recreation, Parks and Tourism Resources, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV

A survey of 179 visitors to six selected state parks along Columbia River Gorge, near Portland, Oregon, was conducted from July 24 to August 4, 2008. Theory of Planned Behavior (TPB) was used to understand visitors' intentions to visit the state park in the future plus purpose for visiting the state parks. Previous literature has shown that intention an important predictor of future behavior. The role of past-experience, self-esteem, and intrapersonal and structural constraints in predicting future intentions was also examined. Composite indices, including observable variables associated with attitude, subjective norms and perceived behavioral control (PCB), indicated that respondents possessed positive views toward intention to visit the state parks in next three months. Multiple regression analysis showed that PCB was a significant predictor of intention to visit a state park. Preliminary results of structural equation modeling using AMOS showed that the data fit moderately well with the original TPB model.

### **National Parks and Amenity-Supported Local Economic Vitality: Apostle Islands and Pictured Rocks National Lakeshore**

Thomas Power, Research Professor, Economics Department, University of Montana, Missoula, MT

Changes in the American economy have made economic activity more mobile in the sense that narrow economic considerations no longer necessarily dominate location decisions. This has made the attractiveness of areas as places to live an important determinant of the location of economic activity. National Park units can be thought of as one of those local amenities, but not necessarily the only or dominant one. This paper looks for signs of "amenity-supported" local economic development in two relatively isolated rural areas that also contain small National Park units: The regions around Apostle Islands and Pictured Rocks National Lakeshores. The paper seeks to identify the full range of local amenities that make these areas attractive places to live and the role played by the National Park units within that set of amenities. This provides a broader view of the local economies that does not necessarily put National Park units at the center of the local economy. This approach should encourage more productive cooperation within the regional economy in protecting and developing the local sources of economic well being.

Concurrent Session #63 • Idaho • Panel Discussion

### **Geoparks: Creating a Vision for North America**

Chair: Suzette Kimball, Associate Director for Geology and International Programs, U.S. Geological Survey, Reston, VA

The Global Network of National Geoparks is a network of 57 parks in 18 countries, assisted by UNESCO, that provides opportunities for geotourism, interprets geological heritage, assists local economies, supports research and understanding of geological processes, and connects people to the landscape. As defined by UNESCO, "A Geopark is an area with a geological heritage of significance, with a coherent and strong management structure and where a sustainable economic development strategy is in place ... geological heritage and geological knowledge is shared with the broad public and linked with broader aspects of the natural and cultural environment, which are often closely related or determined to geology and landscape." In this session, a panel of international experts on geoheritage will present the geopark concepts and lead a discussion of how and where geoparks may be applied within the North American community of protected areas.

Panelists: Robert Missotten, Chef, Section Observation Globale de la Terre, UNESCO

Tim Badman, Special Advisor, World Heritage Programme on Protected Areas, IUCN

Wesley Hill, Director of International Programs, Geological Society of America

Concurrent Session #64 • Mt. Bachelor • Invited Papers (Part 1 of 2-Part Track)

### **Recreation Ecology I**

Chair: Jeffrey Marion, USGS Research Scientist, Virginia Tech, Department of Forestry, Blacksburg, VA

Session overview: Recreation ecology is a field of study that seeks to assess and understand the environmental impacts resulting from recreational activity in protected natural areas. These studies can help managers to identify, monitor, manage, and rehabilitate recreation impacts. This session includes papers related to trampling impacts associated with off-trail hiking in parks, trail-based day-hiking, and overnight camping.

### **Lessons Learned from Multi-scale Longitudinal Studies of Recreation Impacts**

Dave Cole, Research Scientist, Aldo Leopold Wilderness Research Institute, Missoula, MT

Most recreation impact studies are short-term studies conducted at a single scale. Much has been learned from such studies. But important lessons can only be learned from long-term trend studies and by conducting research at multiple scales. In this paper, I present results of long-term trend studies on campsites in the Eagle Cap Wilderness, Oregon, and Grand Canyon national Park, Arizona. In each place, a detailed study of conditions on a sample of campsites was complemented by data collected in an inventory of all campsites in selected drainages/management zones. The diversity of campsite management styles in these two areas makes it possible to evaluate the effectiveness of different management strategies. Campsite impacts have generally increased but more as a result of impact proliferation than the deterioration of long-established campsites

### **Site Management and Education: Integrated Approaches to Keeping Visitors on Trail**

Logan Park, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Jeffrey Marion, USGS Research Scientist, Virginia Tech, Department of Forestry, Blacksburg, VA

Jeremy Wimpey, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Visitors often depart established trails in popular frontcountry settings, commonly causing trampling-related impacts to the local biota. Managers must then cope with these impacts through a variety of management actions, including trail/site management, visitor education, and regulations. But which actions are most effective? Which management alternatives least affect the quality of recreational experiences? This paper describes a collaborative effort at the C&O Canal National Historic Park to better understand how combinations of site management and information/education techniques may be used to reduce rates of off-trail travel while preserving engaging recreation experiences.

### **Off-Trail Hiking: Who Does It, Why, and What Works to Reduce It**

Karen Hockett, Visiting Assistant Professor, Virginia Tech, Department of Forestry, Blacksburg, VA

Jeffrey Marion, USGS Research Scientist, Virginia Tech, Department of Forestry, Blacksburg, VA

Yu-Fai Leung, Associate Professor, Parks, Recreation and Tourism Management, North Carolina State University, Raleigh, NC

Amanda Clark, formerly Graduate Student, Parks, Recreation and Tourism Management, North Carolina State University, Raleigh, NC

Debbie Hoffbeck, Graduate Student, Parks, Recreation and Tourism Management, North Carolina State University, Raleigh, NC

On Bear Island, in the C&O Canal National Historic Park near Washington, D.C., high rates of off-trail hiking have resulted in the creation of 9.5 miles of informal trails, adjacent to 3.5 miles of formal trails, that threaten the area's many rare and sensitive plant communities and species. This study evaluated the efficacy of educational messaging and increasingly intrusive site management actions in discouraging off-trail hiking by asking visitors (exit survey) to report their off-trail hiking behavior and describe their motivations for going off-trail. We also evaluated the effectiveness of the interventions with respect to visitor demographics, knowledge of the resource, perceptions of off-trail hiking impacts, and experience with and attachment to the area. This presentation will report major findings from the visitor survey, compare survey results with findings from a corresponding observational component of the study, and discuss management implications. Visitor support for potential management actions will also be discussed.

### **Quantifying the Natural Resource Consequences of Day Use in Rocky Mountain National Park**

Christopher Monz, Assistant Professor of Recreation Resources, Department of Environment and Society, Utah State University, Logan, UT

Ashley D'Antonio, M.S. Candidate, Department of Environment and Society, Utah State University, Logan, UT

Steve Lawson, Associate Professor, Virginia Tech, and Resource Systems Group, Inc., White River Junction, VT

Peter Newman, Associate Professor, Protected Areas Management, Warner College of Natural Resources, Colorado State University, Fort Collins, CO

Dave Pettebone, Doctoral Candidate, Warner College of Natural Resources, Colorado State University, Fort Collins, CO

Larry Gamble, Chief, Branch of Planning and Compliance, Rocky Mountain National Park, Estes Park, CO

Understanding the natural resource consequences of visitor use in parks is essential for avoiding the impairment of park resources and visitor experiences. In particular, visitor use in areas off hardened surfaces, such as designated trails and sites can result in rapid and significant change in resource conditions. This research reports on an ongoing study in the Bear Lake corridor of Rocky Mountain National Park where resource change as a result of visitor activities off designated trails and sites was assessed. The vast majority of this use was from day use visitors engaged in hiking, fishing and climbing activities. Standard procedures were used to assess visitor-created sites and informal trails, while new methodologies were developed to assess larger areas of more diffuse resource impact. Preliminary results suggest that visitor-created resource impacts were prevalent and intense, but were somewhat spatially limited to areas around destination sites (lakes, view sites, etc.) and established trail corridors.

### **Thirteen years of Monitoring Campsite Conditions in Prince William Sound, Alaska, USA**

Paul Twardock, Associate Professor of Outdoor Studies, Alaska Pacific University, Anchorage AK

Christopher Monz, Assistant Professor of Recreation Resources, Department of Environment and Society, Utah State University, Logan, UT

Recreational use of the Nellie Juan Wilderness Study Area in Prince William Sound has risen substantially since the early 1990s, with a dramatic increase as a result of the opening of the Whittier tunnel (formerly rail only) to vehicle traffic in 2000. Since 1995 the authors and colleagues have studied changes in resource conditions on over 215 campsites in western Prince William Sound. Individual sites have been assessed multiple times between 1995 and 2008 for site size, condition class, vegetation loss, root exposure, and other human impacts utilizing standard campsite assessment procedures. Preliminary findings suggest that during this period some sites have shown dramatic changes influenced by management and use patterns but overall average condition class has remained stable. Other indicators such as tree damage, root exposure, and litter have also remained unchanged, although the number of sites with signs of human waste has increased.

(Track continues in Concurrent Session #97)

Concurrent Session #65 • Mt. Hood • Invited Papers (Part 2 of 3-Part Track)

### **Protecting Natural Sounds II: Assessing Acoustical Conditions in Parks**

Chair: Kurt Fristrup, Senior Scientist, National Park Service, Natural Sounds Program, Fort Collins, CO

Session overview: Park acoustical environments encompass diverse categories of sounds, and many potential impacts of noise merit attention. This session will discuss recent advances in data collection, analysis, and noise modeling. New methods for assessing the effects of noise from transportation corridors will be presented. The potential effects of noise on wildlife will be discussed. A comparative analysis of acoustical conditions across many park units will be given. Collectively, these talks will provide a concise introduction to the several tools that resource planners might use to address acoustical issues in National Park units.

### **The Acoustical State of the Parks: A First Look**

Kurt Fristrup, Senior Scientist, National Park Service, Natural Sounds Program, Fort Collins, CO

Charlotte Formichella, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Damon Joyce, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Emma Lynch, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Ericka Pilcher, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Acoustical monitoring data have been collected for more than 40 park units, spanning a wide range of regions, resources, and park purposes and values. The breadth of these data permits a comparative analysis to identify aspects of the acoustical environment that can be attributed to generic factors such as latitude, altitude, vegetative characteristics, hydrographic regime, and placement relative to transportation corridors. All park units in this analysis, including historic sites in urban settings, are subject to noise that could be reduced or mitigated through management action. One emergent conclusion from this work is that wilderness areas



throughout the systems are increasingly imperiled by extrinsic noise sources.

#### **Modeling and Mapping Transportation-related Noise Impacts in Protected Natural Areas**

Ken Kaliski, Director of Environment, Energy, and Acoustics, Resource Systems Group, Inc., White River Junction, VT

Adam Gibson, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Steve Lawson, Resource Systems Group, Inc., White River Junction, VT

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Robert Chamberlin, PTOE Director, Resource Systems Group, Inc., White River Junction, VT

Frank Turina, Resource Planner, National Park Service, Natural Sounds Program, Fort Collins, CO

Kurt Fristrup, Kurt Fristrup, Senior Scientist, National Park Service, Natural Sounds Program, Fort Collins, CO

Over the past several years, the technology for creating noise maps covering large geographic areas has significantly advanced. The European Union now uses noise mapping to assess the exposure of their communities to unhealthy noise levels. In the same way, national parks can use noise maps to predict the exposure of their visitors to human-induced noise. In one of the first significant application to vehicular noise in a U.S. national park, Rocky Mountain National Park is using noise mapping to assess the change in noise exposure resulting from various transportation planning options. The project includes background sound level monitoring to assess existing conditions, model calibration, and computer modeling of transportation noise for various bus and parking scenarios over a 20,000 acre area. This information is integrated with visitor use models to estimate the number and location of people that could be exposed to various levels of transportation noise.

#### **Conserving the Wild Life Therein: Protecting Park Fauna from Noise**

Jesse Barber, Postdoctoral Associate, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO

Casey Brown, Graduate Student, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO

Kurt Fristrup, Senior Scientist, National Park Service, Natural Sounds Program, Fort Collins, CO

Amanda Hardy, Graduate Degree Program in Ecology, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO

Kevin Crooks, Associate Professor, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO

Lisa Angeloni, Assistant Professor, Department of Biology, Colorado State University, Fort Collins, CO

The role of sound in the biology of animals is ubiquitous, and noise generated by humans could have volatile and unpredictable ecological consequences. Herein, we review the evidence of anthropogenic sound impacts on wildlife. We first review studies of the potential effects of man-made noise through both direct disturbance and decreased auditory awareness, or masking. We then highlight our ongoing research on noise impacts in Grand Teton National Park, including investigation of ungulate response to anthropogenic noise along roads and recreational paths, and evaluating the hearing thresholds of birds during noise events such as traffic and airplane flyovers. Overall, our results will help inform managers how to maintain natural soundscapes in protected areas.

#### **Alternative Sound Monitoring Methods: Logging Sounds in Rocky Mountain National Park**

Adam Gibson, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Kurt Fristrup, Senior Scientist, National Park Service, Natural Sounds Program, Fort Collins, CO

Damon Joyce, Research Associate, National Park Service, Natural Sounds Program, Fort Collins, CO

Kenneth Kaliski, Director of Environment, Energy, and Acoustics, Resource Systems Group, Inc., White River Junction, VT

David Pettebone, Human Dimensions of Natural Resources, Colorado State University, Fort Collins, CO

Protecting soundscapes has recently become a major focus of the National Park Service. Unfortunately, sound monitoring can be a costly and technically complex process requiring specialized equipment and trained analysts for processing data. This study explored alternatives to acoustic monitoring such as "attended logging" (use of hand held devices that enable a person to list sounds heard) of actual sounds heard in the field as a replacement for more costly measures. This project included long-term sound monitoring at two base locations in addition to comparative trail transects of up to two miles (straight line distance) from trailheads. Recorded sound and sound pressure level data was then compared to logs of actual sounds heard at transect sampling locations. Results from this study can be used by managers to inform the creation of effective sound monitoring programs that are affordable, effective and efficient.

(Track continued from Concurrent Session #43; continues in Concurrent Session #109)

Concurrent Session #66 • Mt. St. Helens • Invited Papers

#### **Threats to Ocean Parks: Looking for Solutions Outside the Boundary**

Chair: Cliff McCreedy, Marine Resource Management Specialist, National Park Service, Ocean and Coastal Resources Branch, Washington, DC

Session overview: Over 55% of the US population now lives in the coastal zone. Consumptive uses of land, water, and marine life are taking their toll on coastal ecosystems. Despite their protected status, National Parks on the ocean and Great Lakes are succumbing to coastal pollution, overfishing, habitat loss, erosion and other threats. Sources of these problems frequently emanate from outside the park boundary or the jurisdiction of the Park Service, and measuring the impacts to parks at ecosystem scales can present vexing problems, all of which puts the manager squarely on the horns of a dilemma: how can coastal parks protect or restore their resources from impacts that appear to be outside of their control or scientific understanding? This concurrent session will explore innovative approaches to adaptive marine management, restoration and monitoring, and lessons in working outside the boundary in collaboration with sister agencies and other partners.



### **Making the Most of Coastal Water Quality Data in National Parks**

Eva DiDonato, Marine Pollution Ecologist, National Park Service, Ocean and Coastal Resources Branch, Sullivan's Island, SC

The National Park Service developed an Ocean Park Stewardship Action Plan to improve resource conservation within ocean and coastal parks. Good water quality in coastal parks is a significant challenge because success depends on determining resource condition inside and outside park boundaries and influencing change when necessary. Several tools currently used by parks to aid in these efforts include: 1) Watershed Condition Assessments to identify and understand resource issues; 2) analyses of water quality and other data collected by the Natural Resource Challenge Inventory and Monitoring Program; 3) synthesis of data from NPS and other agencies, such as the US EPA's National Coastal Assessment Program; and 4) collaborative, multi-agency monitoring and assessment partnerships. Ideas about how to integrate these tools for successful resource management will be discussed using Timucuan Ecological and Historic Preserve as an example.

### **An Inconvenient Park: Urban Development and Resource Protection at Kaloko-Honokohau NHP**

Sallie Beavers, Marine Biologist, National Park Service, Kailua-Kona, HI

Kaloko-Honokohau National Historical Park, Hawaii, contains 596 acres of marine waters, 158 anchialine pools (approximately 20% of the state's estimated pool resources), and two ancient Hawaiian fishponds. Anchialine pools are brackish-water ecosystems lacking surface connection to the ocean and hydrologically connected to groundwater and the ocean through a permeable aquifer. These water resources receive significant groundwater inputs, are living-cultural resources, and support threatened, endangered, and candidate species. Rapid growth and land-use changes present significant challenges for effective management of these cultural and biological resources. Currently, 3,743 acres are undergoing, or are proposed for, development within 2.5 miles of the Park. Urban water use is expected to more than double from present use. The Park is working to protect its water resources from adverse effects associated with the increased non-point source pollution to groundwater, groundwater pumping, and saltwater intrusion that accompanies urbanization. Challenges and strategies for protective measures will be discussed.

### **Foundations of Marine Reserves at the Channel Islands**

Dan Richards, Marine Biologist, National Park Service, Ventura, CA

In 1978, a small (37-acre) area at Anacapa Island was declared an Ecological Reserve. This tiny no-fishing area would play an important role in the future management of California's marine resources. The National Park Service kelp forest and rocky intertidal monitoring programs began in 1982, and the results helped illustrate the value of even this small reserve. In 2003, a network of reserves went into effect, placing approximately 20% of the park waters, about 142 sq nautical mi, into Marine Protected Areas. Extension of reserves to federal waters of the National Marine Sanctuary was finally completed in summer 2007. Analysis of monitoring and research data from the first five years shows promising results, supporting the efficacy of marine reserves.

### **Monitoring and Adaptive Management of Salt Marsh Restoration in an Urban Park**

Patricia Rafferty, Coastal Ecologist, National Park Service, Northeast Region, Patchogue, NY

Jamaica Bay, part of Gateway National Recreation Area and the largest tidal wetland complex in the New York metropolitan area, is experiencing a dramatic loss of tidal wetlands. Since 1951, 63% of the salt marsh islands in Jamaica Bay have been lost. Marsh restoration, by increasing elevation through the addition of sediment to the marsh surface, is one tool that Gateway is using to understand and manage marsh loss in the bay. The goal of the monitoring and adaptive management program is to determine factors contributing to the success or failure of the restoration, test various *Spartina* planting techniques, justify adaptive management actions, inform the development and implementation of future restoration actions, and better understand factors contributing to marsh loss throughout Jamaica Bay.

### **Staying Above Water: Maintaining Sediment Supplies for Coastal Parks During Climate Change**

Julia Brunner, Policy/Regulatory Specialist, National Park Service, Geologic Resources Division, Denver, CO

Climate change may increase sea levels by up to three feet by 2100. Consequently, many NPS-managed barrier islands may fragment or disintegrate; coastal areas in Louisiana and North Carolina may have already passed the threshold for maintaining island integrity. Maintaining sediment supplies and processes within these parks would slow or counteract such disintegration, yet the majority of national seashores face diminished sediment supply due to projects such as jetties and dredging/disposal practices. Jetties capture sediment, starving downdrift areas. Dredged navigation channels and harbors can alter nearshore wave conditions and increase wave energy and erosion; they also may trap sediment and/or flush it out to deeper waters, away from the littoral system. The NPS is currently inventorying coastal engineering projects in parks as part of developing a sediment-preservation strategy that will emphasize the true environmental and economic costs of sediment deprivation, bypassing dredged sediment, restoring park sediment budgets, and adaptive management.

### **Wednesday Early Afternoon, March 4**

Concurrent Session #67 • Multnomah • Panel Discussion

#### **Impacts of Energy Development on Parks and Opportunities for Mitigation**

Chair: Carol McCoy, Chief, Planning, Evaluation and Permits Branch, Geologic Resources Division, Natural Resource Program Center, National Park Service, Denver, CO

During this panel, National Park Service (NPS) subject matter experts will engage the audience in a lively discussion of cross-boundary impacts to parks from energy development; ways the NPS can effectively collaborate with adjacent land managers responsible for approving energy development; and actions the NPS can take to minimize its own carbon footprint. As the nation strives to meet its energy needs through development of oil, gas, coal, oil shale, tar sands, solar, wind, tidal, and nuclear both onshore and on the OCS, it is critical for the NPS to understand potential impacts to park resources and values, and be engaged in the decision-making processes of other federal, state and local agencies to advance park protection. Experience to date indicates that the earlier the NPS works with decision makers at the pre-lease and pre-approval stage, the greater success the Service has in influencing deci-

sions to account for park protection.

Panelists: Panelists: Chuck Pettee, Chief, Water Rights Branch, Water Resources Division, Natural Resource Program Center, National Park Service, Fort Collins, CO

John Bunyak, Chief, Policy, Planning and Permit Review Branch, Air Resources Division, Natural Resource Program Center, National Park Service, Denver, CO

Vickie McCusker, Acting Program Manager, Natural Sounds and Night Skies Program, Air Resources Division, Natural Resource Program Center, National Park Service, Fort Collins, CO

Elaine Leslie, Deputy, Biological Resource Management Division, Natural Resource Program Center, National Park Service, Fort Collins, CO

Shawn Norton, Branch Chief, Sustainable Operations and Climate Change, Park Facility Management Division, National Park Service, Washington, DC

Concurrent Session #68 • Holladay • Panel Discussion

### **Lessons Learned from the Application of Evaluation Research to Five Program Areas**

Chair: Nora Mitchell, Director, Conservation Study Institute, National Park Service, Woodstock, VT

Evaluation is a social science methodology for understanding the impacts of program investments and the key ingredients required to sustain effective programming over time. Evaluation has been increasingly applied to a diverse set of NPS program areas including interpretation and education (I&E), leadership development, 21st Century relevancy initiatives, national heritage areas, as well as support of strategic planning at national parks. This session introduces various approaches to evaluation and panelists will offer their perspectives on the opportunities, challenges, and lessons learned in using evaluation to improve program design and delivery.

Panelists: Rebecca Stanfield McCown, Graduate Research Assistant, University of Vermont, Burlington, VT

Jodie Riesenberger, Program Director, Center for Park Management, Fort Collins, CO

Jennifer Jewiss, Research Assistant Professor, University of Vermont, Burlington, VT

Daniel Laven, Management Assistant, National Park Service, Conservation Study Institute, Woodstock, VT

Patti Reilly, Acting Superintendent, Jamaica Bay Unit, Gateway National Recreation Area, Brooklyn, NY

Concurrent Session #69 • Broadway/Weidler • Workshop

### **Communicating Science Effectively Workshop**

Chair: William Dennison, Vice President for Science Applications, University of Maryland, Center for Environmental Science, Cambridge, MD

Effectively communicating scientific ideas and approaches is a key attribute of successful scientific programs, particularly those in which a non scientific audience is included. Yet, most scientists are not trained in this skill and will benefit from the general principles and specific examples presented in this workshop. Science communication skills do not require a particular affinity; rather they can be developed through practicing the use of some basic tenets. This workshop focuses on how to create and integrate a variety of visual elements including photographs, maps, graphs, tables, and conceptual diagrams for a diversity of science communication products including oral presentations, posters, science newsletters, web sites, books and booklets. This workshop will be led by experienced scientists who have developed communication skills in order to more effectively integrate and apply their scientific results and teach courses on science communication worldwide.

Presenters: Tim Carruthers, University of Maryland, Center for Environmental Science, Cambridge, MD

Shawn Carter, National Park Service, Washington, DC

Concurrent Session #70 • Hawthorne/Sellwood • Contributed Papers

### **Issues in Water Resource Management**

Chair: Jim Roche, Hydrologist, Resources Management and Science Division, Yosemite National Park, El Portal, CA

### **How Understanding the Hydrogeology at Great Sand Dunes National Park and Preserve, Colorado, Has Helped Protect Park Resources**

Andrew Valdez, Geologist, Great Sand Dunes National Park & Preserve, Mosca, CO

Great Sand Dunes National Park & Preserve (GRSA) of south-central Colorado is the site of a majestic dunefield where perhaps surprisingly, water is an important resource. The need to understand the hydrogeology of GRSA became apparent in the late 1980s when proposals for commercial water development on adjacent lands exposed a lack of resource knowledge and hydrological data. The NPS has made efforts to address this by developing a Resource Management Strategy and writing a Water Resource Management Plan that identified research and monitoring needs to address the information gap. By implementing the plans, the NPS was able to better understand the behavior of the natural system and evaluate potential threats such as water development. In addition, this knowledge has been critical to a boundary expansion, developing a groundwater model, acquiring protective ground water rights, and improved interpretation. GRSA is now positioned to be proactive and not reactive.

### **A Study of Ground- and Surface-water Resources in and around Great Basin National Park, Eastern Nevada**

Russell Plume, Hydrologist, U.S. Geological Survey, Carson City, NV

David Prudic, Research Hydrologist Emeritus, USGS, Carson City, NV

Donald Sweetkind, Research Geologist, USGS, Lakewood, CO

William Van Liew, Hydrologist, National Park Service, Fort Collins, CO

The U.S. Geological Survey and University of Nevada, Reno, in cooperation with the National Park Service and other Federal land management agencies, began a three-year study in and around Great Basin National Park to assess the properties and interconnections

of basin-fill and carbonate-rock aquifers, their influence on ground-water flow direction and magnitude, and their connections with surface-water resources. Planned research includes geologic mapping, streambed temperature measurements, water geochemistry, and, subject to approval, drilling in and near the Park. This research will provide information to assess the potential effects of ground-water development on the three largest streams discharging from the park, and two large springs. The results of this study will benefit Federal and State agencies and interested stakeholders by providing data to better quantify current hydrologic conditions and to proactively assess potential effects to ground-water and surface-water resources due to proposed large-scale ground-water withdrawals from adjacent Spring and Snake Valleys.

#### **Analyzing the Effects of Regulated Streamflow on the Hydrology of Congaree National Park Using Data Mining Techniques**

Paul Conrads, Hydrologist, USGS SC Water Science Center, Columbia, SC

Toby Feaster, Hydrologist, USGS SC Water Science Center, Clemson, SC

Larry Harrelson, Hydrologist, USGS SC Water Science Center, Clemson, SC

Toby Feaster Hydrologist, USGS SC Water Science Center, Clemson, SC

Bill Hulslander, Chief of Resources and Science, Congaree National Park, Hopkins, SC

Congaree National Park includes extensive swamps of old growth bottom hardwood forest. Since 1930, the Congaree River has been influenced by regulation of the Saluda Dam. Many ecologists and water-resource managers have hypothesized that the regulated flows have substantially decreased the magnitude and frequency of flooding of the riparian wetlands in the Park. To evaluate the effect of the dam on the flow and water levels of the Congaree River, the U.S. Geological Survey, in cooperation with the National Park Service, mined the historical database. Results from the study show that the regulated flow had much more of an effect on low and medium water levels than high water levels. The dam increased water levels during low and medium river stages by as much as 1.7 feet. During medium high and high flows, the dam decreased water levels at high river stages by approximately 1 foot.

#### **Threats to the Protection of Water Resources across National Park System Units**

Gail Dethloff, Director, National Parks Conservation Association, Center for State of the Parks, Fort Collins, CO

Megan Lowery, Natural Resources Program Coordinator, National Parks Conservation Association, Center for State of the Parks, Fort Collins, CO

Since 2002, as part of an ongoing program, the National Parks Conservation Association's Center for State of the Parks (CSOTP) has been assessing natural resource conditions in units of the National Park System using a standardized, peer-reviewed methodology. Categories covered in the natural resources methodology include measures related to water quality, incorporating such measurements as nutrient, metal, and dissolved gas concentrations, pH, fecal coliform levels, and flow, and physical aspects of systems including fragmentation (i.e., dams) and cover and habitat characteristics (i.e., channelization, loss of flooding). At this time, we have collected data at over fifty units of the National Park System, including numerous units with significant freshwater and/or marine resources. We have compiled the data from these units to discuss the ability of national parks to conserve water resources, and highlight the predominant threats to those resources from inside and outside park units.

#### **A New Approach to Wet Meadow Restoration at Halstead Meadow, Sequoia National Park**

Joel Wagner, Wetland Program Leader, National Park Service, Water Resources Division, Lakewood, CO

David J. Cooper, Senior Research Scientist, Department of Forest, Rangeland and Watershed Stewardship, Colorado State University, Fort Collins, CO

Evan C. Wolf, Research Associate, Department of Forest, Rangeland and Watershed Stewardship, Colorado State University, Fort Collins, CO

Athena Demetry, Restoration Ecologist, Sequoia and Kings Canyon National Parks, 47050 Generals Highway Three Rivers, CA

Montane wet meadows are vital resources at Sequoia and Kings Canyon National Parks. Their sheetflow hydrology, characteristic vegetation and deep soils regulate flow, control erosion, provide essential habitat, and offer scenic beauty and recreational opportunities. Unfortunately, Halstead Meadow has been severely degraded by gully formation. Channel incision likely started in the late 1800s when livestock stripped vegetation, and intensified in 1934 when the Generals Highway was built across the meadow and flow was concentrated into culverts. By 2005, the 2000-foot-long main gully had lowered the water table, altered vegetation, and eroded soils. In 2007-2008 we implemented a pilot restoration in the upper meadow. Rather than rehabilitating with check dams or "pond-and-plug" methods, we chose full restoration. We placed 8,000 cu yd of sediment into the gullies to restore flat meadow cross-sections, and dropped trees to spread sheetflow. We installed >50,000 native wetland plants that bind the soil, spread flow, and inhibit channel formation. Early success indicates this approach is a model for restoring lower Halstead Meadow and degraded meadows in other parks.

Concurrent Session #71 • Ross Island • Contributed Papers

#### **Challenges in Protecting and Interpreting Paleontological Resources**

Chair: Lisa Norby

#### **Cretaceous Dinosaurs in Denali: Cause for a Holocene Stampede?**

Phil Brease, Geologist, Denali National Park and Preserve, Denali Park, AK

Linda Stromquist, NPS Alaska Regional Office, Anchorage, AK

The first dinosaur footprint was discovered in Denali in the summer of 2005, and two primary trace fossil sites were identified as the field season ended. It is now known, as of the 2008 field season, that there are at least three sites, hundreds of footprints, and perhaps thousands of trace fossils in the Cretaceous Cantwell Formation, a freshwater, sedimentary unit located in the east-central part of Denali NP &P, and adjacent to the park road. Trace fossil finds so far include 3 types of dinosaurs, 1 pterosaurid, 4 types of birds, several types of fish, and many insects or other invertebrates. The finds have spurred significant interest in the fossil finds from both the visiting public, and researchers. In partnership with several NPS offices and parks, as well as the University of Alaska, and the Dallas Museum of Nature and Science, the Denali staff is preparing a Paleontological Resources Management Plan.

### **Casual Collecting of Fossils from National Park Service Shorelines**

Jason Kenworthy, Student Paleontology Technician, National Park Service Geologic Resources Division, Corvallis, OR

Julia F. Brunner, Policy/Regulatory Specialist, National Park Service Geologic Resources Division, Denver, CO

Vincent L. Santucci, Chief Ranger, George Washington Memorial Parkway, Turkey Run Park, McLean, VA

Paleontological resources (fossils) are commonly found along marine coasts and freshwater lakeshores. Approximately one-third of the 97 National Park Service areas which preserve coastal or shoreline resources are known to also preserve fossils. Beachcombing and casual fossil collection present resource management challenges along these popular coastal features. The popularity of these activities and perhaps the perceived “renewability” of coastal fossil material contribute to management challenges. As part of a Servicewide effort to document paleontological resources, nearly a dozen shoreline parks from the Atlantic and Gulf coasts and Great Lakes reported casual, and sometimes directed, fossil collection activity. Fossil types can be common to many parks, such as shark’s teeth along the Atlantic coast. Others are localized, such as “Petoskey stones” at Sleeping Bear Dunes National Lakeshore. The commonality of unauthorized collecting suggests a need for developing a strategy to address the collection of nonrenewable fossils from National Park Service shorelines.

### **Runaway Dinosaur Tracks: Cooperative Efforts to Preserve Fossil Resources at Two National Natural Landmark Sites**

Heather Germaine, Regional National Natural Landmarks Coordinator, National Park Service, Denver, CO

Joe Tempel, Executive Director, Friends of Dinosaur Ridge, Morrison, CO

Mike O’Brien, Exhibits Specialist, Texas Parks and Wildlife Department, Austin, TX

Morrison Fossil Area, Colorado and Dinosaur Valley, Texas are both designated National Natural Landmark (NNL) sites that represent significant aspects of our nation’s paleontological history. The dinosaur tracks are located on a steep hillside and in the bed of a river, respectively, and thus are exposed to the elements and susceptible to the impacts of weathering and erosion. Funding constraints and natural settings that complicate logistics, add to the challenge of preservation of these heritage resources. The NNL Program and a variety of partners have been working cooperatively to explore long-term preservation options. After implementing several stop-gap measures over the years, the Morrison Fossil Area is pursuing designs for a tracksite cover and Dinosaur Valley is undertaking a project to digitize 67 years worth of hand-drawn track maps and photodocumentation of all known tracks. These preservation projects are also creating opportunities for unique educational experiences.

### **Protecting Resources and Promoting Research: Contributions by Paleontology Interns at Florissant Fossil Beds National Monument**

Herbert Meyer, Paleontologist, Florissant Fossil Beds National Monument, Florissant, CO

Bret Buskirk, Paleontology Intern, Florissant Fossil Beds National Monument / University of Washington

Florissant Fossil Beds National Monument has sponsored 19 paleontology interns since 1997. These interns have contributed significantly to the monument’s paleontology inventory and monitoring program, providing critical assistance in conducting annual site observations and in creating and updating databases. Other intern projects beneficial to the monument have included excavations, specimen cataloging, collections management, original scientific research, research on strategies for preserving fossil stumps, curriculum development, and creation of a wide array of databases. Some intern projects have been completed as theses and/or published in peer-reviewed journals, providing benefits to both the intern and the monument. Participants acquire practical experience in paleontological resource management, which is rarely covered in academic programs. Such practical experience is potentially valuable for future employment in environmentally-oriented government agencies as well as in environmental consulting. The internship helps students define their future professional and educational direction.

### **Evolutionary Theory, Modern Ecosystems, and Paleontology Exhibits: Complexity in Resource Interpretation**

Ted Fremd, Paleontologist and Pacific West Region Science Advisor, National Park Service, Kimberly, OR

The temporally thin veneer of modern ecosystems and hominid cultural overprints are underlain by a tremendous record of deep time, accurately recorded by biotas entombed in geologic strata. The fossil record provides direct evidence of the processes and events that have resulted in existing species, all of which are entirely the product of coevolutionary mechanisms. Paleontological areas preserved in the world’s national park systems are ideally situated to provide the public with access to scientifically accurate information concerning evolution. This role is becoming increasingly important as fresh waves of creationist-inspired literature and education programs continue to afflict the populace, particularly in the United States. Without a clear understanding of the fact that the earth’s organisms are a result of millions of years of speciation and extinction, critical modern habitats appear less profoundly imperiled by human activities, and evidence of impending global climate change proceeding at unprecedented rates may be underappreciated.

Concurrent Session #72 • Oregon • Contributed Papers

### **Integrating Cultural Values with Western Science and Resource Management**

Chair: Brent A. Mitchell, Vice President, Stewardship, QLF Atlantic Center for the Environment, Ipswich, MA

### **Tuntutq Contingency: Oral History and Caribou Logic on the Alaska Peninsula**

Loukas Barton, Archaeologist, Katmai, Aniakchak, and Alagnak NPS Areas, King Salmon, AK

Caribou have been important to life on the Alaska Peninsula for thousands of years. During this time, the abundance of caribou, strategies for taking caribou, and decisions about when and if to hunt them have varied in response to environmental, technological, and regulatory change. In spite of these changes, scholars argue for a universal logic to large-game hunting. The 20th century alone has witnessed many of these changes, and many residents have lived through them. These are the people to query about the details of caribou hunting through time—they provide a test for the logic used both to interpret the past, and manage the future. This project is an attempt to collect and preserve traditional knowledge about caribou hunting on the Alaska Peninsula. I present the foundations of it here to elicit feedback—suggestions, criticisms, and discussions—regarding its feasibility, sensitivity and utility.



### **Understanding the Footsteps of Ancestors: Integrating Cultural Values into Natural Resources Monitoring**

Leslie HaySmith, Ecologist, National Park Service, Volcano, HI

Corbett Nash, Research Corporation of the University of Hawaii, Hawaii Volcanoes National Park, HI

The Pacific Island Network has developed science communication tools to convey natural resource history, issues, and trends within a cultural context. The Pacific Islands are known for strong native cultural ties, which should be holistically integrated into resource monitoring. As part of science communications outreach, the Network has conducted scoping sessions to better understand changing natural and cultural foundations of our parks. A key component of PACN science communications is the use of conceptual diagrams (historical map-making), that were constructed by working with park natural and cultural resource staff and elders or "kupuna." This information forms a building block for developing baseline diagrams to detect changes in our parks over several centuries. This data is integrated into website drill down systems, thereby providing a better understanding of resource trends, their cultural significance, and adaptive management strategies based on strong cultural ties to the landscape.

### **Monitoring and Mayhem: The Challenge of Multi-Stakeholder Initiatives in Managing the Peace-Athabasca River Delta**

Jeff Shatford, Park Monitoring Ecologist, Wood Buffalo National Park, Fort Smith, NT, Canada

Stuart Macmillan, Wood Buffalo National Park, Fort Smith, NT, Canada

The Peace-Athabasca Delta in Wood Buffalo National Park, Canada is unparalleled in its extent, beauty and productivity in the northern boreal landscape. However, the flow of water into the marshes, lakes and channels is increasingly under management and use by interests outside of WBNP. Large-scale oil sands development on the Athabasca River and hydro-electrical projects on the Peace put the delta, its abundant wildlife and the livelihood of its indigenous residents, at risk. In 2007, we initiated a cooperative monitoring program to bring attention to the condition of the delta and provide recommendations for watershed management. The challenge for park managers is meeting the interests of provincial and federal governments and the governing bodies of 11 aboriginal groups. Each brings their own mandate, institutional and financial challenges. The program is being designed to integrate both traditional knowledge and western science that will inform its broad membership and protect the natural wonders of the delta.

### **Utilizing Indigenous Knowledge in Ecosystem-based Management of Papahānaumokuākea Marine National Monument, Hawaii**

Aulani Wilhelm, Papahānaumokuākea Marine National Monument, NOAA Office of National Marine Sanctuaries

Randall Kosaki, Papahānaumokuākea Marine National Monument, NOAA Office of National Marine Sanctuaries

As one of the world's largest marine managed areas, the Papahānaumokuākea Marine National Monument (Papahānaumokuākea) offers an unprecedented opportunity to take incremental and informed steps toward ecosystem-based management at a large scale. There are similarities between managing at an ecosystem level and the traditional knowledge and practices implemented by Native Hawaiians to manage their natural resources and systems. Both approaches share the view of nature as a holistic and dynamic system of interrelated parts and emphasize the need for long-term sustainability and health of our natural resources. This presentation will highlight initiatives recently undertaken by managers at Papahānaumokuākea to seek out indigenous Hawaiian and local knowledge (often termed "Traditional Ecological Knowledge") alongside western scientific perspectives to learn, adapt and manage the biodiversity and abundance of ecosystems within Papahānaumokuākea. Examples of these initiatives will be presented along with lessons learned, outcomes and recommendations for incorporating indigenous knowledge and values in marine conservation.

### **The Arizona Trail: A Path to Appreciation**

Shawn Hyde, Undergraduate Student, Arizona State University, Phoenix, AZ

The Arizona Trail is an 809-mile, non-motorized, continuous long-distance trail that, when complete, will allow trekkers to wind their way along some of the state's most intensely scenic, culturally significant and ecologically diverse terrain. Beginning in the south at Coronado National Memorial (U.S./Mexico border) and terminating at Arizona's northern border with Utah, the path wanders through a number of national forests, parks and monuments, BLM domains, state parks, and county, city and privately owned lands. This paper will explore historic American attitudes, both positive and negative, toward the creation of multiagency managed, long-distance scenic trails and will analyze the methods by which Arizona Trail land management partnerships hope to mitigate the physical and social obstacles inherent in such. It too will address the overall success of such projects in generating a greater appreciation of America's parks, protected areas, and cultural sites.

Concurrent Session #73 • Alaska • Invited Papers

### **An Island No Longer: Bridges from Crater Lake to the Klamath Basin and Beyond**

Chair: Steve Mark, Historian, National Park Service, Crater Lake, OR

Session overview: Both opportunity and challenge characterize a move away from the traditional idea that a national park represents an "island" surrounded by a sea where there is little life other than directives coming from the administering bureau's central offices. Each paper in this session highlights a way in which the future of the U.S. National Park Service is tied to rethinking protected areas in a changing world. The first presenter (Deur) shows how park associated tribes and the NPS have established a working relationship over the past decade, while the second (Buktenica) traces how alliances formed around the need to save a threatened species which needs to migrate along streams flowing out of the park. The third paper (Hilligoss) recounts how the distance between schools and the park has begun to disappear, while the fourth (Hiller Clark) charts a new pathway of bringing digital archives to visitors and stakeholders. This session concludes with a roundtable where the audience will assist presenters with ideas to streamline the park's science and learning center as part of keeping these new bridges in place.

### **Cultural Endurance and Protected Areas: The View from Crater Lake**

Douglas Deur, Research Coordinator, PNW Cooperative Ecosystem Studies Unit, University of Washington, Seattle, WA

Steve Mark, Historian, National Park Service, Crater Lake, OR

Crater Lake National Park, located on the northern end of the Klamath Basin, has been a place of enduring cultural significance to American Indians, especially the Klamath of south-central Oregon. It is a well-documented sacred site, traditionally serving as a place for ceremonies and spiritual training. Hunting and gathering sites located within what is today the park were used by some

tribal members well into the twentieth century, often as part of a “seasonal round” that included extended stays at berry picking sites on adjacent national forest land. Portions of the park were included in lands allocated to the Klamath Tribes in their 1864 treaty with the United States, but were later lost to the tribe. In recent times, the park has served as an “island” of protected natural and cultural resources for the Klamath within their larger homeland, bringing diverse new challenges and opportunities to the park-tribes relationship.

#### **Bull Trout Restoration: Partnering to Save Fish, Improve Water Quality, Restore Habitat, and Improve Irrigation**

Mark Buktenica, Aquatic Ecologist, National Park Service, Crater Lake, OR

Dave Hering, Fisheries Biologist, National Park Service, Crater Lake, OR

Fifteen years of bull trout restoration work on Sun Creek resulted in a stable population of native fish within Crater Lake National Park.

Sun Creek, however, is no longer connected with other streams in the Klamath Basin, thus eliminating a historic migration route for bull trout. This pathway must be reestablished in order to connect Sun Creek bull trout with other populations of this species so that the risk of extinction from a catastrophic event or genetic isolation is lessened. This latest phase of restoration builds on the momentum of previous work, and expands partnerships in a region plagued with conflicts among agencies and landowners over water resources. Restoration has to go beyond park boundaries and in so doing lead to improved habitat on public and private land, but also more profitable irrigated pasture.

#### **Inspiring Curious Minds: Working Together to Engage Youth**

Linda Hilligoss, Education Coordinator, Science and Learning Center, Crater Lake National Park, Ashland, OR

Marsha McCabe, Chief, Interpretation and Cultural Resources, Crater Lake, OR

“I’d rather do this than eat lunch!” squealed a fifth grader while observing a beetle in a decomposing mountain hemlock log near the rim of Crater Lake. “Classroom at Crater Lake,” an education program offered through the national park’s science and learning center, draws thousands of students each year to its awe-inspiring outdoor classroom. The NPS, area K-12 schools, and Southern Oregon University are building bridges from Crater Lake National Park through an innovative partnership. From snow inquiry (on snowshoes!) to EarthCaching and “bioblitzing,” the park and its partners are uncovering and discovering new ways to get kids to spend time outdoors, appreciate cultural traditions, explore new career options, and become the next generation of land stewards. By providing authentic experiences that allow students to work beside scientists and communicate with park rangers, young learners can begin to redefine their heroes and frame their futures.

#### **Bridging the Digital Divide: Putting Research and Archival Records On-line from Crater Lake**

Anne Hiller Clark, Librarian, Oregon Institute of Technology, Klamath Falls, OR

Lia Vella, Librarian, Science and Learning Center, Crater Lake, OR

Despite the impressive amount of scientific and historical research on Crater Lake National Park (CLNP), access to the resulting documents is often difficult. Staff at CLNP and at the Oregon Institute of Technology (OIT) libraries leverage their resources and expertise to create the Crater Lake Digital Research Collection to meet the needs of scientists, park staff, students, and the general public. The project’s objectives are to develop a useful and relevant collection of digital materials to facilitate further research on CLNP and to create a model for library and agency collaboration. A valuable collection, subject matter expertise from park staff, and the technical skill of OIT librarians make for more productive outreach than either partner could accomplish alone.

#### **Round Table: Streamlining the Crater Lake Science and Learning Center**

This part of the session consists of audience dialogue aimed at informing Science and Learning Center operations at Crater Lake National Park in order to sustain the bridges described in the previous papers of this session. The audience is expected to relate their experience with learning centers located in other park units, while the authors of the session papers provide specifics from their experience at CLNP.

Concurrent Session #74 • Idaho • Workshop

#### **The Many Faces of Visitor Use Management in National Parks: Strategic Planning for the Future**

Chair: Kerri Cahill, Visitor Use Specialist, National Park Service, Denver, CO

Visitor use management is increasingly characterized by complexity, uncertainty and change. The purpose of this workshop is to initiate a creative discussion around the most significant challenges facing protected area managers as they grapple with complex issues surrounding visitor use. The National Park Service has recently formed a service-wide workgroup to address some tough questions regarding the operational and institutional needs of the agency related to visitor use planning and management. The output of the workshop discussions will be shared directly with the NPS service-wide workgroup, as well as contribute to future discussions on this topic amongst academic and management communities. This workshop will engage participants in small group discussions to brainstorm and prioritize the most significant challenges for visitor use management as well as practical solutions for the short and long term. Discussions will likely explore technical, operational, funding and training needs to meet current challenges.

Presenters: Jim Bacon, Outdoor Recreation Planner Planning Division, Yosemite National Park, El Portal, CA

Steve McCool, Professor Emeritus, College of Forestry and Conservation, University of Montana, Missoula, MT

Wayne Freimund, Professor, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

Concurrent Session #75 • Mt. Bachelor • Panel Discussion

#### **The Science and Strategies of Collaboration to Combat Marijuana Cultivation on Park Lands**

Barbara Alberti, Chief, Natural Resources and Fire Management, Whiskeytown National Recreation Area, Whiskeytown, CA

Park professionals are collaborating across the West to develop new strategies to reduce the impacts of marijuana cultivation on park lands. Illegal marijuana cultivation is one of the most pressing issues facing land managers—and the problem grows daily. Visitor

and employee safety is at risk, and natural and cultural resources are being damaged. Partnering law enforcement with natural resource specialists and GIS technology is a powerful formula for curtailing this illegal activity. Panelists will provide: 1) an overview of the issue and law enforcement response, 2) an analysis of statistical modeling of potential target areas, 3) examples of restoration successes, and 4) an outline of strategies for interdisciplinary collaboration and public outreach. The second hour will include a moderated discussion for the audience to provide feedback and offer lessons learned with similar issues (e.g. illegal activity along the US-Mexico border, resource poaching).

Panelists: Cammie D'Entremont Partelow, Cartographic Technician/Park Ranger, USGS/NPS, Menlo Park, CA

Steve Shackelton, Chief Ranger, Yosemite National Park, Yosemite, CA

Athena Demetry, Restoration and Invasive Plant Ecologist, Sequoia and Kings Canyon National Parks, Three Rivers, CA

Alan Foster, Special Agent, National Park Service, Investigative Services Branch, Whiskeytown, CA

#### Concurrent Session #76 • Mt. Hood • Workshop

##### **Movies on the Mountain: Collaboration through Video Documentation**

Chair: Lawrence Johnson, Video Producer, Lawrence Johnson Productions, Inc., Portland, OR

This workshop will present techniques for video documentation and will show how video creates opportunities for collaboration within the community. Video is a powerful and cost-effective tool to assist in presenting management projects to the public. Video can communicate a consistent message without sending a presenter. Video raises public awareness, and increases access to the often hidden process of science. Video is an innately collaborative medium, connecting people and environment, specialist and citizen. It is also a helpful tool in preserving the cultural importance of protected areas. Workshop topics: 1) How to produce and distribute video programs; 2) How to find a professional producer; 3) The power of video in raising public awareness on issues related to preservation and protection; 4) How to conduct video interviews; 5) Working with Tribes and developing a community project; 6) How oral history can help establish the cultural importance of protected areas.

Presenters: Karen Meyer, Green Fire Productions

Charles Hudson, Public Affairs Director, Columbia Inter-Tribal Fish Commission

Brent Johnson, Botanist, Pinnacles National Monument

#### Concurrent Session #77 • Mt. St. Helens • Panel Discussion

##### **Water for Life: Integrating Natural Resources, Planning, and Management**

Chair: Barbara J. Johnson, Division Chief, National Park Service, Denver Service Center Planning, Lakewood, CO

Using water resources as a common thread, this panel will discuss the current status of natural resource-based, integrative efforts into park planning and management. The overall park planning process will be introduced and interpreted to provide the context for four separate but interrelated topics as they relate to park plans: water resource planning efforts to translate science and integrate into park plans; laying out the framework for connecting science and management through the park planning process; the resource stewardship strategy process and lessons learned from pilot projects; and integrating potential water resource impacts from climate change into park planning.

Panelists: David Vana-Miller, National Park Service, Water Resources Division, Denver, CO

Steven Fancy, National I&M Program Leader, National Park Service, Natural Resource Program Center, Fort Collins, CO

Don Weeks, Hydrologist, National Park Service, Water Resources Division, Denver, CO

Patrick Malone, Natural Resource Specialist/Project Manager, National Park Service, Denver Service Center Planning Division, Lakewood, CO

Leigh Welling, Climate Change Coordinator, Natural Resource Stewardship and Science, National Park Service, Fort Collins, CO

#### **Wednesday Late Afternoon, March 4**

#### Concurrent Session #78 • Multnomah • Panel Discussion

##### **Feral to Permitted to Preserved: Managing Scientific Collections Taken from National Parks**

Chair: Ann Hitchcock, Senior Advisor for Scientific Collections, National Park Service, Washington, DC

Key NPS permit conditions pertaining to permanently retained scientific collections are often overlooked, later causing confusion in park, research, and repository communities. These conditions, as applicable, include obtaining signed agreements from proposed non-NPS repositories to accept specimens under NPS permit and loan conditions before permits are issued, identifying responsibility and funding for labeling and cataloging specimens in the permit application, using loan agreements whenever specimens leave the park, using Material Transfer Agreements for research on microorganisms, and creating research and development agreements when park-permitted research leads to commercial applications. Permit coordinators, researcher applicants and permittees, park curators, and repository managers collaborating effectively experience high benefits and satisfaction. Hear from park permit coordinators and curators how the system works at four national parks with active research programs—Acadia, Everglades, Yellowstone, and Yosemite. Discuss the challenges of All Taxa Biodiversity Inventory (ATBI) and BioBlitz projects for scientific collections management.

Panelists: Christie Hendrix, Research Permit Coordinator, Yellowstone National Park, Yellowstone National Park, WY

David Manski, Chief, Division of Resource Management, Acadia National Park, Bar Harbor, ME

Nancy Russell, Museum Curator, South Florida Collection Management Center, Everglades National Park, Homestead, FL

Miriam Luchans, Museum Registrar, Yosemite National Park, Yosemite, CA

Carla C. Matix, Office of the Solicitor, Department of the Interior, Washington, DC

Discussant: John Dennis, Deputy Chief Scientist, National Park Service, Washington, DC

## **Transportation in Parks II**

Chair: Jeffrey Hallo, Assistant Professor, Clemson University; Dept. of Parks, Recreation and Tourism Management, Clemson, SC

Session overview: Transportation is a vital component of parks. However, transportation systems raise many potential issues for managers and visitors of parks. This session is the second in a two-session track of papers, whose purpose is to provide a forum for communicating results and 'best practices' from a variety of park transportation projects. In this session, a series of three papers are presented from a transportation planning and user capacity project at Rocky Mountain National Park. These papers provide (1) an overview of the four integrated components of the planning and user capacity study, (2) an assessment of visitors' preferences for various modes of transportation, including personal vehicles and park shuttle buses, and (3) a quantification and exploration of both current and alternative visitor delivery systems. Also, a fourth paper in this session explores the concepts of standards of quality and levels of service in the context of transportation for tourism, using results from studies at Acadia National Park, the Blue Ridge Parkway, and Muir Woods National Monument.

### **Research to Support Implementation of Transportation Planning and User Capacity Decisions in Rocky Mountain National Park**

Peter Newman, Associate Professor, Human Dimensions of Natural Resources Department at Colorado State University, Fort Collins, CO

Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA, and Resource Systems Group Inc., White River Junction, VT

Chris Monz, Assistant Professor, Recreation Ecology and Management, Department of Environment and Society, Utah State University, Logan, UT

Robert Chamberlin, PE/PTOE, Resource Systems Group, Inc., White River Junction, VT

Larry Gamble, Chief of Planning and Compliance, Rocky Mountain National Park, Estes Park, CO

Ken Kaliski, Resource Systems Group Inc., White River Junction, VT

David Pettebone, Graduate Student, Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, CO

Karen Hockett, Assistant Professor, College of Natural Resources, Virginia Tech, Blacksburg, VA

Ashley D'Antonio, M.S. Candidate, Department of Environment and Society, Utah State University, Logan, UT

Rocky Mountain National Park's (ROMO's) Bear Lake Road corridor has a high degree of visitor access. With many visitors accessing the Bear Lake area via the shuttle bus, rather than private vehicles, the constraint to visitor use levels associated with parking lot capacities has been eliminated. ROMO is now re-evaluating transportation alternatives. This paper provides an overview of a 2008 study with four integrated components: 1) modeling of private and transit vehicle traffic in the Bear Lake Road, 2) modeling of visitor use at selected recreation sites serviced by the Bear Lake shuttle bus, 3) assessing resource impacts at selected recreation sites serviced by the Bear Lake shuttle bus, and 4) conducting visitor survey research at selected recreation sites serviced by the Bear Lake shuttle bus. Information will inform future ROMO management actions in the Bear Lake Corridor, but also provides a model for studies related to alternative transportation on public lands.

### **Exploring Visitor Preferences for Transportation Options in Rocky Mountain National Park**

David Pettebone, Graduate Student, Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, CO

Peter Newman, Associate Professor, Human Dimensions of Natural Resources Department at Colorado State University, Fort Collins, CO

Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA, and Resource Systems Group Inc., White River Junction, VT

Len Hunt, Human Dimensions Research Scientist, Centre for Northern Forest Ecosystem Research, Ontario Ministry of Natural Resources, Thunder Bay, ON, Canada

Stated choice analysis was used to assess visitors' preferences various modes of transportation including personal vehicles versus park shuttle buses. Visitors were asked to choose which transportation option they preferred to use along the Bear Lake road in Rocky Mountain National Park based on destination convenience, vehicle traffic volume, visitor volume (by transportation mode), and probability of solitude. Results provide insight into visitor preferences concerning the management of transportation systems in busy national parks like Rocky Mountain. Results suggest that visitors prefer to drive their personal vehicles but would use the park's shuttle system to avoid traffic congestion along roadways or crowding along the trail.

### **Linking Transportation with Resource and Experiential Conditions at Rocky Mountain National Park**

Robert Chamberlin, PE/PTOE, Resource Systems Group, Inc., White River Junction, VT

Larry Gamble, Chief of Planning and Compliance, Rocky Mountain National Park, Estes Park, CO

Steve Lawson, College of Natural Resources, Virginia Tech, Blacksburg, VA; Resource Systems Group, Inc., White River Junction, VT

Rocky Mountain National Park's (ROMO's) Bear Lake Road corridor has a high degree of visitor access. In 1929 there was a 100-car parking lot constructed at the Bear Lake trailhead. In 1978 ROMO initiated transit service within the corridor which has since evolved into a high capacity system. In 1998 a 390-space park and ride lot was constructed mid-corridor to serve as a transfer point. ROMO is evaluating the linkages between this visitor delivery system and resource conditions—visitor perceptions of crowding and biophysical impacts to the trail. This paper quantifies the visitor delivery system in the corridor, inclusive of transit and private vehicle access. Alternative visitor delivery systems are investigated—including modifying bus capacity, bus headway, parking lot capacities, and traveler information systems—that affect the timing and magnitude of visitor arrivals at these key venues.

### **Standards of Quality and Levels of Service: Bridging the Gap between Efficiency and Sustainability in the Context of Transportation for Tourism**

Peter Pettengill, Graduate Research Assistant, University of Vermont, Burlington, VT

Robert Manning, Professor, University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT



William Valliere, Research Specialist, University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT

Laura Anderson, Postdoctoral Associate, University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT

Historically, transportation planning and management have largely been guided by principles of efficiency. Specifically, the Transportation Research Board has utilized a Levels of Service (LOS) framework to assess quality of service in terms of measures such as traffic congestion, speed and travel time, and maximum road capacity. In the field of park and outdoor recreation management, on the other hand, indicators and standards of quality have emerged as an important conceptual framework for assessing the quality of visitor experiences. This contemporary management-by-objectives approach provides a standard of quality based upon minimum acceptable conditions. While LOS is an effective utilitarian approach to transportation planning, application of an indicators and standards framework could prevent unacceptable negative impacts to park resources and the visitor experience. Past studies in Acadia National Park, Blue Ridge Parkway, and Muir Woods National Monument will provide a means for exploring this conceptual bridge.

#### **An Evaluation of Visitor Decisions Regarding Alternative Transportation in Glacier National Park**

Melissa Baker, Instructor of Parks, Recreation and Tourism, School of Forest Resources, University of Maine, Orono, ME

Wayne A. Freimund, Professor, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

In 2007, Glacier National Park implemented a free, voluntary shuttle bus system along the Going-to-the-Sun Road. The first year of implementation of the transit system at Glacier National Park presented a unique opportunity to evaluate visitor behavior in national parks. This study examined the intersection of national park visitors' recreation experience preference and their decisions toward shuttle use in a national park. Expanding upon the theory of planned behavior, this study explores the effects of attitudes, subjective norms, and perceived behavioral control as well as visitors' higher order goals of recreation experience preference and desired recreational activities on their intentions toward shuttle use. When added to a model including the constructs of the theory of planned behavior, visitors' desires for experiences of solitude significantly improved the prediction of behavioral intentions beyond that of the theory of planned behavior alone.

(Track continued from Concurrent Session #57)

Concurrent Session #80 • Broadway/Weidler • Panel Discussion

#### **Overcoming that Manifesting Destiny: Challenging NPS Interpretation of Nez Perce National Historical Park**

Chair: Gary F. Somers, Superintendent, Nez Perce National Historical Park, Lapwai, ID

There is a degree of hubris inherent in the nation co-opting a marginalized cultural group's history as its own and charging the NPS to protect and interpret that history. Nevertheless, that is what Congress did in establishing Nez Perce National Historical Park in 1965. Overcoming past misunderstandings and cultural divides to bring first-person tribal voices to interpretation requires close and trusting relationships between NPS staff and tribes. Park staff and tribal partners will review ongoing challenges as they: integrate cultural traditions into interpretation through publications, waysides, and exhibits; partner with Oregon State Parks on Iwetemlaykin State Heritage Site; provide cultural training for staff geographically isolated from Nez Perce people; and manage and interpret burials, cemeteries, and other sacred sites. The discussion will also focus on upcoming challenges and the future role of the National Park Service at Nez Perce National Historical Park.

Panelists: Gary F. Somers, Superintendent, Nez Perce National Historical Park, Lapwai, ID

Albert Andrews Redstar, Language Program Director, Confederated Tribes of the Colville Reservation, Nespelem, WA

Armand Minthorn, Board of Trustees Member, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR

Nakia Williamson, Cultural Resources Specialist, Nez Perce Tribe, Lapwai, ID

Marc Blackburn, Interpretive Media Specialist, Nez Perce National Historical Park, Lapwai, ID

Timothy A. Nitz, Oregon/Washington Unit Manager, Nez Perce National Historical Park, National Park Service, Joseph, OR

Concurrent Session #81 • Hawthorne/Sellwood • Day-Capper

#### **NPS Director's Order 11B: Information Quality—Objectivity, Utility, and Integrity of Information; Ethics; Peer Review**

Chairs: John Dennis, Deputy Chief Scientist, National Park Service, Washington, DC

Louise Hose, National Park Service Research Coordinator, Gulf Coast Cooperative Ecosystem Studies Unit, Texas A&M University, College Station, TX

In 2008, the National Park Service adopted final guidance regarding information quality—objectivity, utility, and integrity. This guidance addresses information that NPS releases to the public or utilizes in management decisions. With respect to all information, this guidance provides a process for receiving and addressing complaints about NPS information quality. With respect specifically to scientific and scholarly information, this guidance articulates a code of ethics and implements an administrative and peer review requirement. Because the guidance applies to information used by NPS regardless of the source of the information, NPS partner supplied information as well as NPS employee supplied information is covered by its provisions. This Day-Capper session will offer participants an overview of the guidance, provide answers to questions, and generate an opportunity to share experiences with using, and ideas regarding, the guidance.

**Land and Water: Spirit and Form**

Chair: Melia Lane-Kamahele, National Park Service, Honolulu, HI

**Healing Landscapes: An Historical Perspective**

Kurt Russo, Director, Native American Land Conservancy, Bellingham, WA

This presentation draws on the concept of the collective social imaginary that is the foundation of the world-making enterprise. These social imaginaries are comprised of paradigms, core values, systems of signification, and a background metaphysic that provide order, unity, and coherence to experience. A contrast of social imaginaries is evident in how indigenous belief in the autochthonous powers in landscape is represented and signified by the conventions and convictions of the human and the life sciences. There is a growing consensus among historians that the nature of “true knowledge” is determined by adjudicating centers of power that are neither impartial nor value-neutral. Instead, the conventions of legitimated systems of knowledge are the result of historical conjunctions, including the nexus of power and knowledge. The interrogation of this nexus provides an avenue for understanding how the indigenous belief in the powers in landscape appear, or fails to appear, as legitimate knowledge.

**Traditional and Cultural Uses Important in Spite of Change**

Rosemary Ahtuanguak, Nuiqsut, AK

The Inupiat have lived in the Arctic for thousands of years as evidenced through archeological studies as well as the uniqueness of the descendants who still live in the area. The traditions and culture of the area continues into today with the risks of changes being brought with oil and gas development. The importance of the traditional and cultural uses are necessary for many families survival is dependent upon the harvesting of the foods from the area. The western diet in rural stores come with multipliers of cost which make staples beyond the dollars per hour of many wage earners. The health and sustenance of the people are tied to the life of seasons and change.

**Water is Sacred: A Tribal Perspective on the State of Water in America**

Mark Franco, Headman, Winnemem Wintu Tribe, Redding, CA

Caleen Sisk-Franco, Tribal Spiritual Leader, Winnemem Wintu Tribe, Redding, CA

Randy Yonemura, Water Commissioner, Intertribal Water Commission, Sacramento, CA

Atta Stevenson, Water Commissioner, Intertribal Water Commission, Sacramento, CA

This panel will bring forth the tribal perspective of water: the relationship and responsibility that people have toward water. We will present the tribal view that water is a living entity: having both spirit and form. The relationship of tribal people who maintain the connection to the water and hold ceremony for water is unique in today's world—both tribal and western, as people become fixated on this new blue gold rush and strive to be the owners of what cannot be owned.

**Return of the Chumash: Considerations and Institutional Challenges**

Marcus Lopez, Captain of the Tomol, Barbareno Chumash Council, Santa Barbara, CA

The Tomol crossing and gathering of Chumash People on the ancient village site of Swaxil on the island of Limuw (Santa Cruz Island, CA) brought together extraordinary people from the major Chumash Tribal organizations and nationally known dignitaries, this past September. The gathering and crossing was a powerful, phenomenal, cultural dynamic. The crossing did not take place in a vacuum. It involved a variety of government organizations; herein lies the challenge. Views of what is Sacred to Natives and the Dominant society are different. The Federal, State or local governments has its own language and understanding. Government bodies can undertake working with Native Peoples and understand that they are not a malcontent minority, but are tied by history, land and Ocean; and are an asset, a positive contribution. This crossing proves this, opening minds that were once closed.

**Preserving Sacred Lands: A Collaborative Effort of the University of Wisconsin Arboretum**

Fawn YoungBear-Tibbetts, Staff Member, University of Wisconsin Arboretum, and Director of Marketing and Communications, Tangram Consulting Services, Inc., White Earth Band of Minnesota Chippewa, Windsor, WI

I am currently working on a collaborative project at the University of Wisconsin-Madison Arboretum dealing with the Native American Mounds on our property that I would like to share. This project has become my attempt at creating a positive example of a successful collaboration between UW students, Ho-Chunk Tribal members, the State of Wisconsin, and the Arboretum. Last year the Director asked if I could help finding any students who would be interested in stewarding or volunteering to work in the mounds area. Currently we are working on three groups of mounds within the Arboretum with many groups and organizations. I believe that this type of collaboration is a wonderful example of what institutions can accomplish when they have the appropriate networks available and what we can accomplish when we work together.

**Aircraft Overflights: Things You May Want to Know**

Chairs: Catherine Lentz, Environmental Protection Specialist, NPS, Hawaii Volcanoes National Park, Honolulu, HI

Elizabeth Gordon, Cultural Resources Program Manager, NPS, Haleakala National Park, Makawao, HI

Session overview: An issue common to many parks is that of aircraft overflights; whether military, commercial, air tours, private aviation, or all of the above. Aircraft overflights have the potential to affect park resources and values in many different ways. While each park is unique, each is firmly based on the core principles of the Organic Act, Management Policies, and other key NPS guidance. Communication and collaboration, in concert with our core values, are essential when dealing with overflights. These papers will provide some lessons learned and practical solutions.

**Assessing Impacts from Aircraft Overflights at Grand Canyon National Park**

Rick Ernenwein, Recreation Planner, Grand Canyon National Park, Flagstaff, AZ

Aircraft overflights at Grand Canyon National Park have been the subject of considerable research, environmental assessment, rulemaking, and controversy for many years. The National Park Service and Federal Aviation Administration are currently engaged in a process to prepare an Environmental Impact Statement to evaluate alternatives to achieve substantial restoration of natural quiet. Key steps in the process over the past several years are described, including: a stakeholder working group process; development of impact intensity thresholds; noise modeling; noise metrics and analysis methods; and impact assessment issues and techniques. Practical lessons learned are also described that may be of interest to people involved with aircraft overflights and noise issues in other parks and protected areas.

#### **Military Overflight Management and Education Program: Immersion and Communication**

Gregg Fauth, Wilderness Coordinator, Sequoia and Kings Canyon National Parks, Three Rivers, CA

Sequoia and Kings Canyon National Parks contain 830,000 acres of land managed as wilderness (designated and proposed) with the eastern half of the parks overlain by the R-2508 Military Aviation Training Complex. Through the years this situation has led to significant conflict between the National Park Service and local military leaders as park management has attempted to eliminate "low fliers" and their associated noise level in the parks. Over the past 15 years, through a program of communication and education, a more open and cooperative relationship has developed between the parks and the military with the result of significantly reduced flight "deviations." Military leaders and park managers continue to work together and learn to understand the compatibility and similarity of each others' mission through a variety of means. This paper will address the practices and strategies that have led to improvements in the quality of the wilderness experience in these parks and beyond.

#### **Echoes in the Canyons: Tools to Manage Soundscapes in Yosemite**

Joe Meyer, Chief, Physical Science and Geographic Information Systems Branch, Yosemite National Park, El Portal, CA

Yosemite's soundscape is both spectacular and challenging. It is spectacular because the sounds of waterfalls, storms, and other natural sounds echoing through the deep canyons and along the granite domes are important to visitors. It is challenging because sound travels long distances in these same deep canyons and granite domes. Until recently, the park was unable to scientifically describe the sound environment, specifically the frequency and intensity of human-caused noise. This presentation will describe the acoustic environment of Yosemite using baseline data, present cases in which these data have been important factors in management issues, and outline efforts to extend the baseline data. It will also identify knowledge gaps that can be filled in with research, potential methods of addressing soundscape issues, and potential uses of acoustic data in management plans.

#### **Air Tours and National Parks: Lessons Learned (So Far) from the Mount Rushmore ATMP**

Frank Turina, NPS Natural Sounds Program, Fort Collins, CO

Work began on the Mount Rushmore National Memorial ATMP in September 2003. For more than five years, NPS has worked with FAA to address and resolve a multitude of issues and conflicts that emerged over implementation of the National Park Air Tour Management Act and the management of air tours over the Memorial. Many of the disputes resulted from major differences in the missions, cultures, and organizational structures of the two agencies. This paper summarizes some of the more prominent conflicts and controversies confronted during the development of the ATMP and presents a set of "lessons learned" as a result of the effort to complete the MORU ATMP.

#### **Air Tour Management Plan Top Ten**

Elizabeth Gordon, Cultural Resource Program Manager, Haleakala National Park, Makawao, HI

Catherine Lentz, Environmental Protection Specialist, Hawaii Volcanoes National Park, Honolulu, HI

The National Parks Air Tour Management Act of 2000 requires Air Tour Management Plans (ATMP) to be prepared for all National Park Service (NPS) units that have commercial air tours over or within 1/2 mile of the unit boundary. The objective of an ATMP is to develop acceptable and effective measures to mitigate or prevent the significant adverse impacts, if any, of commercial air tour operations upon the natural resources, cultural resources, and visitor experiences of a park unit. The Act specifies that the Federal Aviation Administration is the lead agency and the NPS is the cooperating agency. Given the two agencies widely divergent missions, this makes for an entertaining process. Contrary to the Monty Python maxim of "Run Away! Run Away!", the ATMP process requires park staff to boldly go where few have gone before.

Concurrent Session #84 • Alaska • Workshop

#### **Monitoring Vegetation and Climate Change in the Alpine: Establishing GLORIA Sites in the National Parks**

Chair: Isabel Ashton, Ecologist, Rocky Mountain Inventory & Monitoring Network, Fort Collins, CO

The National Park Service has played a large role in the protection and preservation of high elevation mountain ecosystems due to their natural splendor and unique assemblages of flora and fauna. Despite protection, alpine systems are increasingly threatened by climate change and atmospheric pollution. The Global Observation Research Initiative in Alpine Environments (GLORIA) is an international effort to monitor alterations in vegetation in the world's high mountain ecosystems caused by climate change. In 2008, Rocky Mountain National Park and Great Sand Dunes National Preserve began the process of establishing GLORIA sites within their parks. We hope to use this workshop as a time to reflect on the process of site establishment, develop a directory of sites, enhance collaboration across GLORIA sites on park lands, encourage other parks to join the network, develop data collection and analysis goals, and adapt the GLORIA protocols to the National Park Service long-term monitoring goals.

Presenters: John Spence, Terrestrial Ecologist and Research Coordinator, Glen Canyon National Recreation Area, Page, AZ

Mike Britten, Rocky Mountain Inventory and Monitoring Network Program Manager, Fort Collins, CO

Paul McLaughlin, Biological Technician, Rocky Mountain National Park, Estes Park, CO

**International Collaborative Efforts**

Chair: Tom Fish, CESU National Coordinator, National Park Service, Washington, DC

**Causes and Potential Solutions for Conflicts between Park Management and Local Communities in Germany**

Eick von Ruschkowski, Research Assistant, Institute of Environmental Planning, Leibniz University of Hannover, Hannover, Germany  
National parks in Germany (and much of central Europe) often face the challenge that they have been established very recently in or nearby areas that have been populated and used for several centuries. Thus, many conflicts of interest between the continuation of traditional uses and future development arise, often additionally fuelled by management issues (local vs. state vs. federal). The paper presents the results from a field study carried out in the Harz National Park, located in a North German low mountain range. The scope of the study was to identify and analyze existing and potential conflicts between park management and the local population. Based on the results, measures to improve local support for the park were proposed. A specific focus was put on known and hidden communication channels between stakeholders and the park's administration in order to develop a strategy that makes outreach more efficient.

**Is Community-based Conservation an Effective Tool in the Llancahue Watershed, Chile?**

Michelle Moorman, Graduate Student, North Carolina State University, Raleigh, NC

Susan E. Moore, Director, Forestry and Environmental Outreach Program, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC

Pablo J. Donoso, Instituto de Silvicultura Prodecano, Facultad de Cs. Forestales, Universidad Austral de Chile

We are helping write a management plan for a peri-urban park in the Llancahue watershed, south central Chile. We are providing suggestions that address the conservation of natural and cultural resources and ecosystem services, the development of recreation and environmental education opportunities for the local city of Valdivia, and the creation of alternative livelihoods for the campesino (rural farming) community. During the process, we have used community-based conservation techniques to engage and obtain information from the key stakeholder groups to evaluate institutional values and perceptions toward the Llancahue watershed. In addition, we want to assess potential needs and uses different groups may have for a peri-urban park and gauge their interest in developing partnerships for the park's protection. We are using this information to develop a site-specific plan that will help meet the needs of local communities and develop community partnerships amongst various stakeholder institutions.

**Beyond the Boundaries: A Qualitative Case Study of Protected Areas in Chiapas, Mexico**

Carla Mora-Trejos, Research Assistant, Parks Recreation and Tourism Department, Clemson University, Seneca, SC

Elizabeth Baldwin, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

With increased interest in the parks and protected areas of Mexico it is important to research places with a high perception of success, to document and understand patterns of collaboration that work. The Sierra Madre in Chiapas is one such place and is part of the Mesoamerican Biological Corridor. Therefore, it is an important area for conservation due to biodiversity, natural richness and lasting remaining habitat. Due to the large number of different local groups and cultures, Chiapas presents an interesting challenge for the management of protected areas. This case study investigates how the protected areas in Chiapas have worked with these challenges through interviews with local land managers and residents. Preliminary data has revealed a perception of great success in collaboration; further data will reveal the practices driving the success, and a critical look at this perception.

**Collaboration as Process: Trans-boundary Conservation across the Big Bend on the U.S.-Mexico Border**

Geoff Kelley, Ph.D. Candidate, University of Georgia, Alpine, TX

Effective conservation requires stakeholder participation and collaboration at all stages of management, from park design through implementation and beyond. Social scientists have long stressed the importance of site-specific and contextualized analyses of historical, political, economic, and cultural factors underscoring land use practices and management policies in areas considered for protected status. Acquiring these contextualized data is time consuming and difficult, especially when the protected area crosses international borders. In light of these complexities, collaboration should be seen as an ongoing process, not as an assumed given a priori. This paper details historical and ongoing bi-national collaborative efforts in the Chihuahuan Desert Trans-boundary Conservation Corridor along the United States-Mexico border where the author is currently conducting fieldwork for his dissertation in anthropology on trans-boundary conservation.

**Collaborations with Partners across International Borders to Enhance Resource Stewardship**

Katherine Faz, Community Planner Tech, National Park Service Rivers, Trails, and Conservation Assistance Program, San Marcos, TX  
In 2008, Palo Alto Battlefield National Historic Site and the National Park Service Rivers, Trails and Conservation Assistance (RTCA)

Program co-sponsored a Bi-national Consortium project that took an unconventional approach to establishing public and private partnerships along the Rio Grande corridor in Texas and in Mexico. The goal of the consortium project is to encourage resource stewardship beyond physical and geographic boundaries for the enhancement of historic properties and resources in both countries. During a series of interviews and work sessions, community and regional partners were asked to identify preservation and interpretation issues and develop solutions to the issues. For this panel discussion, panelists will offer insight into the challenges and successes of creating collaborations with national and international entities, methods for sustaining partnerships across borders, and the importance of building bi-national collaborations.

**NPS Inventory & Monitoring (I&M) Network Coordinators Workshop**

Chair: Bill Route, Network Coordinator, NPS-Great Lakes I&M Network, Ashland, WI

This workshop will provide the 32 I&M Network Coordinators with an opportunity to share common experiences and challenges in designing and implementing an integrated long-term I&M program. The I&M Program was established to help park managers



across the country understand the status and trends of their park's natural resources. To facilitate collaboration, information sharing, and economies of scale, the NPS has organized more than 270 parks with significant natural resources into 32 ecoregion-based networks. Each network supports a core, professional staff that conducts the day-to-day activities of the network and that collaborates with staff from network parks and other programs and agencies to implement an integrated, long-term program to monitor each network's highest-priority vital signs. This session will address the Network Coordinator role: what it takes to lead and sustain a network, and to build a monitoring program that results in information that is relevant and useful to park decision-makers.

**Concurrent Session #87 • Mt. Hood • Workshop**

**NPS Inventory & Monitoring (I&M) Data Managers Workshop**

Chair: Dennis Skidds, Data Manager, Northeast Coastal & Barrier Network, Kingston, RI

This workshop will provide the 32 I&M Network Data Managers with an opportunity to share common experiences and challenges in designing and implementing data management systems to support an integrated long-term I&M program. The I&M Program was established to help park managers across the country understand the status and trends of their park's natural resources. To facilitate collaboration, information sharing, and economies of scale, the NPS has organized more than 270 parks with significant natural resources into 32 ecoregion-based networks. Each network supports a core, professional staff that conducts the day-to-day activities of the network and that collaborates with staff from network parks and other programs and agencies to implement an integrated, long-term program to monitor each network's highest-priority vital signs. This session will address the Data Manager role: what it takes to be effective in developing data management systems and procedures that ensure data quality, security, longevity and availability.

**Concurrent Session #88 • Mt. St. Helens • Workshop**

**NPS Inventory & Monitoring (I&M) Ecologists Workshop**

Chair: John Paul Schmit, Ecologist, National Capital Region I&M Network, Washington, DC

This workshop will provide I&M Network Ecologists with an opportunity to share common experiences and challenges in creating and evaluating vital sign protocols developed to implement an integrated long-term inventory and monitoring program. The I&M Program was established to help park managers across the country understand the status and trends of their park's natural resources. To facilitate collaboration, information sharing, and economies of scale, the NPS has organized more than 270 parks with significant natural resources into 32 ecoregion-based networks. Each network supports a core, professional staff that conducts the day-to-day activities of the network and that collaborates with staff from network parks and other programs and agencies to implement an integrated, long-term program to monitor each network's highest-priority vital signs. This session will address aspects of the Ecologist's role: designing and implementing monitoring protocols, analyzing results, and communicating these results to a diverse audience.

**Thursday Morning, March 5**

**Concurrent Session #89 • Multnomah • Contributed Papers**

**Climate Change: Responses by Protected Area Managers**

Chair: Mary Foley, Regional Chief Scientist, Northeast Region, National Park Service, Boston, MA

**Strategies for Addressing Climate Change in the National Park System in Alaska**

Robert Winfree, Alaska Regional Science Advisor, National Park Service, Anchorage, AK

Park managers need information about how climate change will affect park resources, facilities, operations, and visitor experiences, directly and indirectly, and about appropriate actions to deal with related impacts. Climate change is an issue for park managers nationwide, as it is for the world, but there are also real differences in arctic and subarctic climates; thawing glaciers and permafrost, tundra fires, large free ranging caribou herds, and subsistence economies to name a few. The NPS Alaska Region climate change strategy summarizes current thinking about climate change in Alaska and addresses challenges and opportunities in the broad areas of science and resource stewardship, interpretation and education, sustainable operations and adaptation. The strategy describes in general terms the range of probable effects from climate change on NPS units and programs in the Alaska Region, major questions, levels of confidence, uncertainties about those effects and identifies a suite of appropriate steps for action.

**Rethinking Rare Plant Species Persistence in the Face of Global Change**

Peggy Moore, Plant Ecologist, U.S. Geological Survey, El Portal, CA

Several frameworks have been offered to structure our thinking about rarity. However, few of these have addressed issues of conservation. Stebbins and Major provided us with a classification of California's rare species based on their evolutionary history. Others have used patterns of distribution and abundance to identify rarity classes. Such approaches can provide the basis for protecting classes of species, but they may not be helpful in assessing risk to taxa from anthropogenic impacts. Climate change impacts on rare plants include altered fire regimes, habitat fragmentation, and pollinator shifts. Each of these has different implications for species with different life histories. Farnsworth and Ogurcak used collection and visitation records to identify life-history characteristics and ecological affinities that may place species at risk for decline. These included pollination mode, dispersal strategy, and wetland status. This kind of approach may provide the best chance of identifying species vulnerable to climate change effects.

**Carbon Footprint Analyses of Resource Management Operations: Realistic Challenges and Timely Opportunities**

Carol Guy, Consultant, PRIZIM Inc., Saint Paul, MN

Alexis Kingham Fuge, PRIZIM Inc., Gaithersburg MD

Leigh Leonard, PRIZIM Inc., Madison WI

Frank Priznar, PRIZIM Inc., Gaithersburg, MD

Federal resource management agencies have an urgent responsibility to reduce their greenhouse gas emissions given their role as custodians of US natural and cultural resources, the growing threat of climate change and recent requirements such as E.O.13423. To develop a reduction strategy, emissions sources and sinks must first be determined at the operations (e.g. park, forest) level through carbon footprint analyses (CFA). Due to the complex nature of carbon sequestration and associated uncertainties, conducting a CFA of a land-based entity can be very challenging. Resource managers require clear, reliable guidance on CFAs for planning and decision-making. To help meet this need, we identify critical factors, known pitfalls, and realistic benefits to be gained from a CFA using perspective and lessons learned from hands-on experience in parks and forests. We present the complexities of CFAs and the challenges they pose, as well as the opportunities they present to resource management organizations.

#### **Cloud Forests of the Channel Islands: Understanding the Effects of Recent Landscape Alterations**

Kate Roney Faulkner, Chief, Natural Resources Management, Channel Islands National Park, Ventura, CA

Kathryn McEachern, Senior Plant Ecologist, USGS Biological Resources Division, Ventura, CA

Sarah Chaney, Restoration Ecologist, Channel Islands National Park, Ventura, CA

Dirk Rodriguez, Monitoring Botanist, Channel Islands National Park, Ventura, CA

Tim Coonan, Supervisory Wildlife Biologist, Channel Islands National Park, Ventura, CA

Woodlands and shrublands once dominated Santa Rosa Island. Over 150 years of grazing resulted in the conversion of vegetation to non-native grasslands and bare ground. Removal of non-native ungulates is nearly complete. However, managers now believe the lack of vegetation in upland areas may hinder island recovery. A multi-disciplinary team will develop a model of ecosystem function and test the hypothesis that the once extensive woodlands of the island captured fog and provided an important source of water. A pilot study is underway to compare water inputs from fog in different types of vegetation. If fog provides a substantial part of the island water budget, the study will be expanded to quantify effects throughout the watershed on physical and biological parameters. Restoration of the island's "cloud forests" may be a critical first step in mitigating the island's future climate, predicted to be dryer and warmer due to global warming.

#### **Visitors' Perceptions of Local Climate Change: Awareness, Concern, and Civic Action**

Matt Brownlee, Ph.D. Student, Graduate Research Assistant, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

Jeffrey C. Hallo, Assistant Professor, Clemson University, Department of Parks, Recreation and Tourism Management, Clemson, SC

The South Carolina Botanical Garden in Clemson, South Carolina, has experienced a decade of "severe" drought conditions and increased temperatures. This has resulted in managers investigating appropriate drought-resistant flora for displays, alternative watering schedules, and discussing educational programs. A visitor use survey was conducted at the garden to explore the relationships between different types of visitors (e.g., local and non-local, frequent versus occasional) and their (1) awareness of local climate change, (2) concern for local climate change, and (3) willingness to provide civic support (e.g., donations or volunteering) in response to local climate change. Implications of study findings to management of gardens and similar protected areas are discussed. Relationships between climate change, visitor perceptions and visitor behaviors (such as civic support) are becoming increasingly relevant to parks and protected areas. In addition, potential management action in response to these issues will inevitably require increased attention.

Concurrent Session #90 • Holladay • Invited Papers

#### **Voices of a Collaborative System: Strategies and Lessons Learned from the Colorado River in Grand Canyon**

Chair: Jan Balsom, Deputy Chief, Science and Resource Management, Grand Canyon National Park, Grand Canyon, AZ

Session overview: The Grand Canyon Protection Act of 1992 provided an opportunity for collaborative management of one of the most complicated river systems in the world. The Act and the Record of Decision on Glen Canyon Dam Operations (1996) established an adaptive management program whose sole purpose was to provide the Secretary of the Interior information on resources within Grand Canyon National Park and Glen Canyon National Recreation Area so that Glen Canyon Dam is operated in a manner "as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use." The presenters in this session will discuss their perspectives on the effectiveness of the collaborative effort and suggestions for protecting the variety of resources of concern within the river system.

#### **Southern Paiute People and Piapaxa 'Uipi: Adaptation and Lessons Learned in the Glen Canyon Dam Adaptive Management Program**

Charley Bullets, Program Director, Southern Paiute Consortium, Pipe Spring, AZ

The Southern Paiute Consortium, representing the specific cultural concerns of the Kaibab Band of Paiute Indians and the Paiute Indian Tribe of Utah, has been an active participant in the Glen Canyon Dam Adaptive Management Program since its inception in 1994. The Consortium participates in the adaptive management program in hopes of providing information to the federal land and water managers about resource conditions in the Canyon. Over the past 13 years, tribal representatives have conducted considerable research and monitoring in an attempt to provide federal land managers a tribal perspective on natural and cultural resource conditions along the river. This presentation will highlight the Consortium's interests in the Grand Canyon and tribal perspectives relative to the on-going adaptive management program.

#### **Successful Collaboration Requires a Shared Objective**

Nikolai Lash, Water Resources Program Director, Grand Canyon Trust, Flagstaff, AZ

The Glen Canyon Dam Adaptive Management Program fails to reach its objective of making recommendations to the Secretary of the Interior to improve resource conditions in Grand and Glen canyons because the stakeholders do not share a common vision. A substantial minority of stakeholders does not share the preservation objective of the Grand Canyon Protection Act (GCPA) and will

vote against recommendations that benefit resources if hydropower revenue is diminished. Of the 25 stakeholders, 11 of them routinely do not vote for motions designed to meet the GCPA requirements. Because AMP motions require a two-thirds majority to pass, these 11 NO votes are sufficient in themselves to block motions that benefit Grand Canyon. What is needed is an AMP composed only of those entities having an interest in improving Grand Canyon resources, consistent with GCPA requirements. The current composition of the AMP undermines its attempt to reach the GCPA-mandated objective.

#### **Collaboration within the Glen Canyon Dam Adaptive Management Work Group**

Tom Ryan, Environmental Resources Division Manager, Bureau of Reclamation, Salt Lake City, UT

The Glen Canyon Dam Adaptive Management Program (GCDAMP) includes the Adaptive Management Work Group (AMWG). The AMWG was chartered in 1997 as a Federal Advisory Committee to provide a formal mechanism for advice and recommendations to the Secretary of the Interior on the operation of Glen Canyon Dam in accordance with the 1992 Grand Canyon Protection Act. As with most stakeholder groups, there are widely divergent viewpoints among AMWG members. Although the 25 members of AMWG have been able to reach agreement on recommendations to conduct major flow-related experiments and non-flow actions, breakdowns in collaboration within AMWG have periodically hampered the effectiveness of the work group. Collaboration among all stakeholders is essential for the success of an adaptive management process. Effective collaboration within the AMWG is critical for future success of the GCDAMP.

#### **Accomplishing Conservation to Benefit Biological Diversity through Collaboration and Adaptive Management**

Sam Spiller, Lower Colorado River Coordinator, US Fish and Wildlife Service, Phoenix, AZ

The Grand Canyon Protection Act (1992) (GCPA) resulted in the Adaptive Management Program and Adaptive Management Work Group as collaborative vehicles for the Department of the Interior to accomplish conservation for biological diversity within the Grand Canyon. The Fish and Wildlife Service (FWS) works to maintain and recover the endangered humpback chub (*Gila cypha*) (chub). The maintenance and eventual recovery of the chub depends on management of an aquatic system that is colder, fluctuates in a tidal manner, and contains non-native cold and warm water predatory fish; all factors differing from pre-Glen Canyon Dam conditions and having potential negative impacts. Similarly, other aquatic and riparian invertebrate, fish, and bird species that represent Grand Canyon biological diversity may be in decline. The FWS believes desired future conditions can serve to identify management to address natural, cultural, water, power, and recreational resource needs within this collaborative opportunity provided by the GCPA.

#### **Preserving Grand Canyon's Resources: Adaptive Management or Adaptive Science?**

Steve Martin, Superintendent, Grand Canyon National Park, Grand Canyon, AZ

Martha Hahn, Chief, Science and Resource Management, Grand Canyon National Park, Grand Canyon, AZ

Effective collaboration is key to management success in any adaptive program. The Grand Canyon Protection Act clearly articulated a simple goal of improving resource conditions in Grand Canyon National Park and Glen Canyon National Recreation Area through research and monitoring applied to adaptively managing the operations at Glen Canyon Dam. After 13 years of the adaptive management program, park managers have not seen management actions that have resulted in improvement of resource conditions. We believe it is time to shift the focus away from research and monitoring and apply our efforts to implementing effective management actions. This suggested shift is based on over 25 years of intensive data collection and research that provides a sound foundation for making decisions that will improve conditions downstream of Glen Canyon Dam. Effective management requires collaboration and a shared vision for the future of the Colorado River in Grand Canyon.

Concurrent Session #91 • Broadway • Contributed Papers

#### **New Directions, New Visions: The Future of Innovation in Park Management**

Chair: David Ostergren, Director, Graduate Program in Environmental Education, Goshen College, Wolf Lake, IN

#### **Making a Case for Utilizing Integrated Science in Protected Areas**

Charles van Riper III, Senior Research Ecologist, USGS, Tucson, AZ

The increasing complexity of natural and social issues facing managers of protected areas, necessitates the utilization of interdisciplinary integrated science. Interdisciplinary science is a cumulative approach that synthesizes the perspectives of the individual disciplines and integrates them during all phases of the approach to a question or problem. This presentation will address the following questions: What is interdisciplinary science? Why are there increasing calls for it? What are the types of interdisciplinary science? When should interdisciplinary science be utilized? What does this mean for Protected Area Managers? I will also show how interdisciplinary science often allows new questions to emerge as the problem is further defined, something that rarely results from single discipline research. In concluding, I will argue that true collaboration, beyond mere cooperation, is essential to successful interdisciplinary science within Protected Areas.

#### **Beyond the Trees: Protecting Parks in the Next 100 Years**

Timothy Baird, Ph.D. Student and NSF IGERT Fellow, Department of Geography, University of North Carolina, Carrboro, NC

Sarah E. Stehn, M.S. Student, Department of Forest Ecology and Management, Michigan Technological University, Houghton, MI

Currently, parks in the U.S. and around the world are managed as partial systems. This poses considerable challenges to current and future management of the park. Generally, management resources are limited to address concerns within the borders of the park. These issues, however, are frequently driven by ecological and social phenomena that operate outside the park. Through case studies of two parks, Indiana Dunes National Lakeshore and Tarangire National Park in Tanzania, we propose a conceptual and practical reorganization of management priorities that may help our parks to develop the adaptive skills necessary to thrive in a world of rapidly changing social, economic, political and ecological contexts. By extending our conceptualizations of park management to include the conservation shed, we can begin to move beyond parochial strategies that focus on partial systems and reactive man-

agement towards more richly conceived social/ecological systems wherein the prescription for active management becomes clearer.

### **NPS and CPM Partner for Management Excellence**

Hayley Mortimer, Director, Center for Park Management, Helena, MT

As the National Park Service (NPS) faces the challenges of its second century, the importance of effective management and leadership is increasingly vital to meeting the agency's mission. The National Park Service and the Center for Park Management (CPM), a consulting service within the National Parks Conservation Association, have entered into a multi-year collaborative agreement to conduct a series of significant system-wide projects to establish and maintain management excellence within the Park Service. This Management Excellence Partnership is itself an effective partnership, but more importantly is designed to improve the agency's overall management capacity, allowing the NPS to partner more effectively with its vast number of stakeholders. This session will provide an overview of some of the key projects under the Management Excellence Partnership, along with lessons learned, tools, and best practices.

Concurrent Session #92 • Weidler • Invited Papers

### **Analyses and Syntheses of Inventory and Monitoring Data**

Tom Philippi, Quantitative Ecologist, Office of Inventory, Monitoring, and Assessment, National Park Service, Fort Collins, CO

Session overview: The NPS Inventory and Monitoring program has completed the process of selecting vital signs and developing monitoring plans for over 270 NPS units with significant natural resources. These monitoring plans are now being implemented. A set of 12 core natural resource inventories are being completed for the 270 units. The next major step for the I&M program is to develop analyses and syntheses of biotic and abiotic data from vital signs inventories and natural resource inventories to provide information useful to park managers and planners for addressing natural resource issues. This session is aimed at exchanging ideas and examples among the I&M networks early in the development process. These presentations range from conceptual approaches to syntheses and reporting of I&M data to case studies of analyses and syntheses completed or in progress.

### **The Utility of Structural Equation Modeling for Synthesizing the Effects of Multiple Controlling Processes**

Jim Grace, Senior Research Ecologist, USGS National Wetlands Research Center, Lafayette, LA

In this talk I will address two main questions: First, "What is structural equation modeling (SEM)?" SEM is a multi-equational data modeling framework that can be used to specify and evaluate complex hypotheses about multiple interacting processes controlling system responses. Second, "How is SEM used and what are its strengths?" To address this question I will illustrate the use of SEM through example and compare it to conventional approaches to analyzing complex data. Emphasis will be placed on how SEM can be used to disentangle multiple interacting processes. Model selection from an SEM perspective will also be examined as a way of illustrating its capacity to facilitate interpretation. I will end by discussing some of its potential value for the analysis of National Park Service Vital Signs monitoring data.

### **Methods for Developing Integrative Park Report Cards Using Monitoring Data**

John Paul Schmit, Quantitative Ecologist, Center for Urban Ecology, National Park Service, Washington, DC

Todd R Lookingbill, University of Maryland, Center for Environmental Science, Appalachian Laboratory, Frostburg, MD

Samantha M. Tessel, University of Maryland, Center for Environmental Science, Appalachian Laboratory, Frostburg, MD

Robert H. Hilderbrand, University of Maryland, Center for Environmental Science, Appalachian Laboratory, Frostburg, MD

For monitoring programs to effectively provide managers with a basis for decision-making, monitoring data must be synthesized into meaningful assessments of environmental condition. Selecting a synthesis method is an important first step in reporting monitoring results, as the results are sensitive to decisions made in the integration process. Using data from 10 parks, we evaluated four approaches for data synthesis. For three resource areas (forests, streams and landscapes), we selected four metrics and combined them into a single park score using simple summation, distance, multivariate hypervolume and ordination methods. Summation and distance are better able to differentiate among parks, less sensitive to uncertainty in assessment points, better able to incorporate varied data sources, and more informative for management actions. Ordination and hypervolume performed poorly, due to the realities of monitoring data collection, such as lack of sample co-location.

### **Bayesian Approaches to Trend Analysis**

Scott Gende, Ecologist, Glacier Bay Field Station, USGS, Juneau, AK

Noble Hendrix, Biometrician/Senior Aquatic Ecologist, R2 Resource Consultants, Inc., Redmond, WA

Frequentist approaches to trend analysis commonly include falsifying the null hypothesis of no change against an alternative, resulting in a dichotomous conclusion (changing vs. not). Frequentist approaches have the benefit of computational simplicity but are philosophically inconsistent with time series of abundance data (i.e., assumes repeated sampling of the data set). Bayesian inference represents an alternative to understanding trend, and although more computationally complex, is philosophically consistent with a single temporal data set. Bayesian inference can allow for other sources of data (knowledge), produce probability statements regarding trend, and can forecast management effectiveness under uncertain states of nature. The potential subjective nature of Bayesian inference (e.g., using judgment for selection of priors) is a criticism, but it is also present in frequentist approaches that must rectify statistical vs. biological significance. We use several datasets to compare and contrast strengths and weakness of frequentist and Bayesian approaches to trend analysis.

### **Using Aquarius Time Series Software to Manage Data from Continuous Water Quality Monitors in UCBN**

Eric Starkey, Biological Technician, NPS Upper Columbia Basin Network, Moscow, ID

Many Inventory and Monitoring Networks use continuous water quality monitors, which will require efficient data processing and analysis. In 2008, continuous water quality datasondes were deployed in Lapwai Creek at Nez Perce Historical Park, Idaho and Mill Creek at Whitman Mission Historical Site, Washington. In an effort to more efficiently manage water quality data the UCBN



agreed to pilot test Aquarius Time-Series Software produced by Aquatic Informatics Company in Vancouver, British Columbia. The Aquarius program streamlines record processing and allows tracking of data corrections and deletions. The UCBN anticipates that Aquarius Time-Series Software will help standardize the processing and QA/QC of continuous water quality data within the National Park Service. Other useful features include the ability to join monthly time series, add and track data corrections and/or deletions, data grading, descriptive statistics toolbox, graphical outputs, and export to other databases including Access and NPSstoret.

#### **An Overview of Habitat Analysis Approaches to Extracting Management Information from Core Inventory Data**

Tom Philippi, Quantitative Ecologist, Office of Inventory, Monitoring, and Assessment, National Park Service, Fort Collins, CO

Peter Budde, GIS Coordinator, Office of Inventory, Monitoring, and Assessment, National Park Service, Fort Collins, CO

Brent Frakes, Business Analyst, Office of Inventory, Monitoring, and Assessment, National Park Service, Fort Collins, CO

Lisa Nelson, Senior GIS Analyst, Office of Inventory, Monitoring, and Assessment, National Park Service, Fort Collins, CO

One major potential use of spatial inventory data is prediction of where species are, or where they might be in the future. A wide range of statistical methods exist, differing in the form of location data. Some approaches only require locations of presences; others use plot data with presences and absences (and possibly abundances), either from a probability sample or from a less formal sample. Ecologically, rare species are unlikely to exist in all suitable habitat locations, so absences do not necessarily imply unsuitable habitat. Further, for exotic invasive species, where "habitat" is areas at risk of invasion, the current distribution is likely spatially restricted, and dispersal limitations may be important. We briefly illustrate these different approaches with vegetation plot data and core inventory products from Rocky Mountain National Park.

#### **Multi-season Occupancy Models for Inventory and Monitoring Datasets**

Tom Rodhouse, Ecologist, NPS Upper Columbia Basin I&M Network, Moscow, ID

Advancements in estimation and modeling of species occupancy have made this a useful approach for a wide range of applications involving presence/absence data, such as habitat modeling and trend detection. It provides a flexible and convenient means of dealing with several challenging issues, including detectability, and is readily integrated into existing modeling tools used to develop resource selection functions (e.g., logistic regression). Multi-season data can be incorporated into these models to address temporal changes in state variables such as occupancy, extinction and colonization. Hypotheses of underlying processes can be explicitly evaluated as well. Within the NPS Inventory and Monitoring Program, occupancy models are being used with existing inventory data as well as with (rapidly) accruing long-term monitoring data. I will briefly review fundamentals of occupancy modeling, focusing on the unique aspects of multi-season models, and present several examples from the NPS Inventory and Monitoring Program.

Concurrent Session #93 • Halsey • Panel Discussion

#### **World War II Home Front: Preservation Partnerships**

Chair: Vincent Santucci, Chief Ranger, National Park Service, McLean, VA

The contributions and sacrifices made during the Second World War were not exclusive to the battlefields across two oceans. Between 1941 and 1945 the Home Front of the United States was dramatically transformed to sustain the demands of global warfare. Today some of the places and the stories tied to the WWII Home Front are being preserved by the National Park Service. Rosie the Riveter WWII Home Front National Historical Park and Naval Magazine National Memorial, California, represents sites which are integral to this discussion. Manzanar National Historic Site, California, interprets the history of Japanese-American internment during the war. Military intelligence activities, ranging from prisoner of war interrogation to an intelligence language school, are preserved at sites within the George Washington Memorial Parkway, Virginia, and Golden Gate National Recreation Area, California. Partnerships with local communities and organizations, veterans groups, branches of the United States Military, intelligence community, academic institutions, media, and other groups, have enhanced opportunities for Home Front preservation. This panel will highlight the successful partnership strategies which have been employed at WWII Home Front sites across the National Park Service.

Panelists: Harry Butowsky, Historian, National Park Service, Park History Program, Washington, DC

Tom Leatherman, Deputy Superintendent, Rosie the Riveter WWII Home Front National Historical Park and Port Chicago Naval Magazine National Memorial (former Superintendent Manzanar NHS), National Park Service, Danville, CA

Stephen Haller, Historian, National Park Service, San Francisco, CA

Brandon Bies, Cultural Resources Specialist, National Park Service, McLean, VA

Robert Sutton, Chief Historian, National Park Service, Washington, DC

Laura Cohen, Chief of Interpretation, Prince William Forest Park, Triangle, VA

Matt Virta, CR Program Manager, George Washington Memorial Parkway, McLean, VA

Concurrent Session #94 • Hawthorne/Sellwood • Contributed Papers

#### **Invasive Species**

Chair: TBD

#### **Controlling an Invasive Marine Algal Species in a Culturally Significant Hawaiian Fishpond**

Mariska Weijerman, Marine Resources Research Specialist, Cooperative Ecosystems Studies Unit, University of Hawaii, Manoa, Kailua-Kona, HI

Sallie Beavers, Ecologist, Kaloko-Honokohau National Historical Park, Kailua Kona, HI

Rebecca Most, Biological Science Technician/Ecologist, Kaloko-Honokohau National Historical Park, Kailua Kona, HI

Kristy Wong, Biological Technician, Division of Aquatic Resources, Maui Office, Department of Land and Natural Resources, Wailuku, HI

Kaloko Fishpond, located in Kaloko-Honokohau National Historical Park, is undergoing rehabilitation to function as a traditionally-managed Hawaiian aquaculture. An unintentionally introduced alien marine alga, *Acanthophora spicifera*, invasive elsewhere in Hawaii, was first documented at Kaloko Fishpond in 2000. This alga is degrading the pond's water quality and poses the risk of spreading to nearby coral reefs. The University of Hawai'i Pacific Cooperative Studies Unit and the National Park Service, initiated a project to control this alga in Kaloko Fishpond and reduced the abundance from 66% to 24%. Different removal methods were assessed and all showed a substantial initial decrease in algal density, but the long-term effect was minimal because of rapid re-growth. The use of shelters to boost local fish populations appeared to be the most promising method. A management strategy to substantially reduce the algal biomass in the fishpond should include biological control and periodic manual removal of the algae.

#### **Requests for Management of Invasive Species are on the Rise**

Mark Wotawa, Quantitative Ecologist, National Park Service, Fort Collins, CO

Carol DiSalvo, IPM Coordinator, National Park Service, Washington, DC

The National Park Service (NPS) initiated an Integrated Pest Management (IPM) program in the late 1970s to reduce risks to people, resources, and the environment from pests and pest-related management actions. The IPM program incorporates various management tools to formulate the best strategy for each pest situation. IPM tools include education, mechanical, physical, cultural, biological, genetically modified organisms, and chemical pesticides. Proposed and actual use of chemical pesticides in the NPS, as well as their intended purpose, have been documented and tracked in a Servicewide database. Trends in pesticide use proposals during 1988–2006 indicate a distinct increase in the proportion of those for management of exotic, invasive species versus those proposed for public health, structural, and/or ornamental protection. Patterns in pesticide proposals and use will be presented, and the management implications for such a shift will be explored.

#### **Working Together against Weeds: An Interdisciplinary Approach to Preventing Weed Introductions through Park Management Activities**

Sylvia Haultain, Plant Ecologist, Sequoia and Kings Canyon National Parks, Three Rivers, CA

Jay Goldsmith, Natural Resource Specialist, NPS Pacific West Regional Office, Oakland, CA

Jane Rodgers, Grand Canyon National Park, Grand Canyon, AZ

Bobbi Simpson, Liaison, California Exotic Plant Management Team, Point Reyes Station, CA

In late March of 2007, the Pacific West Region of the National Park Service hosted an ambitious three-day interdisciplinary weed prevention workshop at Point Reyes National Seashore. Working Together against Weeds brought together a diverse group of thirty-eight participants to explore ways to best prevent the introduction of weeds within the context of day to day park operations. Coordinated by twelve NPS ecologists from throughout the California parks and the Oakland regional office and funded by the PWR Employee Development fund, the workshop generated a collection of readily shared resources for parks to use in their weed control and educational efforts. This presentation summarizes the results of the workshop, including key recommendations and operations-specific best management practices developed by interdisciplinary teams during the workshop that can be readily adopted by parks and other protected areas.

#### **The Challenge of Controlling the Invasive Offspring of Historic Olive Trees**

Paula Power, Ecologist, Channel Islands National Park, Ventura, CA

Sarah Chaney, Restoration Ecologist, Channel Islands National Park, Ventura, CA

James R. Roberts, Biological Technician, Channel Islands National Park, Ventura, CA

Clark Cowan, Biological Technician, Channel Islands National Park, Ventura, CA

Santa Cruz Island, largest of the islands in Channel Islands National Park, is home to many endemic and rare plants and animals. However, the vegetation has been highly altered during the past 150 years by introductions of non-native species. For example, European olive (*Olea europaea*) was planted during the late 1800s as part of an island-wide ranching operation. The olive orchard is now a contributing element to the cultural landscape. In the past 100 years, olive seeds have dispersed throughout the island. Native plant communities, recovering from years of overgrazing by feral sheep and pigs (which were removed during the past two decades), are now threatened by the spread of aggressive olive trees. Data will be presented on the time and cost required to control olives in recovering native plant communities. A range of options for managing the spread of historic olive trees also will be discussed.

#### **Cooperative Restoration: Integrating Traditional and Contemporary Concepts to Restore a Sierra Nevada Meadow**

Brent Johnson, Botanist, Pinnacles National Monument, Paicines, CA

In 2005, Yosemite National Park initiated a project to restore a 13-acre wetland meadow that contains a Native American traditional gathering area. This meadow was likely managed and used by the native Ahwaneechee and is still used by their descendants and Yosemite's Indian cultural program. However, invasive Himalayan blackberry had spread into the site, and conifers were encroaching into the meadow. The National Park Service cooperated with local Native American Tribes and other park partners to put together a long-term restoration strategy to address these concerns. This involved tribal members participating in a prescribed burn that included a traditional fire starting practice. Additionally, park staff and volunteers removed invasive blackberry and installed experimental plots to examine the meadow plant community response to burning and mechanical removal of blackberry. The project provided an excellent opportunity for American Indians to once again participate in managing the park's natural and cultural resources.

Concurrent Session #95 • Ross Island/Morrison • Contributed Papers

#### **Virtual Learning**

Chair: Samantha Weber, Consultant, Yosemite, CA

### **Partnerships in Communication: Recent Advances in Virtual Research Learning Centers**

Emily Yost, Science Communication Assistant, Utah State University/NPS, Yellowstone National Park, WY

Tami Blackford, Editor, Yellowstone Science, Yellowstone National Park, Yellowstone National Park, WY

Robert E. Bennetts, Program Manager, National Park Service, Southern Plains Network, New Mexico Highlands University, Las Vegas, NM

Janine Waller, Editorial Assistant, Yellowstone National Park, Yellowstone National Park, WY

The Greater Yellowstone Science Learning Center and the Learning Center of the American Southwest, both virtual research learning centers, communicate scientific results about the natural and cultural resources of protected areas to a variety of audiences. These websites are portals to integrated inventory, monitoring, and research information acquired through the collaborative efforts of the National Park Service Inventory and Monitoring Networks, Cooperative Ecosystem Studies Units, park units and other protected areas, partner scientists, and others. Recent advances in website development have greatly enhanced their efficiency and potential for use. These advances, made possible by leveraging partnerships and pooling resources, include: (1) effective content management which enables pages that are generated from a relational database; (2) a content tracking system to incorporate metadata such as content reviewers and data sources; and (3) the development of templates transferable to other programs.

### **An Examination of Live Interactive Virtual Explorations at the Cabrillo National Monument in Southern California**

Kimberly Bruch, Public Information, University of California–San Diego Supercomputer Center, La Jolla, CA

Hans-Werner Braun, Research Scientist, University of California–San Diego Supercomputer Center, La Jolla, CA

Susan Teel, Director, California Mediterranean Research Learning Center, Thousand Oaks, CA

Building upon lessons learned from the National Science Foundation funded High Performance Wireless Research and Education Network Live Interactive Virtual Explorations (LIVE) pilot project, the Sea to Shining Sea (seatoshiningsea.org) project is expanding concepts from southern California to several National Parks. Researchers are perfecting development and implementation of a wearable, inexpensive backpack-based system that allows for real-time bidirectional Internet-based video, audio, and sensor data flows between the field and remote audiences. Research also encompasses development of a LIVE Backpack Guide, which explains how to setup and participate in a LIVE session. This paper details information within the backpack guide as well as a case study regarding the use of the LIVE Backpack system at the Cabrillo National Monument, Biscayne National Park, and an array of education sites ranging from rural Native American learning centers and schools to urban science centers and museums.

### **Bringing National Parks into America's Classrooms**

Bruce Nash, Ecologist, National Park Service, Lakewood, CO

Erika Matteo, Multimedia Specialist, University of Colorado–Denver, Lakewood, CO

David Krueger, Information Technology Specialist, National Park Service, Lakewood, CO

Kristen Nein, Education Specialist, University of Colorado–Denver, Lakewood, CO

Educators want to make national parks a part of their curricula. The newly revised “Views of the National Parks” (Views) program brings parks into the classroom by supplying movies, soundscapes, interactive graphics, 360-degree panoramas, inspiring photography, and expert-reviewed content. Views includes modules on individual parks and on park resource-related subjects (e.g., Glaciers, Volcanism). A Spanish version of the Wilderness module offers opportunities to reach minority audiences and assist with English language acquisition. The new Views “Teachers’ Lounge,” created with partners at the University of Colorado–Denver School of Education, provides lesson plans, educational curriculum guides, “hands-on” activities, content standards, and other resources that complement the Views modules. Views offers teachers an engaging park-based resource that combines science, mathematics, language arts, the arts, and multicultural perspectives. Together, Views and the accompanying educational resources offer a clear path from the computer screen to the classroom and eventually to the parks themselves.

### **Using Internet Databases to Expand Research-based Education Programs**

Susan Sachs, Education Coordinator, Appalachian Highlands Science Learning Center, Great Smoky Mountains National Park, Waynesville, NC

Dave Zelenka, Interactive Earth, Port Angeles, WA

Great Smoky Mountains National Park has five internet databases that host inventory and monitoring data collected during middle and high school field trips. Topics include salamanders, terrestrial invertebrates, ozone bio-monitoring, slime molds and water quality monitoring. Activities have been developed using the databases that allow teachers to incorporate inquiry-based learning into the pre and post field trip lessons. After a brief overview of the structure, we will showcase an example of how the database can be used as a field-trip extension where students analyze data to answer their own original questions. The databases are hosted by Hands on the Land, a public lands partnership coordinated by Keystone Center, which is looking for more partnering sites. Learn ways this website can assist you with electronic educational needs.

Concurrent Session #96 • 3 Sisters • Invited Papers

### **Understanding Protected Areas in Geographical Context**

Claire Jantz, Assistant Professor, Shippensburg University, Department of Geography–Earth Science, Shippensburg, PA

Session overview: Recognizing that threats to protected areas often originate in the surrounding landscapes, the focus of parks conservation is expanding to include areas and resources located outside of park boundaries. Geotechnology (e.g. remote sensing and geographic information science) and spatial modeling have grown in importance as wider landscapes are considered and as advanced spatial analysis techniques have become widely available and understood. This session will focus on the use of geotechnology and spatial modeling as tools that can form the basis for management partnerships, from the local to the national level. Issues of network connectivity, inventorying and monitoring, sprawl, land use planning, and greenway planning will be addressed by the session participants. Many of the papers illustrate the increasing importance of forming partnerships between scientists/experts and decision makers to pool resources and expertise to achieve common management goals.

### **Forecasting Urban Development in the Upper Delaware Watershed**

Claire Jantz, Assistant Professor, Shippensburg University, Department of Geography–Earth Science, Shippensburg, PA

Scott Goetz, Senior Scientist, The Woods Hole Research Center, Falmouth, MA

Eric Brown de Colstoun, Science Systems and Applications, Inc., NASA Goddard Space Flight Center, Greenbelt, MD

The Upper Delaware watershed contains a wealth of natural and scenic resources, including the Upper Delaware Scenic and Recreational River and the Delaware Water Gap NRA. Because of the recreational opportunities afforded by these resources, they are an important component of the economic base. Recent growth is threatening the integrity of these resources, primarily through forest fragmentation, impairment of water quality, loss of open space and wildlife habitat, and degradation of scenic views. The need was identified to develop land use strategies that could accommodate population and economic growth without sacrificing the natural resources that attract visitors and residents to this area. To address this need, the SLEUTH urban land cover change model was applied for the counties in this region, in partnership with four county planning offices, Pennsylvania's DCNR, the NPS, and NASA—representing a unique partnership that has brought advanced geotechnology into local land use decisions.

### **Connectivity: A Step Beyond Partnerships**

John Donahue, Superintendent, Delaware Water Gap National Recreation Area, Bushkill, PA

Leslie Morlock, GIS Specialist, Delaware Water Gap National Recreation Area, Bushkill, PA

Delaware Water Gap National Recreation Area is located within 100 miles of the greater New York City metropolitan area. Surrounded by three states and straddling the Delaware River the park is faced with large-scale developments, both existing and proposed, making the need for preserving open space and maintaining the rural character in the region imperative. Using GIS and a simple set of criteria, park staff began looking at areas desirable to preservation efforts that could potentially link the state and federal lands. Three areas in Pike County, PA were identified as potential wildlife corridors/greenways. County, state and NPS staff have been collaborating to identify areas of priority to focus preservation efforts. What began as individual efforts by multiple agencies resulted in a collaboration to work towards identifying areas that held high merit for various preservation efforts.

### **Assessing the Ecological Context of the National Park and National Wildlife Refuge Systems**

Leona Svancara, Spatial Ecologist, University of Idaho and Idaho Department of Fish and Game, Moscow, ID

J. Michael Scott, Unit Leader, US Geological Survey and University of Idaho, Idaho Cooperative Fish and Wildlife Research Unit, Moscow, ID

Thomas R. Loveland, Research Geographer, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD

Anna B. Pidgorna, Program Manager, Heifer Project International, Kiev, Ukraine

The ability of protected areas to maintain current levels of biodiversity depends, at least in part, on the integrity of surrounding lands.

Our objective was to quantify the extent and pattern of natural land cover, risk of conversion, and relationships with demographic and economic variables in counties surrounding both National Parks and National Wildlife Refuges, just parks, just refuges, or counties distant from either type of protected area. We found that conservation risk (ratio of converted to protected lands) in counties surrounding parks or refuges was significantly lower than distant counties and even lower in those counties near both parks and refuges. In addition, counties surrounding both parks and refuges had significantly higher per capita income than any others. Our results provide a consistent, national-level assessment of potentially adverse changes on lands surrounding parks and refuges and indicate that any one agency or organization cannot do it alone.

### **U.S. Residential Housing Growth: Trends and Patterns Near National Parks and National Wildlife Refuges**

Patrick Jantz, Ph.D. Candidate, Donald Bren School of Environmental Science and Management, University of California–Santa Barbara, Santa Barbara, CA

Residential growth and change in the United States has shifted over time to favor low density growth driven in part by natural amenities. Recent research has used U.S. Census and other data to quantify and map these growth patterns at regional to national scales. Because of the nature of recent residential growth, National Parks, National Wildlife Refuges, National Forests, and other protected areas with high concentrations of natural amenities may be disproportionately affected. In this research we compared and contrasted growth around National Parks and National Wildlife Refuges because they are extensive, heterogeneous protected area networks that harbor important elements of biological diversity. Using U.S. Census Bureau data for 1990 and 2000 and satellite-derived land cover change maps, we quantified changes in housing and land cover around Parks and Refuges. Changes were assessed using a moving window approach with multiple neighborhood sizes. “Hot spots” of growth and change were identified.

Concurrent Session #97 • Mt. Bachelor • Invited Papers (Part 2 of a 2-Part Track)

### **Recreation Ecology II**

Chair: Logan Park, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Session overview: Recreation ecology is a field of study that seeks to assess and understand the environmental impacts resulting from recreational activity in protected natural areas. These studies can help managers to identify, monitor, manage, and rehabilitate recreation impacts. This session includes papers describing new methodologies being employed in recreation ecology research and monitoring.

### **Classifying Approaches to Visitor Impact Assessment in U.S. and Australian Protected Areas**

Yu-Fai Leung, Associate Professor, North Carolina State University, Parks, Recreation & Tourism Management, Raleigh, NC

Catherine Pickering, Associate Professor, International Centre for Ecotourism, Griffith University, School of Environment, Gold Coast, Queensland, Australia

Visitor impacts are increasingly recognized as a threat to natural resources in many protected areas worldwide. In order to formulate effective management strategies, managers need timely and useful information to evaluate the extent and severity of impacts as well as their trends and patterns over time and space. As a result, visitor impact assessment is advocated by a growing number of protected area agencies and organizations as an essential part of science-based management. Despite such recognition, effective or sus-



tained visitor impact assessment programs are rare. A significant part of this problem is due to lack of guidance in choosing the right approach and confusion conducting whether the assessment should be incidental, inventories, monitoring or recreation ecological research. Based on the scientific literature and management practice in the U.S. and Australia, we propose a typology of visitor impact assessment that would help managers and scientists understand the range of assessment approaches and the criteria for choosing among them.

#### **Recreation-Related Ecological Conditions of Mountain Summits in the Northern Forest: A Framework for Management**

Kelly Goonan, Graduate Research Assistant, University of Vermont, Burlington, VT

Christopher Monz, Assistant Professor of Recreation Resources, Utah State University, Department of Environment and Society, Logan, UT

Robert Manning, Professor, University of Vermont, Burlington, VT

Jeffrey Marion, USGS Research Scientist, Virginia Tech, Department of Forestry, Blacksburg, VA

Jeremy Wimpey, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Carena van Riper, Graduate Research Assistant, University of Vermont, Burlington, VT

Outdoor recreation/tourism is an important use of the Northern Forest of the northeastern US. A framework of indicators and standards supported by ongoing monitoring can help manage recreation in a sustainable manner. This project utilized an interdisciplinary approach that assessed current ecological conditions on a range of mountain summits, and a visitor survey utilizing visual methods to formulate associated standards of quality. Methods used in campsite impact assessments were adapted for use on mountain summits. Preliminary findings from the ecological work suggest that visitor activities resulted in various impacts to summit resources, and that these impacts vary across the range of summits studied. A visitor survey incorporating normative questions was administered to a representative sample of visitors at each site. Findings have identified standards of quality for the condition of summit resources and acceptable management strategies for protecting these resources. The results of this study will be used to guide the formulation of standards for ecological conditions on a range of mountain summits throughout the Northern Forest.

#### **Computer Modeling Hiker Travel on Trails: A GPS-Driven Approach**

Logan Park, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Steve Lawson, Associate Professor, Virginia Tech, and Resource Systems Group, Inc., White River Junction, VT

Computer simulation modeling is emerging as a powerful tool for understanding and predicting the dynamics of complex recreation networks, such as trail and road systems within a park. Modeling a park or protected area's travel networks can provide insights on crowding, resource pressure, and opportunities for optimizing management practices. However, construction of rigorous models requires volumes of quantitative data on visitor behaviors. This study describes a collaborative effort at Rocky Mountain National Park to develop GPS data to understand the rates of hiker travel through a trail system, and how they relate to opportunities to improve the park's shuttle system.

#### **Utilizing GPS-based Measurements of Visitor Behavior in Parks and Protected Areas: Limitations and Opportunities**

Ashley D'Antonio, Graduate Student, Utah State University, Department of Environment and Society, Logan, UT

Christopher Monz, Assistant Professor of Recreation Resources, Utah State University, Department of Environment and Society, Logan, UT

Steve Lawson, Associate Professor, Virginia Tech, and Resource Systems Group, Inc., White River Junction, VT

Karen Hockett, Visiting Assistant Professor, Virginia Tech, Department of Forestry, Blacksburg, VA

Logan Park, Doctoral Candidate, Virginia Tech, Department of Forestry, Blacksburg, VA

Peter Newman, Assistant Professor of Protected Areas Management, Colorado State University, Human Dimensions of Natural Resources Department, Fort Collins, CO

Jeffrey Hallo, Assistant Professor, Clemson University, Department of Parks, Recreation, and Tourism Management, Clemson, SC

Understanding the spatial pattern of visitor use in parks is essential for protecting park resources and visitor experiences. Knowing the specific locations and intensity of use can provide an important "early warning" of locations of potential visitor resource impact and of times and places where visitor density is suggestive of crowding and other experience issues. This research reports on recent methodological advances in several studies where global positioning system (GPS) tracking methodology was used to determine visitor flows and densities along trail corridors. For example, GPS strategies were employed on trails within the Bear Lake Corridor of Rocky Mountain National Park and analyzed to examine the spatial patterns of visitor use. Findings from this study suggest that this methodology holds significant promise for understanding visitor flows and densities. However in some cases, accuracy considerations limited the ability to assess small spatial scale changes in dispersed, off trail situations.

#### **Assessing the Effect of Rock Climbing and Hiking on the Cliff Vegetation of Great Falls Park, VA**

Chris Carr, Doctoral Candidate, University of Cincinnati, Cincinnati, OH

Jeffrey Marion, USGS Research Scientist, Virginia Tech, Department of Forestry, Blacksburg, VA

Charlie Davis, Lutherville, MD

This research examines the effect of rock climbing and hiking on the vegetation of the cliffs and adjacent rocky areas of the Potomac Gorge section of Great Falls Park, VA. Recreational activities generally reduce vegetation cover—the visibility of trails reflects this loss. However, vegetation is generally patchy in rocky areas due to factors such as aspect, soil depth, and moisture. The patchy spatial distribution can confound efforts to associate vegetation loss with recreational activities, particularly given that visitors naturally seek out and use barren or less vegetated surfaces. This research is examining rock physical features (e.g., crack size and orientation) and vegetation parameters (e.g., species and cover) in 98 cliff-associated quadrats in an effort to develop a predictive model of vegetation abundance. Recreational impacts to vegetation will be quantified by comparing predicted abundance to actual abundance.

(Track continued from Concurrent Session #64)

Concurrent Session #98 • Mt. Hood • Panel Discussion

**World Heritage: Where Are We Now?**

Stephen Morris, Chief, Office of International Affairs, National Park Service, Washington, DC

The United States was a key player in the development of the World Heritage concept, which some consider a global expression of the national park idea, and was the first country to sign the World Heritage Convention. Between 1978, when the first sites were inscribed on the World Heritage List at a U.S.-hosted meeting in Washington, DC and 1994, 20 sites in the U.S., mostly units of the National Park System, were designated as World Heritage Sites. However, the U.S. significantly scaled back its participation in World Heritage following the inclusion of Yellowstone on the List of World Heritage in Danger and the resulting controversy in 1995. A significant re-engagement with the Convention began in 2003 with the re-entry of the U.S. to full membership in UNESCO. In 2005, the U.S. campaigned for and won a seat on the World Heritage Committee, the governing body of the Convention. As part of the campaign, the government pledged to issue a new "Tentative List" of candidate sites, to replace the outdated previous list prepared in 1982. The new Tentative List was completed after a two-year process in 2008 and the first U.S. nominations in 15 years are being prepared for submission. What led to the revival of the program in the U.S.? How sustainable is the renewed program? How could the concept be better promoted within North America? Do we have lessons to learn from our colleagues in Canada about ways to promote World Heritage? What obstacles and opportunities face the World Heritage program at large, and what should the U.S.'s role be in helping shape the future of the Convention?

Panelists: Cindy Orlando, Superintendent, NPS, Hawai'i National Park, HI

Erika Harms, United Nations Foundation

Concurrent Session #99 • Mt. St. Helens • Panel Discussion

**The Untold Stories of the Famous and Forgotten: The National Trail System of the National Park Service**

Chair: W. Otis Halfmoon, Tribal Liaison, National Trails System, National Park Service, Santa Fe, NM

The National Trails System manages 9 National Historic Trails within 24 States, consults and collaborates with over 100 Federally Recognized Tribes and with hundreds of diverse communities that follow these trails that are significant to American history. Each Trail is a mountain unto itself, the preservation of precious resources, landmarks, written and oral histories each bring a challenge. How does a Superintendent manage nine separate NPS units? How does the manager identify the resources? How does the American Indian fit into this equation? These Trails tell the stories of the pioneer, explorer and soldier, from the message of a religion to the concept of Manifest Destiny. The removal of a people from their homeland due to the people that ride the wagon train to cross numerous Mountains. These stories and landmarks must be preserved and developed on the ground for American citizens. This is done by consultation and collaboration with various State entities, private organizations and numerous American citizens. This is the story of America.

Panelists: Mike Taylor, Natural/Cultural Resource Manager, National Trails System, National Park Service, Santa Fe, NM

Frank Norris, Historian, National Trails System, National Park Service, Santa Fe, NM

W. Otis Halfmoon, Tribal Liaison, National Trails System, National Park Service, Santa Fe, NM

**Thursday Early Afternoon, March 5**

Concurrent Session #100 • Multnomah • Invited Papers

**Natural and Cultural Resource-Based Storm Response and Recovery in Ocean and Coastal Parks**

Chair: Mark Borrelli, Coastal Geologist, Texas A&M University, and Geologic Resources Division, National Park Service, Lakewood, CO

Session overview: Assessing the vulnerability of natural and cultural resources in ocean and coastal parks is critical for post-storm response and recovery. This session will highlight several ongoing projects that document impacts from storm events. Several of these projects are collaborative efforts between the investigators and park staff. The larger goal for these and similar projects is to develop park-specific management guidelines based on these findings. A prototype, park-specific storm recovery plan written primarily to manage natural and cultural resources at Cape Lookout National Seashore in a post-storm environment will also be presented.

**The Storm Project: Discussing Data Products and the Way Forward**

Mark Borrelli, Coastal Geologist, Texas A&M University, and Geologic Resources Division, National Park Service, Lakewood, CO

Rebecca Beavers, Coastal Geologist, Geologic Resources Division-Natural Resource Program Center, National Park Service, Lakewood, CO

A project to assess the vulnerability of natural and cultural resources to storm events in coastal parks is ongoing. This talk will highlight some of the finished products from this project to inform and encourage others parks to pursue similar efforts. Storm vulnerability assessments for 6 parks along the US east coast and Hawai'i have been completed. These assessments provide, among other things, GIS-based spatial data for the parks to aid in future resource-based management decisions. A searchable, online GIS database for coastal engineering projects in ten coastal parks is near completion. Efforts to develop the position of All-Hazard Resource Advisor (READ) to help Incident Management Teams in post-storm recovery has seen significant progress. Materials to educate the public on storm and coastal processes have been developed with staff from the "Views of the National Parks" web portal and are available in several mediums.

**Managing the Natural Recovery of Coastal Systems Following Extreme Storms**

Chris Houser, Assistant Professor, Texas A&M University Department of Geography, College Station, TX

While the response of a coastal system to an extreme storm can be quite dramatic and changes to the physical environment occur rapidly, recovery is generally slow and dependent on the frequency of storm events. This paper describes the response and recovery of the Gulf Islands National Seashore to Hurricanes Ivan (2004), Dennis (2005) and Katrina (2005). It is argued that the response

and recovery are controlled by the geologic framework of the island, which in turn controls the height and extent of beach and dune morphology. Development and management of the park must recognize the spatial and temporal controls on island response and recovery, particularly with respect to changes in storm frequency and magnitude. If vegetation is unable to reestablish or the dune is unable to recover in height and extent, there is the potential for a loss of system resiliency and for a smaller discontinuous dunes to develop.

#### **Predicting Coastal Storm Impacts for National Parks**

Patrick Barnard, Coastal Geologist, U.S. Geological Survey, Pacific Science Center, Santa Cruz, CA

The USGS, in collaboration with the National Park Service, is leading the development of a coastal hazards model for forecasting the impacts of severe winter storms on NPS shorelines. The model is currently being tested along the Southern California shoreline from Point Conception to the Mexican border, and will also use the NPS-managed shoreline at Ocean Beach, San Francisco, as another important testing site. The primary goal of this program is to, in real-time, forecast the potential for coastal flooding and inundation, beach erosion and cliff failure using state-of-the-art data integration techniques and physical process models. The coastal hazards model will be used as the basis for local hazard assessments and real-time warning systems in strategic partnership with the National Park Service, as well as numerous other federal, state, local, and academic partners.

#### **Storm Recovery Planning for Natural and Cultural Resources: The Cape Lookout Storm Recovery Plan**

Eric Bardenhagen, Ph.D. Candidate, Hazard Reduction and Recovery Center, Texas A&M University, College Station, TX

George Rogers, Professor, Hazard Reduction and Recovery Center, Texas A&M University, College Station, TX

A Storm Recovery Plan has been created for Cape Lookout National Seashore, a coastal park in North Carolina. This plan rests on four basic foundations: first, guidance for post-storm recovery efforts is specifically focused on the long term management of natural and cultural resources found within the park; second, the plan incorporates vital park infrastructure and existing administrative and operational capabilities of the park; third, a resource valuation survey is administered to park user groups to help establish an empirical basis for resource priority listings to be used during recovery efforts; and fourth, the plan includes a strategically planned integration of local recovery goals with Incident Management Team processes and plans. This plan is the first of its kind within the National Park Service and it is intended that the lessons learned from this process will lead to a successful methodology for use in other coastal parks and facilities.

#### **National Seashores, Shoreline Erosion, Sea Level Rise, and Adjacent Communities: A History of Conservation Conflict**

Mary Foley, Regional Chief Scientist, National Park Service, Northeast Region, Boston, MA

National seashores were established to protect the natural resources of relatively undeveloped and unspoiled coastal areas, to maintain public access to the coast, and to provide for coastal recreation. As the coastal areas on both the Atlantic and Pacific coasts have become increasingly developed, many national seashores are experiencing greater conflicts with either communities adjacent to the parks or communities located within the parks themselves. NPS management policies call for natural geological processes to be allowed to proceed unimpeded while communities look to maintain shoreline position. To what extent should the NPS compromise to protect individual private homes? Is it even possible given the accelerated rates of sea level rise projected by the Intergovernmental Panel on Climate Change (IPCC). The experience of Fire Island National Seashore will be explored.

Concurrent Session #101 • Holladay • Invited Papers

#### **Linking Predators to Plants: What is the Role of Trophic Cascades in National Parks?**

Chair: William Ripple, Professor, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

Session overview: In this session we document trophic cascades as the ecological effects of extirpating, maintaining, and reintroducing large carnivores in national parks. By the early 1900s, wolves and other large predators were the target of widespread eradication efforts in national parks. With the extirpation or displacement of these predators, ungulate irruptions subsequently occurred. Unimpeded foraging by ungulates dramatically altered plant communities, food webs, and responses of these communities to disturbances such as floods and fires. Thus, the loss of large predators appears to have set in motion a chain of events that soon became etched in the ecosystem character and dynamics as biodiversity invariably began a downward spiral. Large predator reintroduction appears to have reversed these changes and initiated the process of plant community recovery. Restoration of herbivore-degraded plant communities is needed to reestablish ecosystem services and maintain biodiversity in national parks. National Parks highlighted in the session include Yellowstone, Wind Cave, Zion, Olympic, Yosemite, and others.

#### **Adolph Murie, Olaus Murie, Aldo Leopold, and Large Carnivore Conservation in the National Parks**

Cristina Eisenberg, Corvallis, OR

In the 1930s and 1940s, early wildlife biologists Adolph Murie, Olaus Murie, and Aldo Leopold, whose work was foundational to contemporary trophic cascades science, were among the first to document the ecological effects of large carnivore removal. These effects included ungulate irruptions resulting in excessive herbivory and simplification of food webs, which today's scientists refer to as trophic cascades. In field notes and reports the Muries and Leopold noted both density-mediated and behavioral responses to large carnivore extirpation. Working in Yellowstone, Grand Teton, Denali, and Isle Royale National Parks, and inspired by George Wright's policy insights, they argued for restoration and conservation of wolves (*Canis lupus*) in these parks. An archival examination of their field journals and correspondence yields surprising insights about managing our national parks for sustainability of large carnivores and biodiversity across multiple ecosystems.

#### **Wolves to Aspen and Cavity-nesting Birds: Trophic Cascades and Beyond in the Northern Yellowstone Ecosystem**

Jeff Hollenbeck, Corvallis, OR

Here I will present some evidence for a trophic cascade in the northern Yellowstone ecosystem, including tree ring data showing periods of riparian tree stem recruitment (or its absence), recent field data describing aspen and cottonwood stand condition, and cavity-nesting bird data which provide a basis for discussing the long-term implications of top predator perturbation. Our data sug-



gest that after wolf extirpation in the early 1900s, changes in the abundance and behavior of elk resulted in intense overbrowsing of young aspen suckers, essentially halting new stem recruitment in most aspen stands and threatening their persistence. The reintroduction of wolves in 1996 appears to have restored top-down ecosystem processes that allow successful aspen recruitment. However, the interim loss of wolves, and their effect on aspen via elk, may continue to affect this ecosystem for some time.

#### **Plant Recruitment Following Wolf Reintroduction in Yellowstone National Park**

Josh Halofsky, Olympia, WA

Trophic cascades theory holds that indirect influences of apex predators, such as gray wolves (*Canis lupus*), can be transmitted beyond their immediate prey base to lower trophic levels. Implied in this theory is that such predators may be needed to maintain biodiversity. This presentation will summarize reported changes in plant recruitment in Yellowstone National Park following wolf reintroduction. Specifically, I will 1) provide evidence of willow (*Salix* spp.) and aspen (*Populus tremuloides*) recruitment, 2) discuss how changes in plant recruitment coincide with changes in herbivore browsing patterns, and 3) discuss how changes in both herbivore densities and browsing behavior following wolf reintroduction may influence plant recruitment. While factors such as climate, fire, and natural stand dynamics all influence plant recruitment, the evidence from our studies support the theory of trophic cascades, a theoretical framework park managers could employ to maintain or increase biodiversity.

#### **Ecosystem Effects of Reduced Cougar Populations in Zion and Yosemite National Parks**

William Ripple, Professor, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

Robert Beschta, Department of Forest Ecosystems and Society, Oregon State University Corvallis, OR

Using historical reconstructions, tree rings, and field plots, we discovered a potential trophic cascade involving cougar and mule deer in the Yosemite Valley of Yosemite National Park and Zion Canyon of Zion National Park. Increases in human visitors in both Zion Canyon and Yosemite Valley during the early 1900s apparently reduced cougar densities, which subsequently led to higher mule deer densities, higher browsing intensities, and reduced recruitment of palatable trees as well as decreases in wildflowers. In Zion Canyon we documented increased stream bank erosion, and reductions in both terrestrial and aquatic species abundance including hydrophytic plants, amphibians, lizards, and butterflies. These results may have broad implications with regard to our understanding of alternative ecosystem states and reductions in biodiversity where large carnivores have been removed or are being recovered.

#### **Ecological Consequences of Large Predator Removal and Some Alternatives for Ecosystem Recovery**

Robert Beschta, Department of Forest Ecosystems and Society, Oregon State University Corvallis, OR

William Ripple, Professor, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

Following the extirpation or displacement of large predators in the American West, increased ungulate herbivory has likely had a profound effect on many terrestrial and aquatic ecosystems. Herein, we summarize the 20th century effects on woody plant communities for five national parks where the role of large predators has been diminished—Olympic, Wind Cave, Yellowstone, Yosemite, and Zion. In a subset of these parks, recent studies suggest the loss of an apex predator allowed large herbivores to heavily impact riparian plant communities, thus leading to increased streambank erosion, wider and shallower channels, and impacts to biodiversity. Only in Yellowstone National Park, where wolves have been reintroduced, does it appear that impacts to plant communities have been reversed. In parks where large predator reintroduction or recolonization is unlikely we suggest options that might be used to reduce impacts from large herbivores.

Concurrent Session #102 • Broadway • Invited Papers

#### **Restoration of Freshwater Aquatic Ecosystems in the National Park System**

Chair: John Wullschleger, Fisheries Program Leader, National Park Service, Fort Collins, CO

Session overview: In the United States, animals that depend on freshwater ecosystems are nearly twice as likely to be at risk of extinction as animals found primarily in terrestrial or marine environments. In particular, native freshwater and anadromous fishes include many taxa that are threatened, endangered or extinct. Other major groups that rely on aquatic habitats such as amphibians and mussels also include high percentages of taxa that are imperiled or in decline. The causes for the decline of native aquatic taxa vary but are commonly related to habitat degradation or adverse impacts associated with non-native species. Biologists throughout National Park system are engaged in the restoration and monitoring of aquatic habitats and the native aquatic organisms which they support. Their efforts are particularly important because the aquatic habitats within National Parks are often closer to their natural condition and receive greater protection than those on private or other public lands.

#### **Restoration of Mountain Yellow-legged Frogs and Aquatic Ecosystems in Sequoia and Kings Canyon National Parks, California**

Danny Boiano, Aquatic Ecologist, Sequoia-Kings Canyon National Parks, Three Rivers, CA

In 2001 Sequoia and Kings Canyon National Parks began removing nonnative trout from 11 naturally fishless lakes to assess the feasibility of restoring aquatic habitat for native fauna, particularly the imperiled mountain yellow-legged frog (*Rana muscosa*, *R. sierrae*, MYLF). Although it was once a common inhabitant of high Sierra Nevada lakes, the MYLF has disappeared from about 94% of historic localities due to the widespread introduction of trout and, recently, due to disease. To date, we have removed more than 23,000 trout, with complete eradication in several lakes. Following trout removal, MYLF densities in these lakes exhibited an average 16-fold increase, while one lake showed a 72-fold increase. Due to this success, Sequoia-Kings Canyon is developing a restoration plan for approximately 75 additional lakes. Although disease has impacted many MYLF populations, several populations occupying fishless sites have survived and reproduced after becoming infected, indicating the importance of continuing to eradicate nonnative trout from naturally fishless lakes.

#### **Implementing and Developing a Non-native Fish Control Strategy in the Upper Colorado River Basin**

Melissa Trammell, Fisheries Biologist, National Park Service, Intermountain Region, Salt Lake City, UT

Competition and predation by non-native fish species has contributed to the decline of native fishes in the Colorado River Basin, includ-



ing the four big-river fishes listed as endangered: Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*). The Upper Colorado River Endangered Fish Recovery Program (RIP) has implemented large-scale removal efforts with the intent of controlling non-native fishes to benefit the endangered fish. The program has relied on mechanical removal (primarily electrofishing) while developing a more comprehensive strategy for long-term control. A strategy for the Yampa River has been completed and will serve as the template for a basin-wide strategy being developed by the Recovery Program. Similar removal efforts are underway in the San Juan and Lower Colorado River basins. Many of the removal efforts occur within the boundaries of NPS units, including Dinosaur National Monument, Glen Canyon NRA, and Grand Canyon NP.

#### **The Effects of Ocean-Atmosphere Oscillation Phenomena on Sockeye Salmon Populations in Long Lake, Wrangell-St. Elias National Park and Preserve, Alaska**

Molly McCormick, Fisheries Biologist, Wrangell-St. Elias National Park and Preserve, Copper Center, AK

Joshua Schmidt, Yukon-Charley National Rivers/Gates of the Arctic National Park and Preserve

Monitoring of sockeye salmon run timing and abundance in Long Lake, inside Wrangell-St. Elias National Park and Preserve, has occurred continuously for 35 years. Long Lake sockeye are unique, exhibiting the longest known spawning duration of any sockeye population. The span of this data set has provided an opportunity to investigate changes in migratory timing and population size. Results indicate that mean run timing has advanced, shifting approximately 9 days since 1974, and tends to occur later in El Niño years and years with warmer springs. Population modeling suggests that both El Niño and the Pacific Decadal Oscillation events influence the numbers of fish counted at Long Lake, implying that ocean conditions may be affecting survival. The identification of factors influencing changes to this population through time may increase our understanding of the effects of a warming climate and/or large scale ocean conditions to salmon throughout the Copper River drainage.

#### **Influences of Native fish Re-establishment on Stream Ecosystems**

Laura Belica, Fisheries Biologist, Great Basin National Park, Baker, NV

Gretchen Baker Great Basin National Park Baker, NV

Great Basin National Park has become a leader in efforts to re-establish native fish assemblages. Work began with the native Bonneville cutthroat trout and continues with efforts to restore complete native fish assemblages that include non-game fishes. Re-establishing native fish assemblages has direct and indirect effects on stream ecosystems and baseline conditions. In one stream, effects have included the removal of non-native fish and the associated impacts of removal methods on the diversity, abundance, and density of macroinvertebrates. Fish species composition was changed to a native assemblage; however the populations of reintroduced fishes have not yet achieved densities and distributions similar to those of the previous non-native fishes. In another stream native fishes were reintroduced decades after a severe flood extirpated the fish populations. These modifications to the fish assemblages alter baseline conditions and have the potential to influence macroinvertebrate assemblages which are a component of GRBA's water quality monitoring program.

#### **Effectiveness of Gill Nets for Controlling Self-sustaining Populations of Non-native Trout in North Cascades National Park Mountain Lakes**

Reed Glesne, Aquatic Ecologist, North Cascades National Park, Sedro-Woolley, WA

Thirty-eight mountain lakes in the North Cascades National Park Service Complex (NOCA) contain self-sustaining populations of fish.

Trout in these lakes have the ability to overpopulate and establish multiple age classes, resulting in statistically significant declines in the abundance of native organisms such as long-toed salamanders and other amphibians, aquatic macroinvertebrates, and large diaptomid copepods. The NOCA Mountain Lakes Fishery Management Plan/EIS (MLFMP) establishes the goal of eradicating self-sustaining populations of non-native trout to foster recovery of native aquatic organisms. However, for many park lakes, size, depth, habitat complexity, and connections with other fish-bearing waters may preclude eradication and require an approach that reduces trout population density to minimize impacts. Three methods of fish removal, gill nets, antimycin, and spawning habitat exclusion, are proposed in the MLFMP. This presentation focuses on the use of gill nets in 9 lakes, including efficacy for partial removal, population estimates, cost and success.

Concurrent Session #103 • Weidler • Short Presentations Followed by Q&A

#### **Get the Lead Out! Reducing Environmental Risk to Natural Resources and Elevating Human Health Concerns**

Chair: Elaine Leslie, Deputy Chief, Operations, Biological Resource Management Division, National Park Service, Fort Collins, CO

Lead is a poisonous metal present in a variety of commercial products and as a pollutant from industrial activities. It is an environmental contaminant in many areas of the world and in many habitat types both urban and rural, including our national parks. Lead is banned in gasoline, children's toys, and paint because of its effects on animal and human health. Land and resource managers recognize the important role hunting and fishing play in the complicated and intensive management of wildlife populations. Given the increasing awareness of environmental lead, the National Park Service (NPS) feels a compelling obligation to mitigate its potential negative effects. Removal of lead as a source of contamination in national parks will benefit humans, wildlife and ecosystems within and outside of our park boundaries. Discussion will include actions the NPS will initiate to implement measures that will reduce lead in the environment to protect our natural resources and ecosystems and minimize risk to human health.

Presenters: Mike Soukup, formerly Associate Director, Natural Resource Science and Stewardship, National Park Service

Mike Wallace

James Petterson

Vernon Thomas

Steve Cain

Kent Redford

**Understanding and Managing Recreation Impacts**

Chair: Jim Bacon, Outdoor Recreation Planner, Yosemite National Park, El Portal, CA

**A Cost Effective and Efficient Way to Assess Trail Conditions: A New Sampling Approach**

Rachel Knapp, Graduate Student, University of New Hampshire, Department of Natural Resources, Durham, NH

Mark J. Ducey Professor, University of New Hampshire, Department of Natural Resources and the Environment, Durham, NH

Park-owned footpaths require regular maintenance, yet trail assessment can be time consuming and costly. This study is aimed at reducing the time it takes to assess trail conditions. We evaluated randomized graph sampling, which entails taking measurements along selected trail segments in order to make inferences about the whole network. Using simple auxiliary information, (i.e. wetland along a path), can reduce the standard error of the trail assessment measurement by nearly 20%. This method is less time consuming than taking measurements along the entire network of trails and more efficient than randomized segment sampling, which may require walking long distances to reach chosen segments. It can be equally useful for analysis of either qualitative or quantitative measurements or a combination of the two. We illustrate this technique using a 5km trail network although it is most appropriate for longer networks such as those at the state and national park level.

**A Multidisciplinary Approach to Coastal Campsite Monitoring at Kenai Fjords National Park**

Meg Hahr, Ecologist, Kenai Fjords National Park, Seward, AK

Christopher Monz, Recreation Ecologist, Department of Environment and Society, Utah State University, Logan, UT

Janette Chiron, Lead Coastal Ranger, Kenai Fjords National Park, Seward, AK

Greg Daniels, GIS/Database Programmer, National Park Service, Alaska Regional Office, Anchorage, AK

Christina Kriedeman, Biological Sciences Technician, Kenai Fjords National Park, Seward, AK

Joel Cusick, GIS Specialist, National Park Service, Alaska Regional Office, Anchorage, AK

Coastal resource managers have long recognized that increasing recreational use poses significant threats to park resources and visitor experience conditions. However, few parks have successfully implemented visitor impact monitoring programs that enable managers to objectively evaluate changes in resource conditions and the effectiveness of management interventions. Kenai Fjords National Park began surveying coastal backcountry campsites and associated resource impacts in 1988. Over the years, a variety of methods were used to document the geographic distribution and condition of campsites, yielding large amounts of data that were never analyzed due to inconsistencies in methodologies, data collection, and effort. We will describe a collaborative, multidisciplinary approach involving resource managers, rangers, GIS specialists and university researchers that integrates rapid field assessment, high-precision GPS, and GIS to monitor campsite conditions and interpret long-term trends in visitor impacts. Potential applications include a region-wide protocol for coastal campsite impact monitoring.

**Best Practices for Equestrians in California National Parks**

Mietek Kolipinski, Senior Scientist, National Park Service, Oakland, CA

Bonnie Davis, Dominican University of California, San Rafael, CA

Sibdas Ghosh, Dominican University of California, San Rafael, CA

Adda Quinn, Dominican University of California, San Rafael, CA

Connie Berto, Dominican University of California, San Rafael, CA

We authored a reference document and two brochures summarizing Best Management Practices for horse and related equine/livestock uses in National Park Service Units of California. Equestrians ride on NPS-managed land for recreation and for camping and packing either with their livestock, or through commercial concessionaires (packers, dude string operators, or saddle rent stock). Some NPS rangers and other employees use horses in daily work, as well as for recreation. A lack of concern can result in negative impacts in natural areas. A primary BMP strategy involves reducing spread of non-native plant seeds and propagules by providing livestock with weedless baled feeds, pellets, cubes, etc. Incomplete lists of invasive weed species on state agriculture weed lists are problematic. Each NPS Unit allowing horse use in California received a park-specific section. Contents can be reproduced for use as handouts for staff and inquiring public.

**Nighttime Recreation in Parks and Protected Areas: Motivations, Benefits, and Experiences**

John Beeco, Graduate Assistant, Clemson University, Pendleton, SC

Jeffrey C. Hallo, Assistant Professor, Clemson University, Clemson, SC

Elizabeth D. Baldwin, Assistant Professor, Clemson University, Clemson, SC

Many protected areas offer nighttime programs for visitors; however, nighttime hours have not been fully recognized as a potential resource in these areas. Nighttime hours in protected areas could provide visitors with experiences unique to these times of the day. Also, typically low levels of visitation during nighttime hours could provide visitors with additional or better suited opportunities to fulfill motivations and benefits sought during daytime activities. Furthermore, nighttime hours could be used by managers to increase or temporally disperse use. Therefore, a study was conducted to explore the social implications of nighttime recreation in protected areas. Specifically, the study explored the motivations, benefits, visitor experience, and management activities associated with nighttime hiking. Qualitative interviews were conducted with approximately 30 participants of night hikes from both state and national protected areas, as well as 4 Interpretative Rangers. Results and implications are presented from a qualitative analysis of interview transcripts.

**The Evolution of Minimum Impact Techniques on the Colorado River through Grand Canyon**

Mathieu Brown, Adventure Education Faculty, Prescott College, Grand Canyon, AZ

This paper documents the rise and institutionalization of a "minimum impact" recreation culture on one of America's foremost rivers, the Colorado. When dramatic river system changes, namely the construction of Glen Canyon Dam in 1963, met with a growing interest in river running, beaches in Grand Canyon became plagued with litter and sanitation problems. River runners, with strong place-based connections and wilderness values, observed these changes. They implemented innovative solutions, including tech-

nological inventions such as fire pans, stoves, and self-contained portable toilets. These coupled with new behavioral norms helped restore beach conditions and set the standard for present day river running etiquette. How these techniques were developed provides an example of one of the greatest natural resource successes to date and demonstrates an evolution that was at the forefront of recreation based land stewardship.

Concurrent Session #105 • Hawthorne/Sellwood • Panel Discussion

**Preparing the Next Generation of Protected Area Managers: The 2008 Park Break Program**

Chair: Sarah Stehn, Graduate Student, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI

A collaborative effort of multiple individuals, agencies, academic institutions, and non-profit organizations, the Park Break program aims to prepare and inspire the next generation of protected area managers. In its inaugural year, Park Break 2008 served 29 graduate students, 48 scientists, and numerous other park personnel with an opportunity to engage in seminars, discussions, and field trips highlighting the challenges and responsibilities of protected area management today and in the future. Taking place at 4 different national park units over three one-week sessions, students from a variety of academic backgrounds worked together to investigate possible solutions to challenges at those parks. Additional dialogue centered on how general management strategies may adapt to changing political and social climates of the future. This panel will serve to revisit these discussions and place the Park Break program in perspective as a tool for recruitment and training of the next generation of protected area managers.

Panelists: Brandon Pope, Graduate Student, School of Natural Resources, University of Missouri, Columbia, MO

Ryan Sharp, Graduate Student, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

Michelle Moorman, Graduate Student, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC

Carena van Riper, Graduate Student, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Concurrent Session #106 • Ross Island/Morrison • Invited Papers

**Protecting Mexico's Heritage: Managing Complex Relationships along the Site-Society Interface**

Chair: Larry Wiese, Superintendent, Mesa Verde National Park, Mesa Verde, CO

Session overview: This session brings multiple lenses to bear on an apparently straightforward matter, the extension of protected area status to a few thousand acres along a corridor from Mitla to Yagul in the Mexican state of Oaxaca. The corridor includes an assemblage of caves holding remains of occupation to 10000 BC, and includes evidence of very early cultivation of squash (calabaza). Despite long human presence fragments of largely-undisturbed vegetation still exist. Many stakeholders agree on the principle of protected status but differ on appropriate standards, e.g., international vs. local. Others see the corridor from the perspective of more general institutional interests. Local communities seek to preserve control or compete to gain economic leverage. For historical and political reasons no single entity is in charge. In such settings who makes definitive decisions, how, and on what basis? Will decisions come too late for meaningful protection?

**International Standards and National Priorities: Creating Protected Areas in Mexico**

Francisco Lopez Morales, Director, Office of International Heritage Relations, National Institute of Anthropology and History, Mexico, DF, Mexico

Drawing on Mexico's experience in working with UNESCO, the United States, ICOMOS, and other bodies, this paper addresses the tensions between international standards and national priorities in creating protected areas. Central to the argument is the reality that international standards and expectations are the outcome of institutional negotiations, while national priorities are a combination of governmental preferences and scientific knowledge. Agreements along the Mexico-US border are no exception, and unilateral decisions have made progress problematic. Attaining World Heritage status therefore puts a premium on well-documented applications and effective site management plans recognizing the complexities of social as well as environmental factors. Responding to international standards without provoking conflicts internally requires adroit diplomacy.

**Legal Protection and Grassroots Negotiation in Protected Area Management**

Lourdes Nicolas, Chief Attorney, Legal Section, Monte Alban Archaeological Zone, National Institute of Anthropology and History, Oaxaca Regional Center, Oaxaca, Oaxaca, Mexico

In Mexico the legal status of protected areas is defined by national laws and the operational commitments of federal agencies. Unlike the United States, Mexico divides responsibility for protection of cultural resources to one department while natural resources are in the hands of another department. In addition protection responsibility may lie in federal hands but actual land ownership remains at the community level. This fragmentation requires continuing local-level negotiation among agencies and between agencies and communities, something the legal arrangements do not contemplate. Using current efforts to extend protected area status for both cultural and natural resources in a single valley as a case study, this presentation underscores the dilemmas of working within formal legal structures when negotiations require other frameworks.

**Caves, Cacti, and Calabazas: The Realities of Protected Area Management in Oaxaca**

Antonio Martinez, Deputy Field Archaeologist, National Institute of Anthropology and History, Oaxaca Regional Center, Oaxaca, Oaxaca, Mexico

International agreements and national legal frameworks define the outer boundaries of heritage management, but practitioners must function on a day-to-day basis in relation to the environmental and social realities of the site. In the case of the Mitla-Yagul corridor in Oaxaca this means the protection of fragile remains from ten thousand years of human habitation in more than forty caves, dealing with delicate botanical landscapes under heavy pressure from human users, and moving forward with scientific research which betters our understanding of what we seek to protect. Yet other stakeholders prize the corridor for road construction, grazing, and

extensive tourism development. And local communities have both symbolic and pragmatic interests. How do we manage these without losing sight of those national and international considerations?

### **Carrots and Sticks: Reconciling Stakeholder Interests in Protected Area Status**

Nelly Robles Garcia, Director, Archaeological Zone of Monte Alban, National Institute of Anthropology and History, Oaxaca, Oaxaca, Mexico

Jack Corbett, Associate Professor, Hatfield School of Government, Portland State University, Portland, OR

Creating effective protected area management in landscapes already the focus of conflicting interests and priorities is a definite challenge. Doing so with limited financial and legal resources while needing to satisfy the expectations of outside actors is far more difficult. In the Mitla-Yagul corridor no-one is in charge, and no specific institutional actor possesses sufficient sticks or carrots to define management priorities. Some local interests resist efforts to establish protected status while others dream of hordes of free-spending visitors. "More knowledge means better management" may be attractive to the research community but puts additional burdens on practitioners. Management, therefore, becomes a continuing process of constructing collaborations among numerous stakeholders within and outside different levels of government, often without appearing to do so to avoid frictions and sanctions.

Concurrent Session #107 • 3 Sisters • Contributed Papers

### **So, How Are We Doing? Evaluating Program Effectiveness**

Chair: Tony Varcoe, Manager, Research and Management Effectiveness, Parks Victoria, Melbourne, Victoria, Australia

### **Evaluating Management Performance and Effectiveness for Protected Areas**

Angeles Mendoza Sammet, Ph.D. Candidate, Faculty of Environmental Design, University of Calgary, Calgary, AB, Canada

Michael S. Quinn, Associate Professor of Environmental Science and Planning, Faculty of Environmental Design, University of Calgary, Calgary, AB, Canada

Evaluating management effectiveness is becoming a need for individual protected areas and national agencies. The first section of this paper discusses the pros and cons of current approaches to evaluate management, based on the revision of existing frameworks and lessons from case studies in Mexico and Canada. The second section proposes a new alternative to evaluate management that combines principles from ecosystem-based management, environmental management systems, and international certification standards. The alternative, an Ecosystem-based Management System (EBMS) for protected areas, is a tool for planning management and evaluating progress toward sustainability (and conservation) goals. The EBMS is based in three premises: 1) governance, performance, and effectiveness have to be evaluated separately; 2) to be more objective, park evaluations have to separate individual park's interest from agency's ones; and 3) evaluation results have to be useful to compare among parks in different categories and consolidation stages.

### **From Partnerships to Networks: New Approaches for Measuring National Heritage Area Effectiveness**

Daniel Laven, Management Assistant, Conservation Study Institute, Burlington, VT

Daniel H. Krymkowski, Department of Sociology, University of Vermont, Burlington VT

Curtis L. Ventriss, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Robert E. Manning, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Nora J. Mitchell, National Park Service, Conservation Study Institute, Woodstock, VT

National heritage areas (NHAs) are a form of protected area management that rely exclusively on partnerships. NHA designations have increased rapidly in the last 20 years, generating a substantial need for information about how NHAs work and the outcomes associated with the NHA process. Several recent qualitative evaluation studies of NHAs have identified the importance of understanding network structure and function in the context of evaluating NHA management effectiveness or performance. This paper extends previous evaluation research on NHAs by applying NETDRAW (a popular visual approach to network analysis) as well as a statistically more robust approach known as exponential random graph modeling to data collected at three sites. Study findings provide insight into the "health" of each of these networks in terms of balancing the degree of network openness versus the degree of network closure. More importantly, this study demonstrates the potential of using quantitative network analysis as an indicator of NHA effectiveness.

### **Preliminary Evaluation of the Leave No Trace Visitor Education Program in Two USNPS Units**

Wade Vagias, Research Associate, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

Robert Powell, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

Brett Wright, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

A synoptic assessment of the Leave No Trace (LNT) Visitor Education Program was recently completed based on visitor surveys from two NPS Units; Glacier and Olympic National Parks. Leave No Trace is an environmental communication initiative designed to lessen the impact of human powered recreationists upon the ecological and sociological landscape. The LNT program was adopted in 1994 by the NPS; however the program has received scant attention from the research community. The proposed presentation will cover significant findings drawn from the abovementioned research. Specifically, we will address the viability of a theoretical model drawn from the social-psychological literature for predicting compliance with the LNT principles. This will include a discussion regarding the variation of visitors' opinions regarding the appropriateness of specific LNT backcountry practices. Additional discussion will focus on respondent's perceptions of programmatic effectiveness and perceived efficacy of education dissemination strategies for diffusing LNT information. For practitioners, we will provide substantive suggestions for more effectively disseminating the LNT message amongst the recreating public.

### **Beyond Outreach: Promising Practices for Engaging Diverse Audiences at Santa Monica Mountains National Recreation Area**

Rebecca Stanfield McCown, Graduate Research Assistant, University of Vermont, and NPS Conservation Study Institute, Burlington, VT



Robert Manning, Professor, University of Vermont, Burlington, VT  
Daniel Laven, Management Assistant, Conservation Study Institute, Burlington, VT  
Nora Mitchell, Director, National Park Service, Conservation Study Institute, Woodstock, VT

A recent National Park Service (NPS) report identified the importance of effectively engaging communities of color in order for national parks to remain relevant in an increasingly diverse American society (CSI 21st Century Rel. Report). This report laid the foundation for exploratory evaluation research to identify barriers and opportunities to increasing the visitation and participation of new and diverse audiences in national parks. Results from this phase of research have led to the development of a theory of change model identifying key ingredients for successful engagement of diverse audiences. This study builds on the results from the exploratory phase and uses site level data from Santa Monica Mountains National Recreation Area to test and validate the model. Four programs designed to engage communities of color, particularly youth, were studied in order to better understand the connections between program inputs, processes, and outcomes and how they lead to program success.

#### **Stewardship 101: Great Smoky Mountains National Park Junior Ranger Program Evaluation Instrument Development**

Susan Vezeau, Doctoral Student, Clemson University, Clemson, SC  
Bob Powell, Assistant Professor, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC  
Marc Stern, Assistant Professor, Department of Forestry, College of Natural Resources, Virginia Tech, Blacksburg, VA

The purpose of this study is to develop an evaluation instrument to be used to assess the effectiveness of the Junior Ranger program at Great Smoky Mountains National Park in promoting stewardship among youth participants ages 8–12. The Theory of Planned Behavior and the Elaboration Likelihood Model will be employed in a mixed-method research design to illuminate which variables are most likely to influence individuals to develop environmentally positive attitudes and behaviors associated with stewardship.

Concurrent Session #108 • Mt. Bachelor • Invited Papers

#### **Connecting the Dots: Systems and Networks of Marine Protected Areas**

Chair: Lauren Wenzel, Policy Analyst, NOAA Marine Protected Areas Center, Silver Spring, MD

Session overview: MPAs are an important tool for conserving our nation's natural and cultural marine heritage, but lack a national and regional framework for working together on issues of common concern. This panel explores how national, federal and state systems of MPAs they are addressing design, operational and coordination issues. A national system to coordinate MPAs across all levels of government is now being established. It will work with existing MPAs to enhance conservation, and facilitate regional gap analyses to identify areas of high ecological value where new MPAs may be needed. The "Seamless Network" is a partnership of National Park Service, National Wildlife Refuges, National Marine Sanctuaries, and National Estuarine Research Reserves to establish operational partnerships among these federal sites. In addition, two states, California and Oregon, have recently begun developing their own systems of MPAs as part of an ecosystem approach to management. This panel will include a facilitated discussion.

#### **Toward Common Conservation Objectives: Establishing a National System of MPAs**

Lauren Wenzel, Policy Analyst, NOAA Marine Protected Areas Center, Silver Spring, MD

The national system of MPAs will bring together MPAs across all levels of government to address common conservation goals, including the conservation of the nation's marine natural and heritage, as well as sustainable production. The first group of MPAs will join the system in early 2009. What will the initial priorities of the national system be, and how will it help federal, state and territorial MPA programs address their conservation goals?

#### **Lessons Learned from the Seamless Network**

Cliff McCreedy, Marine Management Specialist, National Park Service, Washington, DC  
Brad Barr, Senior Policy Advisor, NOAA Office of Marine Sanctuaries, Woods Hole, MA

The "seamless network" of National Parks, National Wildlife Refuges, National Estuarine Research Reserves and National Marine Sanctuaries has held two regional workshops to identify priorities for conservation action among these federal MPA systems. Participants in the Gulf of Maine and the New York/New Jersey Bight workshops discussed common priorities for research and monitoring, education and outreach, and natural resource management. What can we learn from this process about establishing effective networks, and how will the seamless network be integrated with the national system of MPAs?

#### **Identifying Conservation Gaps to Build a National System of MPAs**

Charles Wahle, Senior Scientist, NOAA Marine Protected Areas Center, Monterey, CA

The MPA Center is piloting a conservation gap analysis on the West Coast (California, Washington, and Oregon) to identify ecologically important areas in need of additional protection. This collaborative process engage natural and social scientists, resource managers and ocean users in a transparent, science-based process to identify key conservation gaps where new MPAs may be needed. This process will provide valuable input to planning processes for federal and state MPA programs.

#### **Establishing a State System of MPAs: Oregon's Marine Reserve Process**

Paul Klarin, Oregon Land Conservation and Development, Salem, OR

Oregon has begun a public process to establish a network of marine reserves along the coast as part of an overall strategy to manage its marine waters and submerged lands using an ecosystem-based approach. Governor Ted Kulongoski has invited the public to propose areas for consideration which will then be reviewed by the Ocean Policy Advisory Council (OPAC). Sites will then be evaluated over a two year period.

#### **Establishing a State System of MPAs: California's Marine Life Protection Act Initiative**

Melissa Miller-Henson, Program Manager, California Marine Life Protection Act Initiative, Sacramento, CA

California's Marine Life Protection Act calls for re-evaluating and redesigning the state's MPAs to, among other things, protect the state's marine life and habitats, marine ecosystems, and marine natural heritage, as well as to improve recreational, educational and study

opportunities provided by marine ecosystems. California is currently at the forefront of state marine conservation efforts, conducting a series of regional public planning processes to redesign the statewide system of MPAs. This session will describe the state's process, including funding, the role of science, and stakeholder involvement.

**Concurrent Session #109 • Mt. Hood • Invited Papers (Part 3 of 3-Part Track)**

**Protecting Natural Sounds III: From Knowledge to Action: Researchers and Managers Working toward Soundscape Protection**

Chair: Peter Newman, Associate Professor, Colorado State University, Fort Collins, CO

Session overview: Research has found that human-caused noise affects wildlife behavior and can detract from the quality of the visitor experience in national parks and related areas. Given the growing importance and urgency of soundscape policy and management, research is needed to better understand how and when human-caused sounds in parks affect resources and experiences. This session presents a series of papers that demonstrates how researchers and managers can work together to create applied science work toward the goal of soundscape protection.

**Soundscape Acoustic Zones of Bryce Canyon National Park**

Britton Mace, Associate Professor, Southern Utah State University, Cedar City, UT

Kelly Fuhrmann, Bryce Canyon National Park, Bryce Canyon, UT

Kristin Legg, Zion National Park, Springdale, UT

Kurt Fristrup, National Park Service, Natural Sounds Program, Fort Collins, CO

A key component of a Soundscape Management Plan is the need to establish acoustic zones throughout a park, which requires the collection of data using attended sound logging and sound recording. Attended Sound Logging captures audibility using software developed by the Natural Sounds Program Center that is run on a PDA. Sixteen acoustic monitoring sites were identified in Bryce Canyon National Park to reflect a spectrum of locations within the hypothesized acoustic zones. Seven of these sites have been selected for sound logging and recording over the next two years, during different times of the day and season. With data from this project, we seek to establish evidence for acoustic zones throughout the park. Preliminary data collected from these sites will be presented to illustrate the similarities and differences between the soundscapes of the core areas of the park and the more remote acoustic zones found in the backcountry.

**Evaluation of Methods Used to Study Visitors' Perceptions of National Park Soundscapes**

Steven Lawson, Associate Professor, Virginia Tech, and Resource Systems Group, Inc., White River Junction, VT

Karen Hockett, Assistant Professor, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA

Nathan Reigner, Graduate Research Assistant, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA

Brett Kiser, Graduate Research Assistant, Forestry Department, College of Natural Resources, Virginia Tech, Blacksburg, VA

Increased popularity of commercial air tours over national parks poses a challenge to the National Park Service's ability to meet the legal mandate to preserve and restore natural soundscapes in parks. This paper describes visitor survey research conducted at Haleakala and Hawaii Volcanoes National Parks to inform Commercial Air Tour Management Plans being developed for the two parks. Research described includes an attended listening exercise, in which study participants were asked to indicate and evaluate sounds they heard during their visit. In addition, results will be presented of visitor surveys in which respondents were asked to evaluate a series of audio recordings of simulated park soundscapes. The audio recordings contained natural ambient sounds endemic to the corresponding park location, and increasing amounts of helicopter air tour noise. Implications for air tour management and planning in the parks will be discussed, as well as generalizability to other National Park System units.

**Application of Adaptive Management to the Protection of Natural Sounds at Muir Woods National Monument**

David Stack, Acoustic Technician, NPS Natural Sounds Program, and Colorado State University, Fort Collins, CO

Peter Newman, Associate Professor, Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, CO

Robert Manning, Professor, Recreation Management Program, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Kurt Fristrup, Bioacoustician, NPS Natural Sounds Program, Fort Collins, CO

Michael Savidge, Project Manager, Golden Gate National Recreation Area, San Francisco, CA

Research in national parks has begun to address the problem of human-caused noise and its impacts in National Parks. This paper reports the results of a study conducted in the summer of 2007 that tested the efficacy and acceptability of management actions in changing visitor behavior related to noise impacts. The study used an experimental design to test the effectiveness of temporal and spatial zoning as it pertains to natural quiet. Three surveys were implemented, during a control and two treatment periods. During each of the treatment and control periods, ambient sounds were captured to test overall changes due to treatment effects. Results indicate that the "quiet zone" and "quiet day" treatments were statistically and practically significant in lowering the amount of human-caused noise in the park and visitors rated these management actions as highly acceptable.

**An Interpretive Toolbox for Natural Soundscapes**

Lelaina D. Marin, Outdoor Recreation Planner, NPS Natural Sounds Program, Fort Collins, CO

Ericka Pilcher, NPS, Fort Collins, CO

Sara Melena, NPS, Fort Collins, CO

As the Natural Sounds Program (NSP) continues to grow, more and more park interpreters have become interested in learning about soundscapes in national parks. Although some information can be found on the NSP Website, it is clear that interpreters are seeking more in-depth background and resource information. To meet the needs of interpreters and fulfill their mission, the NSP is developing an "Interpretative Toolbox" that will update and expand the available materials in order to provide interpreters and the public with accurate and current information about soundscapes, resource issues, and the Program. This "Interpretative Toolbox" will include a program brochure, a Key Resource Information and Issues Handbook, podcasts, fact sheets, and a natural sounds library. This presentation will provide an overview of the NSP's interpretive toolbox that NPS units can access to provide

outreach to the public regarding natural sounds.

### **Wow, Did You Hear That? Connecting Kids and Parks Through Science**

Karen Trevino, Program Leader, NPS Natural Sounds Program, Fort Collins, CO

Few things can have a greater impact on a student's life than a complete wilderness immersion experience. The NPS Natural Sounds Program recently launched a new partnership with Global Explorers Network that connects kids to parks. Global Explorers is a non-profit organization that brings middle and high school kids and teachers together to develop and implement comprehensive educational programs that enable their students to discover the wonders of Earth. Their programs have been featured on the Travel Channel, ABC Nightline, ABC WorldNews Tonight and CBS Sunday Morning. The partnership between Global Explorers and the NPS Natural Sounds program will use GEx students to conduct acoustical experiments during various components of their expeditions. The results of these experiments will help further our understanding of the role that the acoustic environment plays in overall ecosystem health and visitor experience in national park units while providing the students the knowledge and skills necessary to inspire responsible and effective resource stewardship.

(Track continued from Concurrent Sessions #43 and #65)

Concurrent Session #110 • Mt. St. Helens • Panel Discussion

### **Anticipating the Next Invasion: Protecting Park Resources from Aquatic Invasive Species**

Chair: John Wulfschleger, Fisheries Program Leader, NPS Water Resources Division, Fort Collins, CO

The National Park Service (NPS) cares for the nation's most treasured natural and cultural areas. These special places—the legacy with which the NPS has been entrusted to protect for present and future generations—are being destroyed by non-native invasive species in our waters and on land. If the NPS does not take swift and determined action, the natural and cultural richness and integrity of these treasures will be forever changed. Quagga Mussels recently introduced into the west and Viral Hemorrhagic Septicemia (VHS) in the Great Lakes are two of the many non-native species that threaten our natural heritage. Prevention and rapid response are key to forestalling invasions of park waters. This panel of experts will present case histories and lessons learned of successful responses for VHS and quagga mussels, current organizational response and engage participants in identification of park needs for an effective response to aquatic invasive species.

Topics and panelists:

Scope of the problem of aquatic invasive species—a global perspective, including discussion of impacts to parks • Paul Heimowitz, U.S. Fish & Wildlife Service, Pacific Region, Portland, OR

Case studies of impact and response: The speakers will describe species impacts to systems, response actions, challenges, and successes in preventing spread of species

Quagga Response in the Western U.S. • Sandee Dingman, Biologist, Lake Mead National Recreation Area, Boulder City, NV

Viral Hemorrhagic Septicemia Response in Great Lakes • Brenda Moraska Lafrancois, Aquatic Ecologist, Midwest Region, National Park Service; and Jay Glase, Fisheries Biologist, Midwest Region, National Park Service, Houghton, MI

National Park Service Response Outcomes of the Aquatic Invasive Species Pathway Interdiction Workshop in 2008—Tools for National Parks • John Wulfschleger, Fisheries Program Leader, NPS Water Resources Division, Fort Collins, CO

Facilitated Discussion: Where do we go from here? What do parks need to mount an effective response?

## **Thursday Late Afternoon, March 5**

Concurrent Session #111 • Multnomah • Panel Discussion

### **Dealing with Hyper-abundant Native Wildlife: New Directions for Active Park Management?**

Chair: Stephen Woodley, Chief Ecosystem Scientist, Parks Canada, Gatineau, QC, Canada

Protected areas increasingly require active management in order to protect the values they were established to protect. A particularly challenging aspect of active management is the need to deal with various populations of hyperabundant wildlife. These are populations of native species that cause ecological damage because they are far outside their historic levels in the ecosystem. The reasons for hyper abundance are many and all can be tied back to human-caused ecosystem dysfunction. This panel examines the definition of hyper abundance, the possible policy responses and lessons learned from cases studies involving population control.

Panelists: John Waithaka, Conservation Biologist, Parks Canada, Gatineau, QC, Canada

Tammy Dobbie, Park Ecologist, Point Pelee National Park

Peter Deering, Manager of Resource Conservation, Gros Morne National Park

Cliff White, Park Scientist, Banff National Park

Scott Gremel, Wildlife Biologist, Olympic National Park, Port Angeles, WA

Concurrent Session #112 • Holladay • Contributed Papers

### **Ecological Integrity Reporting**

Chair: Dave Parsons, Director, Aldo Leopold Wilderness Research Institute, Missoula, MT

### **A Closer Look at Environmental Indicators, Habitat Thresholds, and Report Card Frameworks**

Tim Carruthers, Science Integrator, University of Maryland Center for Environmental Science, Cambridge, MD

William Dennison, University of Maryland Center for Environmental Science, Cambridge, MD

Shawn Carter, National Park Service, Washington, DC

Todd Lookingbill, University of Maryland Center for Environmental Science, Cambridge, MD

Progress in achieving desired environmental outcomes needs to be rigorously measured and reported for effective environmental management. The assessment of environmental outcomes relies on selecting appropriate indicators (e.g., air, water, biota, ecosystem



processes) that integrate conditions over relevant temporal and spatial scales. Establishing thresholds for environmental indicators provides a suite of benchmarks for achieving desired ecosystem status. A habitat framework for assessing national parks of the Mid-Atlantic region was developed to compare within and between park habitat condition. This habitat framework for integrated assessment is an approach that has broad applications and utility. It involves integrating indicators using combined indices in various reporting regions to establish environmental report cards. Since environmental report cards attract public attention, the process of creating the report card needs to withstand close scrutiny. Effective science communication can help provide a transparent and accountable process for environmental reporting.

### **Collaborative Monitoring and Reporting of Forest Ecological Integrity**

Brian Mitchell, Program Manager, Northeast Temperate Network, National Park Service, Woodstock, VT

Geri Tierney, Research Scientist, State University of New York, College of Environmental Science and Forestry, Syracuse, NY

Kate Miller, Vegetation Ecologist, Northeast Temperate Network, National Park Service, Bar Harbor, ME

Since 2005, multiple National Park Service inventory and monitoring networks and individual parks have been collaboratively developing their forest monitoring programs. By the end of 2008, dozens of parks in the Northeast and Midwest were implementing monitoring using compatible procedures. During plot visits, researchers collect information about metrics that collectively assess the ecological integrity of forest resources. The methods and metrics are modified from the US Forest Service's Forest Inventory and Analysis program, and specific metrics address structure, composition, and function. The Northeast Temperate Network and National Capital Region Network have developed ecological integrity reporting tools that are based on acceptable or desired ranges of variation for each metric. These tools clearly and concisely report the ecological health of forest resources to multiple audiences, including park managers and decision-makers. The other networks in this collaboration are working to adapt the ecological integrity scorecard to their regions.

### **"Partners in Flight" Bird Conservation Focal Species Monitoring in the NPS Klamath I&M Network**

John Alexander, Executive Director, Klamath Bird Observatory and Prescott College, Ashland, OR

Jaime Stephens, Research and Monitoring Director, Klamath Bird Observatory, Ashland, OR

Sean Mohren, Klamath Network Data Manager, National Park Service, Ashland, OR

Daniel Sarr, Klamath Network Data Coordinator, National Park Service, Ashland, OR

Bird communities were among the top 10 vital signs identified for the National Park Service Klamath Network Inventory and Monitoring Program. Bird monitoring efforts in the Network's 6 Parks fit into a larger regional bird monitoring program that represents a multi-agency collaboration in the Klamath Siskiyou Bioregion of northern California and southern Oregon. This comprehensive bird-monitoring partnership promotes a science-based approach to integrating bird conservation objectives into the ecosystem management process. The partnership produces information that informs the conservation of birds and the land management process. We will provide examples of how birds are being used as indicators of ecosystem conditions and how standard methods for monitoring bird distribution, population trends at various scales, and demographic factors are being used to better understand the effect of land management in National Parks and adjacent Bureau of Land Management, Forest Service and US Fish and Wildlife Service management units.

### **The Vitals of Wetlands: Bioassessment of Park-scale Wetland Ecological Integrity in Rocky Mountain National Park**

Billy Schweiger, Ecologist, Rocky Mountain Inventory and Monitoring Network, Fort Collins, CO

Katie Driver, Graduate Degree Program in Ecology, Colorado State University, Fort Collins, CO

David Cooper, Professor, Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University, Fort Collins, CO

Isabel Ashton, Ecologist, Rocky Mountain Network, National Park Service, Fort Collins, CO

Donna Shorrock, Ecologist, Rocky Mountain Network, National Park Service, Fort Collins, CO

Wetland in Rocky Mountain NP is threatened by hydrologic and floristic modification due to elk and (lack of) beaver, invasive flora and climate change. We present an ongoing pilot project that has developed a rigorous survey design and bioassessment approach to the long-term monitoring of wetland. Data collected at over 100 sites to date include quantitative vegetation assemblage composition and cover, ground water hydrology, vegetation herbivory and semi-qualitative measures of several environmental attributes. We are developing integrative assessment models including a multimetric Index of Biotic Integrity and a multivariate Observed:Expected model that will predict assemblage composition based on a suite of geophysical attributes that structure wetland condition. These models will allow informed and management relevant assessment of wetland integrity. We present initial results from these efforts and discuss the connection between vital signs monitoring, reference conditions and the desired future condition of wetland in Rocky Mountain NP.

Concurrent Session #113 • Broadway • Panel Discussion

### **Science Communication: Strategies for Successful Collaboration**

Chair: Sara Melena, Education Specialist, NPS Natural Resource Program Center, Fort Collins, CO

The information produced through monitoring and research in national parks is valuable to support park planning, management, and interpretation. At the same time, the question of how to best communicate this information leaves many people guessing. This session shares the efforts of three different networks of parks in developing and implementing communication strategies to connect interpreters and NPS staff to the wealth of information produced about park resources. Panelists will share results from interviews with stakeholders identifying motivations, barriers, and best practices for science communication and examples of successful collaboration between scientists, resource management and interpretation. One example will focus on an example of citizen scientists' involvement in bird monitoring at Herbert Hoover National Historic Site. Another example will look at how Hopewell Cultural is using inventory and monitoring information to make decisions that balance the parks priorities of protecting the archaeological resource and interpreting its significance.

Panelists: Lindsay Paulding, Graduate Research Assistant, Colorado State University, Fort Collins, CO

Michelle O'Herron, Science Communication Specialist, National Park Service/Golden Gate National Parks Conservancy, CA



Marcus Koenen, San Francisco I&M Network Coordinator, National Park Service, Sausalito, CA  
Mike DeBacker, Heartland Network I&M Coordinator, National Park Service, Republic, MO  
Sherry Middlemis-Brown, Biologist, National Park Service, West Branch, IA

Concurrent Session #114 • Weidler • Panel Discussion

**When a Line on the Map isn't Enough: Thinking through Resource Stewardship Dilemmas**

Chair: Kate Roney Faulkner, Chief, Natural Resources Management, Channel Islands National Park, Ventura, CA

Parks are frequently zoned to identify the preeminent values for which sections of the park will be managed, such as natural area, cultural landscape, frontcountry, etc. However, resources identified as culturally or naturally significant may cause impacts outside of their "zone." For instance, historic nonnative plantings contributing to a cultural landscape may invade surrounding natural areas. Or, native wildlife may reside in an historic structure, causing damage or limited access. This panel will examine examples of cultural and natural resources not staying in their places or otherwise causing undesirable impacts. The discussion will focus on the adequacy of existing NPS policies in working through these conflicts, the need for additional guidance, considerations that should be weighed in determining management options, acceptable mitigations, and who pays if the management decision involves ongoing costs to minimize unacceptable impacts.

Panelists: Christina Marts, Resource Manager, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT

Timothy Babalis, Landscape Historian, NPS Pacific West Region, Oakland, CA

Paul DePrey, Chief of Resources, Joshua Tree National Park, Twentynine Palms, CA

Susan Fritzke, Supervisory Vegetation Ecologist, Golden Gate National Recreation Area, San Francisco, CA

Ann Huston, Chief, Cultural Resources, Channel Islands National Park, Ventura, CA

Concurrent Session #115 • Halsey • Panel Discussion

**NPS Research Administration: Best Management Practices**

Chair: Judith Visty, Ecologist and Research Administrator, Continental Divide Research Learning Center, Estes Park, CO

The purpose of this session is to discuss various aspects of administering a research program within the National Park Service and to identify approaches that are working well and should be shared. Topics that will be covered include: project review in parks, data management, curation of project files, peer review, information interfaces, and prioritizing projects at the park level. The emphasis will be on nuts-and-bolts of how to improve efficiency and quality. Target audience: all those who work with cooperators in administering or developing park research projects.

Panelists: Tara Carolin, West Glacier, MT

Tim Burchett, Estes Park, CO

Brent Frakes, Fort Collins, CO

Christie Hendrix, Mammoth Hot Springs, WY

Concurrent Session #116 • Hawthorne/Sellwood • Invited Papers

**Cultural Resource Management along Canada's Coasts**

Thomas Hammer, Manager, Archaeological Resource Management, Parks Canada Agency, Gatineau, QC, Canada

Session overview: Canada's coastline and internal waters are vast and pose not only challenges in the protection of ecological resources but also in the protection and conservation of cultural resources. These challenges, including a number of shortcomings and opportunities, in the management of cultural resources are steadily becoming more apparent. This session focuses on the management of cultural resources associated with Canada's marine heritage areas including legislative actions, strategies for determining resource value, climate change issues, community involvement and the delicate balance between the management of ecological and cultural resources. Panelists draw on experiences from Canada's heritage areas located on the country's three coastlines as well as along its inland waterways with a view towards finding commonalities leading to innovative and responsive management solutions.

**Cultural Resource Management on the Trent Severn Waterway**

Peter Frood, Field Unit Superintendent, Trent Severn Waterway, Parks Canada

This paper will review and assess Cultural Resource Management practices on the Trent Severn Waterway. The review will focus on the Mnjikaning Fish Weir National Historic Site of Canada, a 5000-year-old aboriginal site at Atherley Narrows on the Trent Severn system and the Trent Rapids Power Corporation hydro development adjacent to Lock 22 and Lock 23, historic locking structures on the Trent Severn Waterway. These measures to protect cultural resources in a marine environment will be briefly compared to measures in place to protect a Species at Risk, the Engelmann's Quillwort, an aquatic species associated with a large group of fern allies of the family Isoetaceae. Similar policy strategies are used for both the cultural resources and the Species at Risk. The key challenge for the protection and presentation of these resources, however, is that of good governance practices in a multi-jurisdiction environment. In the current environment of intense shoreline development and with multiple decision makers, sound policy practices within a jurisdiction are not sufficient to protect these resources; it is the capacity to build cross-jurisdictional protocols, collaborative arrangements and effective relationships between actors in the system that will determine the long term sustainability of these natural and cultural treasures for future generations.

**Coastal Cultural Resource Management: A Nunavut Perspective**

Douglas Stenton, Director of Culture and Heritage, Government of Nunavut, Iqaluit, NU, Canada

For more than four thousand years, the people of Nunavut have lived predominantly through adaptations to coastal-maritime environments, resulting in a large concentration of cultural resources in these areas. On April 1, 1999, the Government of Nunavut assumed responsibility for the administration and management of these resources in Canada's newest political jurisdiction. This paper focuses on archaeological resources and provides an overview of the management issues and opportunities they present for

Nunavut and examples of approaches taken over the past decade to address these challenges.

### **Plugging the Holes: Improving Legal Protection of Canada's Marine Cultural Heritage**

Patricia Kell, Director, Policy and Government Relations Branch, National Historic Sites Directorate, Parks Canada Agency, Gatineau, QC, Canada

This paper examines two recent initiatives to protect more fully aspects of Canada's marine cultural heritage. In the first, the government has undertaken to improve protection of heritage shipwrecks, by removing them from the general salvage provisions. This initiative will better place Canada with respect to ratification of the UNESCO Convention on the Protection of the Underwater Cultural Heritage. The second project, to protect heritage lighthouses through legislation, originated as a grass roots movement. Through perseverance, committed citizens succeeded in getting passed Canada's most substantial improvement in cultural heritage legislation in the past decade. These two projects will be compared in order to highlight the legal complexity of operating in a marine environment, the role of ownership in protection, and the relative importance of stakeholders in defining the government agenda on cultural heritage.

### **Towards an Understanding of the Effects of Climate Change on Parks Canada's Cultural Resources along its Waterways and Shorelines**

Virginia Sheehan, Archaeological Resource Analyst, Parks Canada

Rebecca Duggan, Ft. Louisburg Archaeologist, Parks Canada

Lyne Fontaine, Senior Conservation Engineer, Public Works and Government Services

James Molnar, Manager Aboriginal Archaeological Research, Parks Canada

TJ Hammer, Manager Archaeological Resource Management, Parks Canada

Climate Change is affecting some of Parks Canada's Heritage Places, and those heritage areas along our waterways appear most vulnerable. Over the last few years, coastal erosion in the North due to permafrost melting and other climatically derived factors as well as higher than normal numbers of severe storms on the coast in the Atlantic regions have been noted. This has created a new threat to Parks Canada's cultural resources found near or in the affected waterways. In an attempt to effectively manage its cultural resources against this threat, Parks Canada has initiated a study on the impact of climate change on the cultural resources it manages in its National Historic Sites, National Parks and National Marine Conservation Areas. Through examples from Northern and Atlantic coastal sites, this paper explores the challenges of managing and conserving cultural resources in heritage places from the impact of changes in climate.

Concurrent Session #117 • Ross Island/Morrison • Day-Capper (Film Screening)

### **Refuse to Fold: The Blue Front Café and Mississippi Heritage Tourism**

Chair: Brian Dempsey, Ph.D. Provost Writing Fellow, Center For Historic Preservation, Middle Tennessee State University, Murfreesboro, TN

This day-capper will consist of a screening and discussion of the film "Refuse to Fold: The Blue Front Café and Mississippi Heritage Tourism." The film analyzes a juke joint in Benton, Mississippi, and situates it within a larger process of heritage tourism development throughout the state. Mississippi is actively utilizing African American culture to promote tourism efforts such as a statewide blues heritage trail. Impoverished areas like the Mississippi Delta are increasingly using heritage tourism to alter their challenged circumstances by attracting outside money with the allure of uniqueness. Jimmy 'Duck' Holmes, owner of the Blue Front, serves as the film's central voice as he reveals a complex narrative about his home town, his music, and his community. Questions about why artists do what they do, their perspective about their work, and their place within their community constitute primary analytical elements in this documentary study. The testimony and perspective of Jimmy Duck Holmes will provide a critical window into historical issues surrounding the Blue Front, as well as modern blues tourism, race relationships, and cultural appropriation.

Concurrent Session #118 • 3 Sisters • Contributed Papers

### **Changing Vegetation Communities: Management Challenges**

Chair: Amy Symstad, Research Ecologist, USGS Northern Prairie Wildlife Research Center, Wind Cave National Park, Hot Springs, SD

### **Minimizing and Managing Hemlock Forest Decline at Delaware Water Gap NRA**

Richard Evans, Ecologist, Delaware Water Gap National Recreation Area, Milford, PA

Jeff Shreiner, Biologist, Delaware Water Gap National Recreation Area, Milford, PA

Eastern hemlock forests are very distinctive and highly valued ecosystems and visitor use areas at Delaware Water Gap National Recreation Area (DEWA). Unfortunately, DEWA has been infested with hemlock woolly adelgid (HWA), an alien insect that kills eastern hemlock trees. At present, 30% of the hemlock trees at DEWA are dead, and nearly all the remaining trees are in moderate to severe decline. A simple mathematical model conservatively predicts that hemlock mortality will reach 50% within 5 years and 80% within 13 years. Management concerns include hazardous trees; negative effects on recreational activities and esthetics of visitor use areas; invasions of non-native plants; impacts of white-tailed deer; alteration of habitats, micro-climates, and ecosystem processes; and loss of native biodiversity. Management efforts have included hazardous tree mitigation; minimizing soil compaction; releasing biocontrols; chemically suppressing HWA; suppressing invasive, non-native plants; constructing deer exclosures, and planting native trees in declining hemlock stands.

### **Conservation and Ecological Restoration of Rocky Mountain Subalpine Meadows: Understanding Vegetation Responses to Tree Encroachment**

Adrienne Shaw, M.Sc. candidate, University of Victoria, Victoria, BC, Canada

Climate change and successful fire suppression and exclusion have been major factors in the advancement of forests in open meadow habitats. Tree encroachment of subalpine meadows is prevalent in the Rocky Mountains but little is known about the consequences for the loss of plant diversity and composition. The goal of this research is to assess tree encroachment in subalpine meadows in the Southern Canadian Rocky Mountains and evaluate the implications of meadow loss for conservation and ecological restoration. Tree encroachment histories were developed using dendrochronology methods for fourteen randomly selected meadows in two different land management areas: Waterton Lakes National Park (protected) and the Castle Special Management Area (unprotected). Here I will present regional historical patterns in tree encroachment and the effects of tree encroachment on subalpine meadow understory species for protected and unprotected areas.

#### **Strengthening the Chain: The Bay Area Early Detection Network**

Andrea Williams, Natural Resource Specialist, National Park Service, San Francisco Bay Area I&M Network, Sausalito, CA  
Jennifer Jordan, Biological Science Technician, National Park Service, San Francisco Bay Area I&M Network, Sausalito, CA  
Daniel Gluesenkamp, Director, Habitat Protection and Restoration, Audubon Canyon Ranch, Glen Ellen, CA

Early detection of, and rapid response to, invasive species prevents the environmental and economic damage caused by invasive species and dramatically reduces the need for the planning and resources required to control large, established invasive plant populations. While local, state, and federal agencies, nongovernmental and international organizations all recognize the effectiveness of early detection and rapid response, few detail how. The San Francisco Bay Area Network (SFAN) has an established protocol for early detection of invasive plant species, and is a founding partner in the Bay Area Early Detection Network (BAEDN). BAEDN is a partnership of land managers and invasive species experts formed to coordinate the early detection of, and rapid response to, invasive species populations still limited in distribution. The SFAN protocol, including methods, trainings and materials, are central to this effort; as is Calflora, an online repository on plant locations in the state.

#### **Tamaligi (*Falcataria moluccana*) Control in Forests across Tutuila Island, American Samoa**

Tavita Togia, Terrestrial Ecologist, National Park of American Samoa (NPSA), Pago Pago, AS  
Flint Hughes, Institute of Pacific Islands Forestry, USDA-Forest Service, Hilo, HI

A key threat to the National Park of American Samoa (NPSA), located in the South Pacific Ocean, is invasive trees that overtop the native rainforest. Research by NPSA and the Institute of Pacific Islands Forestry of the US Forest Service demonstrate that invasive tree appear to be excluding an important wildlife food tree mamalava (*Planchonella samoensis*). These changes facilitate further growth of the invasive trees over native Samoa species. NPSA's invasive species control program has developed a successful partnership with the Samoan villages that lease lands to the park by working with the village chief councils and utilizing local villagers to restore these forests. To date over 3,300 mature invasive tamaligi trees (*Falcataria moluccana*) have been killed, reclaiming 1,400 acres of forest.

#### **Distribution and Abundance of Exotic Plants at Walnut Canyon National Monument**

Ron Hiebert, Director, Colorado Plateau CESU, Northern Arizona University, Flagstaff, AZ  
Hillary Hudson, Center for Sustainable Environments, Northern Arizona University, Flagstaff, AZ

We surveyed the monument for exotic plants in the fall of 2008. Cells 150x150m were randomly generated using GIS. One hundred and six cells, representing 30% of the park area, were sampled using tapeless methods. Within each cell, a 50m x 6m belt transect was sampled and exotic plants were identified to species and their cover estimated. The entire cell was surveyed for additional exotic plants using a random walk through the cell. We will report on the distribution of species relative to factors such as nearness to road, vegetation type, side of canyon, and old versus newer additions to the monument. Although much of the monument has been closed to visitors since 1933, some weed species such as yellow toad flax, were widely distributed. Others were restricted to certain habitats, or a side of the canyon. Possible explanations for the distributions observed will be explored and management recommendations will be made.

Concurrent Session #119 • Mt. Bachelor • Invited Papers

#### **Diversionsary Tactics; Or, Diversions, Ditches, and Dams, Oh My!**

Chair: Susan O'Ney, Resource Management Biologist/Hydrologist, Grand Teton National Park, Moose, WY

Session overview: Management of surface waters in many NPS units is complicated by the fact that these waters are impacted by the existence of dams, diversions and/or irrigation ditches. Park managers are limited in their ability to restore these waters to pre-diversion conditions due to western water laws and their associated obligations to water users with adjudicated water rights. Many NPS units are beginning to assess the effects that these pre-existing (to enabling legislation) and new water rights may have on park surface waters. This session will explore a variety of investigations into the hydrology, geomorphology, fish, aquatic invertebrates, water quantity and/or water quality in parks that deal with issues related to diversions, ditches and/or dams.

#### **Developing a Long-term Monitoring Program for Big Rivers on the Colorado Plateau**

Dustin Perkins, Program Manager, NPS, Northern Colorado Plateau Network, Grand Junction, CO  
David Thoma, National Park Service, Northern Colorado Plateau Network, Zion National Park, Springdale, UT  
Mike Scott, USGS, Fort Collins Science Center, Fort Collins, CO  
Jack Schmidt, Utah State University, College of Natural Resources, Logan, UT  
Tamara Naumann, Dinosaur National Monument, Dinosaur, CO

The Northern Colorado Plateau Network (NCPN) is monitoring big rivers in Black Canyon of the Gunnison National Park, Canyonlands National Park, Curecanti National Recreation Area, and Dinosaur National Monument. These four parks contain portions of the Colorado, Green, Gunnison, and Yampa rivers, four of the principle rivers comprising the upper Colorado River drainage. NCPN plans to begin big river monitoring at Dinosaur by building on existing research programs that have been conducted there for the past 10-15 years by USGS-Fort Collins and Utah State University. Dinosaur provides a unique paired comparison between the regulated Green River, the unregulated Yampa River of comparable annual discharge, and the restored Green

River below the confluence. The big river monitoring protocol will focus on detecting significant ecological changes in the key physical drivers of aquatic and riparian ecosystems, such as stream flow and associated channel and flood plain forming processes, the composition and structure of riparian vegetation, water chemistry, and aquatic macroinvertebrates.

#### **Spawning Patterns of Cutthroat Trout in the Snake River below Jackson Lake Dam**

Kris Homel, Graduate Research Assistant, Montana State University, Bozeman, MT

Robert E. Gresswell, Research Biologist U.S. Geological Survey, Montana State University, Bozeman, MT

The effects of discharge regulation on aquatic ecosystems are related to the physical and biological characteristics of the ecosystem, and the pattern of regulated flows. Thus, understanding relationships between the life history traits of an organism and associated qualities of the regulated environment (e. g., biological community composition or the physical template) is critical. The upper Snake River below Jackson Lake Dam provides a unique opportunity to evaluate the behavior of native fines-potted cutthroat trout (*Oncorhynchus clarkii bouvieri*) in an environment that has been transformed by dam construction and discharge regulation. Through a century of regulated discharge, cutthroat trout have persisted in the Snake River, but little is known about behavioral patterns in this altered environment. As a first step, we radio tagged 49 cutthroat trout and followed their movements for 12 months. Here we present preliminary data on the spatial and temporal characteristics of spawning migrations observed in 2008.

#### **Fish Loss to Irrigation Diversions in the Gros Ventre River, Wyoming**

Lisa Eby, Associate Professor, University of Montana, Missoula, MT

Tom Chandler, Wildlife Biology Program, Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, MT

Sam Bourret, Wildlife Biology Program, Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, MT

Ryan Kovach, Wildlife Biology Program, Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, MT

The Gros Ventre River is some of the last remaining core habitat for fine-spotted Snake River cutthroat trout, *Oncorhynchus clarkii bouvieri*. Trout habitat in the lower Gros Ventre River is limited by the effects of at least 13 irrigation diversions between Kelly and its confluence with the Snake River. Such a large proportion of the river is diverted that fish habitat and flow is often completely eliminated near the confluence. Through electrofishing, habitat surveys, and detecting tagged fish at fixed stations on diversions in 2007 and 2008, we evaluated the seasonal use of these ditches as trout habitat and quantified losses to the Gros Ventre population. Entrainment rates increased throughout the season, with entrainment of trout peaking in the fall. Many fish moved out of ditches before closures, but water diversions appear to be a substantial source of mortality for trout when compared with population estimates in the lower river.

#### **Gros Ventre River Hydrology, Diversions, and Water Rights, Grand Teton National Park, Wyoming**

Gwen Gerber, Hydrologist, NPS, Water Resources Division, Fort Collins, CO

The lower Gros Ventre River (GVR) in Grand Teton National Park has been chronically de-watered near the Wyoming State Highway Bridge. Hydrologic data was collected to develop water rights and stream flow protection strategies to protect park resources, including aesthetics, fisheries, and riparian habitat. Diversions in excess of the adjudicated water rights coupled with natural losses to the alluvium are cause for the de-watering. Studies concluded that during years of mean flow or above, the GVR will not be de-watered if diversions do not exceed total adjudicated water rights. During years of flows below the mean, the GVR will be de-watered if diversions are greater than 70% of the total adjudicated water rights. This hydrologic data will be used to work with Trout Unlimited, the State, the U.S. Fish and Wildlife Service, and private landowners to find cooperative solutions to de-watering of the GVR.

#### **Benthic Macroinvertebrate Composition above and below Jackson Lake Dam, Grand Teton National Park, Wyoming**

Aida M. Farag, U.S. Geological Survey, Jackson, WY

David D. Harper, U.S. Geological Survey, Jackson, WY

Darren T. Rhea, Wyoming Game and Fish Department, Pinedale, WY

Jackson Lake, Wyoming, was enlarged by the construction of Jackson Lake Dam prior to the establishment of Grand Teton National Park. The altered discharge regime of the Snake River below Jackson Lake Dam has resulted in delayed and extended runoff, and reduced peak discharge. These changes in discharge have also resulted in an altered temperature regime in the Snake River below Jackson Lake Dam. As a result, the potential exists for changes in the benthic macroinvertebrate composition downstream. Macroinvertebrates were sampled at 12 sites in the Snake River above and below Jackson Lake Dam by USGS CERC, Jackson Field Station personnel. These samples were sorted and identified to at least genus, and to species when possible. Analyses of percent similarities among sites were performed to differentiate potential changes downstream. Results indicate that changes in invertebrate composition were measurable but limited to the area immediately downstream of the Dam.

Concurrent Session #120 • Mt. Hood • Panel Discussion

#### **Creating a Sense of Connection: The Practical Application of Place Attachment Research**

Chair: Elizabeth Halpenny, Assistant Professor, Faculty of Physical Education and Recreation, University of Alberta, Edmonton, AB, Canada

As managers and researchers we understand that passion and commitment come from a sense of personal connection with natural places and with people and events from our past. That sense of connection is developed through meaningful and memorable experiences, both from visits and through outreach education. Management agencies are in much stronger position to protect heritage places for future generations if people know about these places and have had the opportunity to enjoy them in a sustainable way. Four panelists will speak for an hour on this sense of connection by outlining past and current place attachment research and by demonstrating how it is being applied by practitioners. In the second hour all session attendees will be encouraged to exchange additional ideas about how to foster a sense of connection and utilize this attachment to achieve heritage preservation and conservation goals.

Panelists: Linda Kruger, Social Science Team Leader, Alaska Communities and Forest Environments Team, Pacific Northwest Research Station, Juneau, AK



Carol Sheedy, Director General, External Relations and Visitor Experience, Parks Canada Agency, Gatineau, QC, Canada  
Douglas Knapp, Associate Professor, Recreation, Park, and Tourism Studies Department, Indiana University, Bloomington, IN

Concurrent Session #121 • Mt. St. Helens • Contributed Papers

### **New Insights into Wildlife Management**

Chair: Glen Sargeant, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, Jamestown, ND

### **Demography and Genetic Structure of a Recovering Grizzly Bear Population**

Kate Kendall, Research Ecologist, USGS, West Glacier, MT

Jeffrey B. Stetz, University of Montana Cooperative Ecosystem Studies Unit, Glacier Field Station, Glacier National Park, West Glacier, MT

John Boulanger, Integrated Ecological Research, Nelson, BC, Canada

Amy C. Macleod, University of Montana Cooperative Ecosystem Studies Unit, Glacier Field Station, Glacier National Park, West Glacier, MT

David Paetkau, Wildlife Genetics International, Nelson, BC, Canada

Gary C. White, Department of Fish, Wildlife and Conservation Biology, Colorado State University, Fort Collins, CO

Grizzly bears (brown bears; *Ursus arctos*) are imperiled in the southern extent of their range worldwide. The threatened population in northwestern Montana has been managed for recovery since 1975, yet no rigorous data were available to monitor program success. We used data from a large noninvasive genetic sampling effort conducted in 2004 and 33 years of physical captures to assess the abundance, distribution, and genetic health of this population. We combined data from our 3 sampling methods (hair trap, bear rub, and physical capture) to construct individual bear encounter histories for use in Huggins–Pledger closed mark–recapture models. We used location data from telemetry, confirmed sightings, and genetic sampling to estimate occupied habitat. We used factorial correspondence analysis to identify potential barriers to gene flow within this population. Our results suggested that genetic interchange recently increased in areas with low gene flow; however, we also detected evidence of incipient fragmentation across the major transportation corridor in this ecosystem. Our results suggest that the NCDE population is faring better than previously thought, and highlight the need for a more rigorous monitoring program.

### **Implications of Hunting in Channel Islands National Park**

Dan Wakelee, Associate Dean of the Faculty, California State University–Channel Islands, Camarillo, CA

Scott A. Frisch, Professor of Political Science, California State University–Channel Islands, Camarillo, CA

Santa Rosa Island in Channel Islands National Park offers a unique setting to examine some issues associated with hunting in national parks. It is the only location, outside of Alaska, where trophy hunting is permitted on land owned by the National Park system. Under the terms of the sale of the island, and subsequent court settlement, the island's previous owners are permitted to continue private hunting operations until 2011. Hunting operations have complicated efforts to manage the island. This case offers a unique example of efforts policy entrepreneurs to alter the use of parkland. The experience on Santa Rosa Island may have implications for other settings where the National Park Service has responsibility for parklands where it does not exercise full authority to manage non-conforming uses.

### **Wetland Networks Influence Bat Dynamics in Urban Parks**

Todd Lookingbill, Research Assistant Professor, University of Maryland Center for Environmental Science, Frostburg, MD

J.B. Churchill, University of Maryland Center for Environmental Science, Frostburg, MD

K.A.M. Engelhardt, University of Maryland Center for Environmental Science, Frostburg, MD

A.J. Elmore, University of Maryland Center for Environmental Science, Frostburg, MD

J.E. Gates, University of Maryland Center for Environmental Science, Frostburg, MD

National Park lands can provide important source habitat and act as valuable dispersal corridors in urbanizing environments. We assessed the relationships between bat activity and the amount and configuration of wetland habitat in parks along a gradient of increasing urbanization radiating from Washington, D.C. Our initial wetland inventory used a combination of aerial photography with ancillary GIS data and field surveys to delineate wetlands in Harpers Ferry National Historical Park. We supplemented this information with data from the National Wetlands Inventory for four other parks in the region. Ninety-six anabat stations were set up throughout the parks in areas of representative land covers, from which we were able to derive the characteristic spatial scales at which activity was positively associated with wetlands for three of five bat species. We used this information in a graph theoretic framework to construct network models of potential landscape connectivity for the different bat species. Our findings demonstrate how bats gravitate towards parks in urban settings, and how wetland distribution within the parks can act to dampen or amplify this effect. We use the results to illustrate the value of network analysis to guide the coordinated management of two of the parks most valued natural resources—wetlands and bats.

### **The Influence of Human Visitor Activity on Patterns of Wildlife Parasite Infection**

Chris O'Brien, Post-doctoral Researcher, USGS, Tucson, AZ

Charles van Riper III, Senior Research Ecologist, USGS, University of Arizona, Tucson, AZ

Human recreation in Protected Areas can directly influence wildlife species distributions, but little is known about indirect cascading effects on parasites. Parasites with complex life cycles, that span multiple trophic levels and move from vertebrates to invertebrates and back in a single generation, have the potential to be greatly influenced by human recreation patterns. High human use levels can artificially concentrate parasite hosts, thus potentially influencing transmission of wildlife diseases. In this study we link human recreation at a National Park in Arizona to wildlife disease patterns. We test the hypotheses that human recreation affects spatial patterns of waterfowl habitat use, and that this in turn affects the prevalence of a trematode parasite in an endangered intermediate (amphipod) invertebrate host. An observational study and a randomized experiment supported our hypothesis that human recreation directly affects the foraging location of waterfowl. Our findings clearly demonstrate that human recreation can indirectly affect

spatial patterns of parasite abundance and wildlife disease. These results have important implications for the management of areas that are maintained for human leisure activities and wildlife, especially in systems where disease is ecologically important.

#### **Restoring the Fisher (*Martes pennanti*) to Olympic National Park**

Patricia Happe, Wildlife Branch Chief, Olympic National Park, Port Angeles, WA

Jeffrey C. Lewis, Wildlife Biologist, Washington Department of Fish and Wildlife, Olympia, WA

Kurt J. Jenkins, Research Wildlife Biologist, USGS Forest and Rangeland Ecosystem Science Center, Olympic Field Station, Port Angeles, WA

In recent decades there has been increasing concern over the status of fishers in the Pacific states. Within Washington State, these concerns lead to a status review and a reintroduction feasibility assessment. That analysis concluded that successful reintroduction was feasible, and that the best place to reintroduce fishers was within Olympic National Park. After completing environmental assessments in 2007 we initiated the first of 3 years of fisher reintroductions in Olympic National Park. With the assistance of the British Columbia Ministry of Environment and other cooperators, we purchased 18 legally trapped fishers from trappers in British Columbia and transferred them to the Park in January and March 2008. Prior to transporting, each fisher was examined by a veterinarian, measured, and equipped with a radio-transmitter. We will present preliminary information on the first two years of releases, including initial findings on post-release survival, movements, home range establishment, and land use patterns.

#### **Friday Morning, March 6 (8:00–10:00)**

Concurrent Session #122 • Hawthorne  
OPEN

Concurrent Session #123 • Halsey • Side Meeting, By Invitation Only

#### **Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service**

Chairs: Jim Kendrick, Archaeologist, National Park Service, Grants, NM

Duane Hubbard, Chief of Resource Management, Tonto National Monument, Roosevelt, AZ

The Intermountain Region's (IMR) Resource Stewardship Advisory Team (RSAT) comprises both cultural and natural resource specialists from parks and central offices throughout the region. Its goal is to strengthen the leadership capabilities of IMR in comprehensive resource stewardship. RSAT advises the regional directorate on resource issues, and facilitates communication related to resource stewardship among the regional office, parks, and partners. This meeting will initiate RSAT's focus on climate change and its effects on resources within parks in the region. The meeting will also provide a forum to discuss the team's charter, its future organizational structure, and its agenda for the year.

(Continues in Concurrent Session #129)

Concurrent Session #124 • Weidler • Side Meeting, Open to all NPS employees

#### **Building the Capacity to Effectively Respond to the Challenge of Climate Change**

Chairs: Leigh Welling, Climate Change Coordinator, Natural Resource Stewardship and Science, National Park Service, Fort Collins, CO

Daniel Odess, Assistant Associate Director, Cultural Resources, National Park Service, Washington, DC

Shawn Norton, Branch Chief, Sustainable Operations and Climate Change, Park Planning, Facilities, and Lands, National Park Service, Washington, DC

A number of activities have been initiated in response to the challenge of climate change to national parks. Numerous workshops have been organized over the last several years and parks are beginning to develop and implement mitigation, adaptation, and communication strategies and actions. However, with all of this activity, much work remains in developing a coordinated strategy that will help us move forward effectively on this issue. The goal of the meeting will be to discuss current efforts and identify next steps toward implementing a coordinated climate change response plan for the NPS. Brief presentations will include an overview of NRSS activities over the last year (Leigh Welling), an approach underway for responding to cultural resource threats (Dan Odess), and an update on mitigation strategies through the Climate Friendly Parks program (Shawn Norton).

Concurrent Session #125 • Morrison • Side Meeting, Open to All

#### **Geology, Spreadsheets, Quantitative Literacy, and Natural Resources: Spreadsheets across the Curriculum Meet Research Learning Centers**

Chairs: H.L. Vacher, Professor, Department of Geology, University of South Florida, Tampa, FL

Ben Becker, Director, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Geology of National Parks—Spreadsheets, Quantitative Literacy and Natural Resources is a new NSF-funded project (DUE 0836566) in which USF geology faculty and graduate students will work with eight geologically diverse Research Learning Centers to create Spreadsheets Across the Curriculum (NSF DUE 0442629) modules for Geology of National Parks (GNP), a widely subscribed, general education course. The goal is to transform GNP from a rock- and scenery-centric “about geology” course to a “science is useful” course by integrating geologic, management-related numeric information inspired by the Natural Resource Challenge. The purpose of this side-session workshop is to promote discussion and exchange of ideas between representatives of the USF team, the eight partner RLCs, and the broader community interested in the intersection of environmental-geological data, park management, and science/mathematics education. We invite interpretation, education, and science (CESU, I&M, Natural Resources, USGS etc.) personnel to participate, learn more, and discuss potential collaborations.

Concurrent Session #126 • Ross Island • Side Meeting, Open to All

**Ocean Park Stewardship Meeting**

Chairs: Cliff McCreedy, Marine Resource Management Specialist, National Park Service, Ocean and Coastal Resources Branch, Washington, DC

Jeffrey N. Cross, Chief, Ocean and Coastal Resources Branch, Water Resources Division, Natural Resource Program Center, National Park Service, Fort Collins, CO

NPS Regions have developed regional and park-specific Strategic Plans to carry out the goals and objectives of the National Ocean Park Stewardship Action Plan. Participants will review the status of these plans and developments at the national level.

Concurrent Session #127 • Sellwood • Side Meeting, By Invitation Only

**NPS Fire GIS Committee**

Chairs: Gladys Crabtree, National Park Service, Boise, ID

Kathie Hansen, National Park Service

Meeting of NPS Fire GIS Committee.

(Continues in Session #133)

**Friday Morning, March 6 (10:00–12:00)**

Concurrent Session #128 • Hawthorne

OPEN

Concurrent Session #129 • Halsey • Side Meeting, By Invitation Only

**Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service**

(See Concurrent Session #123)

Concurrent Session #130 • Weidler • Side Meeting, By Invitation Only

**National Park Service Climate Change Response Steering Committee Meeting**

Chairs: Bert Frost, Associate Director, Natural Resource Stewardship and Science, National Park Service, Washington, DC

Steve Whitesell, Associate Director, Park Planning, Facilities, and Lands, National Park Service, Washington, DC

Leigh Welling, Climate Change Coordinator, Natural Resource Stewardship and Science, National Park Service, Fort Collins, CO

The NPS has recently created a Climate Change Response Steering Committee. The purpose of the committee is to foster service-wide communication and build on current efforts toward effectively and collectively responding to the challenges climate change presents. This is a business meeting for committee members.

Concurrent Session #131 • Morrison • Side Meeting, Open to All

**Status Report on the National Park Service Socioeconomic Monitoring Program**

Chair: James Gramann, Visiting Chief Social Scientist, National Park Service Social Science Program, College Station, TX

The NPS Socioeconomic Monitoring (SEM) Program will develop baseline information and conduct long-term monitoring of trends in the socioeconomic characteristics of human populations in parks, regions around park, and nationally. The SEM Program complements the NPS's Inventory & Monitoring Program for natural resources and is working with that program to identify and take advantage of opportunities for cooperation and information-sharing. The purpose of the affinity meeting is to describe the planning process for the SEM Program, summarize progress to date, answer questions, and make people aware of future opportunities to take part in the SEM Program's development.

Concurrent Session #132 • Ross Island • Side Meeting, Open to All

**Vegetation and Soils Monitoring in National Parks: Developing and Implementing Long-term Monitoring Protocols**

Chair: Donna Shorrock, National Park Service

Many I & M networks are in the process of developing or finalizing their monitoring plans for vegetation, which may also include a soils component. While the specific goals and strategies for each plan may vary, the networks share an overarching goal and are facing similar challenges. In this meeting, participants will have the opportunity to share past successes and failures, discuss strategies for connecting science to management, identify commonalities networks should share, and attempt to solve some of the issues with which many of us continue to grapple.

Concurrent Session #133 • Sellwood • Side Meeting, By Invitation Only

**NPS Fire GIS Committee**

(See Concurrent Session #127)

## Friday Afternoon, March 6 (1:00–3:00)

Concurrent Session #134 • Hawthorne  
OPEN

Concurrent Session #135 • Halsey • Side Meeting, By Invitation Only  
**Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service**  
(See Concurrent Session #123)

Concurrent Session #136 • Weidler • Side Meeting, By Invitation Only  
**Rocky Mountain Network Board of Directors and Technical Committee Meeting**  
Chairs: Michael Britten, Program Manager, Rocky Mountain Network, Fort Collins, CO  
Art Hutchinson, Chair, Rocky Mountain Network Board of Directors  
Melana Stichman, Chair, Rocky Mountain Network Technical Committee  
The Rocky Mountain Network Board of Directors and Technical Committee will meet to review current program status and overall direction. This includes a discussion of ROMN budget, staffing, protocol development plans, and communication needs and solutions.

Concurrent Session #137 • Morrison • Side Meeting, Open to All  
**USGS, NPS and the Natural Resources Preservation Program (NRPP): Funding Research to Meet the Science and Management Needs of the National Parks**

Chair: Robin P. White, Bureau Approving Official–Biology, U.S. Geological Survey, Kearneysville, WV  
The Natural Resources Preservation Program (NRPP) was created in 1981 to fund natural resources research and management programs in the National Park Service and today is administered by USGS. As the Park Service moves toward a broader vision of national park management and as climate change affects the entire national park system, is the NRPP program continuing to address the science needs of park managers? This session will include several brief presentations on the current USGS/ NRPP process and studies across the United States. The session will then include an open discussion on what changes, if any, might be pursued in the use of these science funds to best meet park management needs.

Concurrent Session #138 • Ross Island • Side Meeting, By Invitation Only  
**Developing a Strategic Plan for NPS's International Programs**  
Chair: Jonathan Putnam, World Heritage Program Officer, U.S. National Park Service, Office of International Affairs, Washington, DC  
The NPS has a venerable history of global leadership. Most of the world's park agencies have been assisted at some point in their development by the NPS, and the NPS likewise has learned much from other countries. International issues also have direct impacts on the resources of U.S. park system—shared and migratory species that cross international borders, invasive species, air and water pollution, wildlife diseases and climate change are just some of the most obvious examples. For at least a decade, however, the NPS has had a much diminished international program, greatly limiting its ability to provide leadership, gain new ideas, and develop international projects that benefit park resources. With a new administration about to take office, there is now an opportunity to take a new look at the NPS's international mission, identify priority areas of international engagement, and develop a strategic plan for NPS's international programs. The NPS Office of International Affairs will hold a strategic planning meeting in Washington, DC by Spring 2009. The GWS 2009 conference presents a unique opportunity for NPS employees and others interested in the NPS international mission to help develop the framework for this meeting, by identifying the key international issues facing the NPS, potential approaches to addressing those issues, and developing messages that will convey the importance of NPS's international mission to NPS leadership, Congress and the American public.

Concurrent Session #139 • Sellwood • Side Meeting, By Invitation Only  
**Research Learning Center (RLC) Coordination Meeting**  
Chair: Ben Becker, Research Learning Center National Coordinator, Point Reyes National Seashore, Point Reyes Station, CA  
Research Learning Center (RLC) strategic planning and coordination meeting. We will discuss the progress of the RLC strategic planning process and coordination for ongoing and new multiple RLC projects.  
(Continues in Concurrent Session #145)

## Friday Afternoon, March 6 (3:00–5:00)

Concurrent Session #140 • Hawthorne  
OPEN

Concurrent Session #141 • Halsey • Side Meeting, By Invitation Only  
**Resource Stewardship Advisory Team Meeting, Intermountain Region, National Park Service**  
(See Concurrent Session #123)



Concurrent Session #142 • Weidler  
OPEN

Concurrent Session #143 • Morrison  
OPEN

Concurrent Session #144 • Ross Island • Side Meeting, Open to All

**Law, Negotiation, and Partnerships: Reflections on Heritage Management in North America**

Chair: Jack Corbett, Associate Professor, Hatfield School of Government, Portland State University, Portland, OR

Heritage managers commonly confront an extraordinary challenge: while the law may specify what constitutes “heritage,” how it may be addressed, or even who may “manage,” complex social, economic, political, and environmental considerations often blur distinctions by allocating resources and opportunities in ways the law does not contemplate. Managing in complex settings therefore involves addressing not only legal frameworks and processes but also continuing negotiation among stakeholders in order to create viable partnerships. Practitioners from Canada, Mexico, and the United States interact with a legal expert to explore how heritage managers address (1) the creation of partnerships with indigenous communities, and (2) the viability of partnerships with multiple actors in the visitor industry. To what extent do the realities of individual systems overwhelm the legal frameworks which define them?

Presenters: Hilary Soderland, Registered Professional Archaeologist, University of California, Seattle, WA

Alastair Kerr, Manager, Heritage Branch, Government of British Columbia, Victoria, BC, Canada

Larry Wiese, Superintendent, Mesa Verde National Park, CO

Nelly Robles Garcia, Director, Archaeological Zone of Monte Alban, Instituto Nacional de Antropología e Historia, Mexico, Oaxaca, Oaxaca, Mexico

Concurrent Session #145 • Sellwood • Side Meeting, By Invitation Only

**Research Learning Center (RLC) Coordination Meeting**

(See Concurrent Session #139)

**POSTER ABSTRACTS (listed alphabetically by lead author)**

**A Systematic Review of Species Performance and Treatment Effectiveness for Revegetation in the Mojave Desert**

Scott Abella, Assistant Research Professor, University of Nevada Las Vegas, Las Vegas, NV

Alice C. Newton, Lake Mead National Recreation Area, Boulder City, NV

Land managers need effective strategies for revegetating disturbed arid lands. We evaluated the following questions by reviewing published revegetation studies in the Mojave Desert: (1) Which species have been most commonly and effectively planted or seeded? (2) Which treatments have increased plant establishment? (3) What are the relative performances of planting and seeding? Fifteen planting studies assessed a total of 41 species, 36 of them shrubs. None of the nine species planted in  $\geq 3$  studies avoided a complete failure (0% survival) in one or more treatments in one or more studies, but several species (e.g., *Larrea tridentata*, *Atriplex* spp.) consistently exhibited high ( $> 50\%$ ) survival. Fencing, shelters, and irrigation increased survival of some species, but these treatments require cost/benefit analyses. Overall our analysis revealed that given proper care, many native shrub species can be consistently established ( $\geq 50\%$  survival) through planting, even in years of below average precipitation.

**A Systematic Review of Wild Burro Grazing Effects on Mojave Desert Vegetation, USA**

Scott Abella, Assistant Research Professor, University of Nevada Las Vegas, Las Vegas, NV

Wild burros (*Equus asinus*), protected by the 1971 Wild Free-Roaming Horse and Burro Act on some federal lands but exotic animals many ecologists and resource managers view as damaging to native ecosystems, represent one of the most contentious management problems in American Southwest arid lands. This review synthesizes literature about burro effects on plant communities of the Mojave Desert, a center of burro management contentions. I classified 24 documents meeting selection criteria for this review in to five categories of research: (i) diet analyses, (ii) utilization studies, (iii) control-impact comparisons, (iv) enclosure studies, and (v) forage chemical analyses. Ten diet studies recorded 175 species that burros consumed. However, these studies and two enclosure studies suggested that burros preferentially eat native perennial grasses. One study in Death Valley National Park, for example, found that Indian ricegrass was 11 times more abundant in burro diets than expected based on its availability.

**Applying the Environmental Protection Agency (EPA) Ecosystem Framework to Evaluate the Collective Performance of Meadow Studies in Yosemite**

Lisa Acree, Botany Program Manager, National Park Service, Yosemite National Park, El Portal, CA

Yosemite National Park is home to over 3,000 meadows, many of high interest to resource managers and scientists. This interest has generated a number of broad- to small-scale meadow studies. While each study contributes to understanding the biotic integrity of Yosemite meadows, this poster evaluates their collective performance using a systematic tool developed by the EPA known as A Framework For Assessing and Reporting on Ecological Condition: An SAB Report. This poster uses the EPA Framework to aggregate information under six attributes: landscape and biotic condition; chemical and physical characteristics; ecological processes; hydrology and geomorphology; and natural disturbance regimes. The EPA Framework can be a valuable tool to identify information gaps at a variety of scales, and share data and insights. The Framework also lends itself for creative applications such as determining a range of biotic indicators for user capacity determinations.

### **Critical Components of Yosemite's Invasive Plant Management Plan**

Martin Acree, Restoration Crew Leader, National Park Service Yosemite, El Portal, CA

Timothy Croissant, Biologist, Yosemite National Park, El Portal, CA

Yosemite National Park's newly approved Invasive Plant Management Plan allows for a broad range of tactics (physical, chemical, cultural, and others,) to be used to control invasive exotic plants. The Plan is structured around distinct building blocks. These blocks include and overarching purpose, general objectives, a prioritization program based on species characteristics, specific objectives for target invasive plants, and species-specific population size and location criteria for herbicide use. This flexible yet specific planning approach has successfully reached the implementation phase despite high public scrutiny, and has resulted in the ability to use herbicide as an additional tool. This poster will describe these building blocks, which can be customized to accommodate specific needs in more detail.

### **A Strategy For Assessing Ecological Condition of National Park Wetlands: Crater Lake and Lassen Volcanic National Parks**

Paul Adamus, Wetland Scientist, Water Resources Graduate Program, Oregon State University, Corvallis, OR

Daniel Sarr, Inventory and Monitoring Coordinator, Klamath Network, National Park Service, Ashland, OR

Cheryl Bartlett, Olympic National Forest, Olympia, WA

The Klamath Network I & M Program supported a prototype assessment of wetlands in Crater Lake (CRLA) and Lassen Volcanic (LAVO) National Parks. Wetlands had already been mapped but little was known of their condition. To select field sites we applied a spatially-balanced randomized design to NWI maps, then used GIS to add sites having geomorphic characteristics or human disturbances that were absent among the randomly selected sites. A 3-person crew visited 68 LAVO wetlands in 2005 and 76 CRLA wetlands in 2006, collecting data on soils, plant species composition, landscape setting, and potential stressors, as well as photographing, GPS-ing, and placing a permanent marker. Six plants new to LAVO and 20 new to CRLA were discovered. A wetland community vegetation classification was produced. We established a quantitative baseline to aid in monitoring future vegetation or condition changes, define realistic performance criteria, and guide protection and restoration efforts.

### **It Takes Many Hands to Control Invasive Plants Along the Appalachian Trail**

James Akerson, Director, NPS Mid-Atlantic Exotic Plant Management Team, Luray, VA

There is a long history of volunteer-led trail management along the Appalachian National Scenic Trail. Until recently, however, invasive plants have been ignored. Now, extensive surveys by through-hikers and the mega-transect initiative are giving definition to the extent of the threat. If the nation is to protect the natural and cultural legacy of the Trail, thousands of volunteers will be needed to enact field treatments. Development of a short-term volunteer program along the Northern Virginia section may become a model for other sections of the Trail. This poster and paper describe the short-term volunteer program goals, organizational structure, and program success to date.

### **The Western Mountain Initiative: Effects of Climatic Change on Tree Mortality and Forest Dieback**

Craig D. Allen, Research Ecologist, USGS Jemez Mountains Field Station, Los Alamos, NM

David D. Breshears, School of Natural Resources, University of Arizona, Tucson, AZ

Adrian J. Das, USGS Western Ecological Research Center, Three Rivers, CA

Jeffrey A. Hicke, Department of Geography, University of Idaho, Moscow, ID

Nate G. McDowell, Atmospheric and Environmental Dynamics Group, Los Alamos National Laboratory, Los Alamos, NM

Don McKenzie, Pacific Wildland Fire Sciences Laboratory, US Forest Service, Seattle, WA

Nathan L. Stephenson, USGS Western Ecological Research Center, Three Rivers, CA

Phillip J. van Mantgem, USGS Western Ecological Research Center, Three Rivers, CA

Jill S. Baron, U.S. Geological Survey, Fort Collins Science Center, and Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO

Daniel B. Fagre, U.S. Geological Survey, Northern Rocky Mountain Science Center, West Glacier, MT

Andrew G. Fountain, Department of Geology, Portland State University, Portland, OR

Dennis S. Ojima, H. John Heinz Center for Science, Economics and the Environment, Washington, DC

David L. Peterson, US Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Seattle, WA

Christina Tague, Donald Bren School of Environmental Science and Management, University of California-Santa Barbara, Santa Barbara, CA

Forests are keystone elements of protected areas across western North America. In the face of projected climatic changes, Western forests are expected to experience significant changes in structure, composition, function, and distribution. Yet the exact nature, timing, and extent of these changes remain uncertain. Thus, the USGS-funded Western Mountain Initiative (WMI) has devoted particular effort toward detecting ongoing climatically driven changes in Western forests, and using the resulting information to improve our ability to forecast and adapt to future changes. Specifically, recent and ongoing WMI research addresses: ongoing warming as a driver of episodes of extensive forest die-back and chronically increasing tree mortality rates; physiological drivers of woody plant mortality; climatically mediated changes in forest insect outbreaks; synthesis of climate-induced forest dieback risk as an emergent global phenomenon; efforts to improve broad-scale modeling and forecasting of forest dieback; and forest management strategies to foster incremental adaptation of current forests to ongoing climatic changes.

### **Monitoring of Rocky Intertidal Communities of Redwood National and State Parks, California**

Karah Ammann, Research Assistant, University of California-Santa Cruz, Santa Cruz, CA

Peter Raimondi, Professor and Principal Investigator, University of California-Santa Cruz, Santa Cruz, CA

David Lohse, Postdoctoral Researcher, University of California-Santa Cruz, Santa Cruz, CA

David Anderson, Fishery Biologist, Redwood National and State Parks Orick, CA

Intertidal monitoring was established in 2004 at three coastal sites within the Redwood National and State Parks (RNSP) in Del Norte County, California. In 2008, the National Park Service accepted the monitoring protocol for these sites into the long-term monitoring program. These sites are part of MARINe (Multi-Agency Rocky Intertidal Network), a regional intertidal monitoring network

that has been working in concert with a number of academic and government organizations to conduct intertidal monitoring along the coast of California and Oregon. Several other coastal parks, including Cabrillo National Monument and Channel Islands National Park, are also involved in intertidal monitoring to establish baseline datasets of their marine resources. The focus of these surveys is to examine temporal changes within permanent study plots. Tracking changes in these communities allows determination of “normal” limits of variation as well as seasonal and long-term patterns. Understanding these patterns is necessary for detecting anthropogenic changes resulting from disturbances such as oil spills or global warming. Monitoring intertidal communities is critical for making informed management decisions.

#### **Conservation Strategies for an Endemic Violet**

Fred Armstrong, Chief of Biological Resources, Guadalupe Mountains National Park, Salt Flat, TX

Kristin Haskins, Research Scientist, The Arboretum at Flagstaff, Flagstaff, AZ

Christine “Kim” Blaxland, Independent Violet Specialist, Radnor, PA

The Guadalupe Mountains violet (*Viola guadalupensis*) was discovered in Guadalupe Mountains National Park and newly described to science in 1990. It grows on vertical limestone faces that are heavily shaded by a relict forest at 2,438 m in elevation. The discovered population consists of about 90 plants tightly clustered within a 2.4 m x 3.0 m area. Searches for other violet sites had proven unsuccessful until GIS modeling in 2006 predicted potential habitat in 10 locations in the park. Location searches based on the model resulted in the discovery of a second, isolated, smaller population. Park staff have harvested seed and specialists have propagated plants for genetic study. The ex-situ plants are being used for seed multiplication and germination experimentation to assist the park to establish additional colonies in appropriate habitat. Micro-climate monitoring is being conducted at modeled habitat sites for potentially establishing new colonies.

#### **Expanding Coral Reef Index Site Monitoring to an Extensive Design at Dry Tortugas National Park**

Andrea Atkinson, Quantitative Ecologist, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Jeff Miller, National Park Service South Florida/Caribbean Network, St. John, VI

Ben Ruttenberg, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Brian Witcher, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Rob Waara, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Judd Patterson, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Matt Patterson, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Andy Davis, National Park Service South Florida/Caribbean Network, St. John, VI

The South Florida Caribbean Network expanded upon its coral reef monitoring design (established on sites of management interest) using 20 ten-meter permanent transects to a design allowing assessment of trends in stony coral communities between 2 -20m depth gradient, inside and outside the no-take “Research Natural Area” (RNA) at Dry Tortugas National Park. Sites were chosen by first using a generalized random-tessellation stratified (GRTS) draw of possible points from hard-bottom, then evaluating 157 sites (data gathered with rapid habitat assessment) until the minimum number of sites meeting requirements of depth and coral cover were found. Based upon results of sample size and sampling optimization analyses, we established nine high coral cover sites (>5% coral cover) both inside and outside the RNA, with each site containing a center point and four permanent 10m transects laid in a systematic pattern. Sampling design power, results, and tradeoffs of the approach are presented.

#### **Installation of GLORIA Climate Change Monitoring at Great Basin National Park**

Gretchen Baker, Ecologist, Great Basin National Park, Baker, NV

Margaret Horner, Biological Science Technician, Great Basin National Park, Baker, NV

In August 2008, park staff, Great Basin CESU cooperators, and volunteers assembled to install GLORIA vegetation monitoring plots atop four of the tallest peaks in Great Basin National Park. GLORIA stands for “Global Observation Research Initiative in Alpine Environments”—a contribution to the Global Terrestrial Observing System. The GLORIA protocol focuses on sampling vegetation and soil temperature in alpine environments with an aim to track changes related to climate change. Wheeler Peak, the second tallest mountain in Nevada at 13,063 feet, was one of the four peaks included in the study. The Great Basin NP location represents the first GLORIA installation in the heart of the Great Basin ecoregion, and will serve to complement other efforts in the Sierras and Rocky Mountains to help complete a full picture of vegetation changes in these sensitive environments. Great Basin park staff will coordinate re-reading of the plots every five years.

#### **The Western Mountain Initiative: Vulnerability and Adaptation to Climate Change in Western Mountain Ecosystems**

Jill S. Baron, U.S. Geological Survey, Fort Collins Science Center, and Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO

David L. Peterson, US Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Seattle, WA

Daniel B. Fagre, U.S. Geological Survey, Northern Rocky Mountain Science Center, West Glacier, MT

Craig Allen, Research Ecologist, U.S. Geological Survey, Jemez Mountains Field Station, Bandelier National Monument, Los Alamos, NM

Nathan L. Stephenson, U.S. Geological Survey, Western Ecological Research Center, Three Rivers, CA

Don McKenzie, Pacific Wildland Fire Sciences Laboratory, US Forest Service, Seattle, WA

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Andrew G. Fountain, Department of Geology, Portland State University, Portland, OR

Climate warming is affecting Western mountain ecosystems, directly through changes in water dynamics and indirectly through altered disturbance regimes. The Western Mountain Initiative team explores the effects of climate change on ecological disturbance, responses of forest vegetation, mountain hydrology, and the coupled hydro-ecological responses that determine vulnerability of



Western mountain ecosystems to change. We address the extent to which climate drivers are mediated by regional- or watershed-scale controls on ecosystem processes, thus quantifying vulnerability to climate change in mountain ecosystems. Region-specific results and emergent West-wide patterns are shared with resource managers through workshops and a comprehensive web-based toolkit on climate-change science and adaptation management. WMI seeks to understand climate-ecosystem interactions, forecast ecological change, and provide adaptation information for managers.

#### **Managing Morel Mushrooms in the U.S. Mid-Atlantic Region**

Elizabeth Barron, Research Fellow, Rutgers University, Piscataway, NJ

Marla R. Emery, Research Geographer, US Forest Service Northern Research Station, Burlington, VT

Giselle Mora-Bourgeois, Science Education Coordinator, Urban Ecology Research, Learning Alliance Center for Urban Ecology, Washington, DC

Anecdotal reports have sparked concerns that morel mushroom populations may be declining on national parks in the greater Washington, DC area. This research focuses on two of these: Catoctin Mountain Park and Chesapeake and Ohio Canal National Historical Park. Oral histories conducted with 42 harvesters in 2005 and 2007 had dual objectives: (1) explore and utilize traditional ecological knowledge to develop further understanding of morels in the mid-Atlantic region, and (2) develop practical suggestions for morel management. Morel hunting is a valued activity for many park visitors. Visitor-harvesters have extensive ecological knowledge of morels. Study participants attribute changes in morel abundance to several non-human factors; these suggestions are consistent with the scientific literature. We recommend outreach strategies developed in conjunction with experienced harvesters. Involving harvesters in decision making enhances the effectiveness of management, increases the legitimacy of guidelines and regulations, decreases enforcement costs, and reinforces good park-community relations.

#### **National Park Service Research Learning Centers (RLCs)**

Ben Becker, NPS Research Learning Center National Coordinator, Point Reyes National Seashore, Point Reyes Station, CA

Jim Pfeifferberger, Education Coordinator, Ocean Alaska Science and Learning Center, Kenai Fjords National Park, Seward, AK

Christie Anastasia, Education Coordinator, Murie Science and Learning Center, Denali National Park and Reserve, Denali National Park, AK

Tami Blackford, Editor, Yellowstone Science, Yellowstone Center for Resources, Yellowstone National Park, WY

There are currently 20 RLCs located at National Parks across the country. RLCs facilitate the use of parks for scientific inquiry, support science-informed decision making, communicate the relevance of and provide access to scientific research, and promote science literacy and resource stewardship. Each year, RLCs facilitate over 900 research projects investigating park biology, physical sciences, social sciences and other disciplines, involve over 450 university students in park research, resulting in over 70 peer-reviewed research papers each year. Such articles and ancillary products are critical for science-informed management decisions. Science communication is integrated into many research projects to promote science literacy, science-informed decision making, and resource stewardship. Hundreds of teachers and students are engaged each year in hands-on science activities. RLCs are increasingly collaborating with other programs, such as interpretation, resource and cultural resource management, I&M and CESUs, to produce high quality resource information via the web to managers and the public.

#### **The Natural Resource Publication Series**

Jason Bennett, Data Management Assistant, National Park Service WASO, Fort Collins, CO

The Natural Resource Publication series addresses natural resource topics that are of interest and applicability to a broad readership in the National Park Service and to others in the management of natural resources, including the scientific community, the public, and the NPS conservation and environmental constituencies. Manuscripts are peer-reviewed to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and is designed and published in a professional manner. The national office of the Inventory and Monitoring Program provides guidance and assistance with publishing in the Natural Resource Report and Natural Resource Technical Report series. These services include an overview of the process, step by step procedures, instructions to authors, and report templates and examples. Reports are assigned a series number and can easily be found through search engines and publication listings.

#### **FFI (FEAT and FIREMON Integrated)**

Nate Benson, Fire Ecologist, NPS Fire Management Program Center, NIFC, Boise, ID

MaryBeth Keifer Fire Ecologist, NPS Fire Management Program Center, NIFC, Boise, ID

A new interagency monitoring tool named FFI (FEAT and FIREMON Integrated) has been constructed through a complementary integration of the Fire Ecology Assessment Tool (FEAT) and FIREMON. FEAT and FIREMON are two commonly used systems for fire ecology monitoring that have similar procedural characteristics and database architecture. Their integration results in an enhanced monitoring tool that facilitates cooperative, interagency data management and information sharing. FFI supports scalable (site-specific to landscape-level) monitoring. FFI provides software components for data entry, data storage, summary reports, analysis tools, data queries, geographic information system (GIS) tools, and personal digital assistant (PDA) use. FFI is delivered with a large set of standard protocols to facilitate data sharing and comparison. When custom data entry forms are needed, the Protocol Manager module lets users define their own sampling protocols and corresponding database forms. The interagency tool allows for more efficient use of limited monitoring resources and provides greater opportunities for regional analysis of monitoring data by managers, scientists and other partners.

#### **Monitoring Trends in Burn Severity (MTBS)**

Nate Benson, Fire Ecologist, NPS Fire Management Program Center, NIFC, Boise, ID

Agency leaders, fire managers, elected officials, and the general public need information regarding the effects of large wildfires. Recently, the Wildland Fire Leadership Council (WFLC), which implements and coordinates National Fire Plan (NFP) and Federal Wildland Fire Management Policies, adopted a strategy to monitor the effectiveness and effects of the National Fire Plan and the Healthy Forests Restoration Act. One component of this strategy is to assess the environmental impacts of large wildland fires and



identify the trends of burn severity on all lands across the United States. To that end, WFLC is sponsoring a six year project, Monitoring Trends in Burn Severity (MTBS), which requires the USFS and the USGS to map and assess the burn severity for all large current and historical fires. Landsat imagery and the differenced Normalized Burn Ratio algorithm, will be used to map burn severity of all fires since 1984 greater than 500 acres in the east, and 1000 acres in the west. The number of historical fires from this period combined with current fires occurring during the course of the project will exceed 9000. The MTBS project will generate burn severity data, maps, and reports for each fire. The information will be available for use at local, state and national levels to evaluate trends in burn severity and help develop and assess the effectiveness of land management decisions. All data (Landsat imagery, dNBRs, fire perimeters, etc.) and assessment results is distributed to the public via an internet map service.

#### **Evaluation of Ensemble Habitat Mapping to Support National Park Service Decisions on Fire Management Activities and Invasive Plant Species Control**

Nate Benson, Fire Ecologist, NPS Fire Management Program Center, NIFC, Boise, ID

Jeff Morissette, Kara Paintner, Pete Ma, Monique Rocca, Sunil Kumar, Alan Swanson, Catherine Jarnevich, Tom Stohlgren, Pat Lineback, Athena Demetry, Jennifer Allen, Ann Rodman, Craig McClure, Tony Caprio, Joel Silverman, Neal Most, Diane Abendroth, Kelly McCloskey, Jeff Heys

USFWS, USGS, NASA, Colorado State University, and the Yellowstone Ecological Research Center are working with NPS to develop robust habitat maps for invasive plant species. The models are based on field data observations of presence/absence provided by the parks combined with climate and vegetation predictors derived from satellite data. The work is focused on Yellowstone, Grand Teton, Sequoia and Kings Canyon, and areas of interior Alaska. At least one focal species per park have been selected for each park. We used an ensemble approach to combine five state-of-the-art models (logistic regression, boosted regression trees, random forest, multivariate adaptive regression splines, and maximum entropy) to produce one habitat map. This poster describes: the methods to produce the ensemble map; how the parks utilize this information; our sampling strategy to evaluate the map; and the initial results from field validation data collected in the summer of 2008. The ultimate objective for this work is to decide if such an ensemble map would be useful to NPS weed managers.

#### **Documenting Soil Change without Monitoring: Inventory Procedures for Dynamic Soil Properties and Plant Community Dynamics**

Pete Biggam, Soil Program Manager, National Park Service, Natural Resources Program Center, Lakewood, CO

Arlene J. Tugel, New Mexico State University, Las Cruces, NM

Jeffrey Herrick, New Mexico State University, Las Cruces, NM

Skye A. Wills, USDA-ARS, Jornada Experimental Range, Las Cruces, NM

The National Park Service thru a cooperative effort with the Natural Resources Conservation Service, Agricultural Research Service Jornada Experimental Range, Forest Service, and Bureau of Land Management, is utilizing data collection procedures in their soil resource inventories to characterize dynamic soil properties using simple conceptual models of management effects on soil (such as state and transition models) to stratify the soil map unit for comparison studies which are designed to characterize dynamic soil properties for one or more land cover types, plant communities, or management systems, following six basic steps identified in "Soil Survey and Resource Inventory Guide for Dynamic Soil Properties and Soil Change." Data and information about how soils change can be used by park staff and researchers in order to plan for long-term productivity, interpret indicators used in monitoring and assessments, integrated in current restoration strategies, and help limit future human impacts on our valuable soil resources.

#### **Benchmark Ecological Sites Provide Information About Climate Change Effects on Forest and Rangeland Ecosystems**

Pete Biggam, Soil Program Manager, National Park Service, Natural Resources Program Center, Lakewood, CO

William Ypsilantis, Bureau of Land Management, Denver, CO

Michael "Sherm" Karl, Bureau of Land Management, Denver, CO

Tim Bottomley, Bureau of Land Management, Denver, CO

Anthony O'Geen, University of California-Davis, Davis, CA

Curtis Talbot, Natural Resources Conservation Service, Lincoln, NE

Lyn Townsend, Natural Resources Conservation Service, Portland, OR

Wendell Gilgert, Natural Resources Conservation Service, Portland, OR

Randy Davis, USDA-Forest Service, Washington, DC

Jeff Dibenedetto, U.S. Forest Service, Billings, MT

A benchmark ecological site is one that has the greatest potential to yield information about ecological functions, processes, and the effects of management or climate changes on a broad area or critical ecological zone. A benchmark ecological site represents similar sites in a major land resource area. Information gathered about benchmark ecological sites can address many different ecological, social, and resource management issues. One of the purposes of designating benchmark ecological sites is to promote greater understanding of the potential effects of global climate change on rangeland and forest ecosystem dynamics and soils. This allows land managers to use adaptive management to provide for sustainability of natural resources on these landscapes. Potential resource issues that could be addressed include the effects of climate change and management actions on threatened, endangered, and other plant and animal species of concern; soil erosion; soil ecology; plant community composition and productivity; and restoration potential.

#### **Taking the Long View: Visibility Monitoring in a Scenic National Park**

Andrea Blakesley, Environmental Specialist, Denali National Park and Preserve, Denali Park, AK

Not all air quality issues are immediately threatening. Some, like intercontinental transport of industrial and agricultural pollutants, may give warning for decades before they are likely to degrade park resources beyond acceptable thresholds. Long enough, some may argue, for the National Park Service to inspire concern about international threats to park values such as good visibility and clean air, and so contribute toward solutions to the problem through education and outreach. Visibility monitoring, including long-term photographic records of scenic views, can provide outreach tools that captivate the public and get them interested in the causes of

visibility degradation.

### **A Monitoring Protocol for Large Spring Ecosystems at Ozark National Scenic Riverways, Missouri: Initial Results**

David Bowles, Aquatic Program Leader, National Park Service, Heartland Inventory and Monitoring Network, Republic, MO

Hope R. Dodd, National Park Service, Republic, MO

Michael DeBacker, National Park Service, Republic, MO

Over 250 springs occur at Ozark National Scenic Riverways (OZAR) including six that are among the largest springs in North America.

These springs are at risk of impairment due to contamination of groundwater and transport of contaminants through the soluble karst substrate. We have developed a protocol to monitor aquatic vegetation, aquatic invertebrates, fish, and their associated habitats in the large springs at OZAR. Our protocol employs a transect-based design borrowed from existing national protocols but with modifications appropriate for these unique and fragile systems. Data collected from 2004–2008 and historical data shows a diverse assemblages of aquatic vegetation (46 species) and aquatic invertebrates (66 genera from over 50 families). Fish species richness is low and has not exceeded 8 species among the springs sampled. Evenness, dominance and other diversity measures vary widely among the six springs.

### **GULN LiDAR Ground-truthing: A GIS Aided Sample Design to Collect Vegetation Composition Data for Assessing Correspondence**

Jeff Bracewell, GIS Specialist, National Park Service Inventory & Monitoring, Gulf Coast Network, Lafayette, LA

Principal Components Analysis was used by the GULN and USGS to classify vegetation structure using EAARL LiDAR data at JELA, Barataria Preserve. Using this LiDAR-based approach, vegetation structure will be monitored over time to indicate changes that may require management action. The GULN established a set of methods with LSU to Ground Truth (GT) the dataset, examining biological correspondence to discrete “patches” in the classified product. First, transects were used to traverse across class boundaries, taking a suite of vegetation-related measurements within classes. Phase 2 took a more detailed approach, employing a grid-based sample method using an 8-class product. Details of sample design using GIS, as well as sample products (field measures) from both phases will be presented to highlight the GT sampling portion of the vegetation structure monitoring protocol currently under development.

### **Centennial Challenge: Another Chance to Restore Mining Impacted Lands in Denali National Park and Preserve**

Phil Brease, Geologist, Denali National Park and Preserve, Denali Park, AK

Jeremy Karchut, Denali National Park and Preserve, Denali Park, AK

After nearly 100 years of mining activity, extensive aquatic, riparian, and upland impacts remain in placer mined stream valleys and upland mining sites in the Kantishna Hills of Denali National Park. Stream valleys exhibit channel banks devoid of vegetation, unstable or excessively confined channels, and increased sediment loading from long-term erosion. Some properties may be historically significant, and may qualify for listing on the National Register of Historic Places. Others have abandoned equipment, buildings, and debris to be removed, and may require removal or control of contaminated soils or tailings and/or acid mine drainage. Various properties have seen restoration completed, but some 175 acres remain unrestored. Funding has been allocated from the Centennial Challenge flexible base initiative for the years 2008, 2009 and 2010, to restore these areas in Denali. The contracting of engineering designs, haz-mat remediation, junk and debris removal, floodplain re-construction, revegetation, and resource monitoring (hydrologic and upland) is underway.

### **Keeping Up with T&E Species in National Parks**

Nancy Brian, Endangered Species Specialist–Botany, Biological Resource Management Division, National Park Service, Fort Collins, CO

Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, Fort Collins, CO

Fagan Johnson, Database Administrator, Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO

For the last decade, the National Park Service (NPS) has tracked the status, trend, and expenditure of 1,100 park populations of species listed under the Endangered Species Act (ESA). While helping the NPS to report to Congress on the percentage of populations making progress toward recovery, the NPS ESA Database holds information that goes beyond meeting the Congressional mandate. For example, it allows the NPS to determine whether it is spending funds on populations that are declining and need attention or those that are stable or increasing. NPS has worked closely with the Colorado Natural Heritage Program to design and implement the database. The Bureau of Land Management has recently modified the database for their use. A public version of the NPS ESA Database is available for citizens interested in knowing where endangered species occur in the national parks and how much is spent on them.

### **All Taxa Biodiversity Inventory at the Big Thicket: Documenting Diversity Before the “Storm”**

Linda Brindle, Executive Director, Big Thicket Association, Saratoga, TX

Dale Kruse, President, Big Thicket Association, and Texas A&M University, College Station, TX

The Thicket of Diversity Project in Big Thicket National Preserve is the first comprehensive biological inventory to be undertaken within the region. Big Thicket National Preserve is the ideal site for the inventory because it is comprised of almost 100,000 acres of land spread throughout seven counties which serve as a home to a diverse abundance of plants and animals. Big Thicket faces increasing threats from development, oil and gas extraction, and exotic species. The Thicket of Diversity ATBI needs to be completed to preserve the greatest number of species “for future generations,” as mandated by the National Park Service Organic Act of 1916. Big Thicket National Preserve has been known as a “Biological Crossroads” since the preserve was founded. It is the first unit in the National Park Service to be set aside with its primary purpose to protect the biodiversity.

### **NPS Vegetation Inventory and Use of Hybrid Approaches to Signature Development and Object Oriented Tools**

Karl Brown, Biologist, National Park Service, Fort Collins, CO

Beverly Friesen, Biologist / Physical Scientist, USGS Rocky Mountain Geographic Science Center, Lakewood, CO

The Vegetation Mapping Program is a cooperative effort by the National Park Service (NPS) and the U.S. Geological Survey (USGS) to classify describe and map vegetation in more than 270 national park units. The Program utilizes the National Vegetation Classification Standard, a system well integrated with the major scientific efforts in the taxonomic classification of vegetation. Hybrid efforts to link signature and taxonomy have shown to be operational and promising on larger landscape efforts. This poster will focus on hybrid examples and lessons learned using object oriented tools with NAIP and high resolution datasets of National Park Service lands. Maps are produced in Universal Transverse Mercator (UTM), NAD83 datum with a 1:24,000 scale and a minimum mapping unit of 0.5 hectares. Thirty-eight parks have completed vegetation mapping inventories. In 2008, 35 additional parks are scheduled. Mapping projects are ongoing at 167 parks. Standards and products can be viewed at: <http://biology.usgs.gov/npsveg/>.

#### **Urban BioBlitz: Finding Species Diversity in an Urban Environment**

Jessica Browning, SCEP Biologist, National Park Service, Gateway National Recreation Area, Jamaica Bay Institute (RLC), Brooklyn, NY

Kim Tripp, Jamaica Bay Institute Director/Research Coordinator, Gateway National Recreation Area, Brooklyn, NY

Located in Brooklyn and Queens, the Jamaica Bay Unit of Gateway National Recreation Area encompasses 12,000 acres; acres that abut New York City, one of the most heavily populated urban areas in the country. On September 7th and 8th, 2007, the first-ever Jamaica Bay BioBlitz, organized as a partnership between the Jamaica Bay Institute and Queens College (CUNY), succeeded in highlighting the natural resources of Jamaica Bay by bringing together community volunteers and scientific experts to create a snapshot of the biodiversity found in and around the bay. Throughout the event, teams departed from the base-camp at the Jamaica Bay Wildlife Refuge to explore the less studied areas of the park in order to identify as many organisms as possible and expand the already extensive list of species known to exist in the park. Educational activities such as ranger-led walks, interactive displays, creative workshops, and research laboratory stations allowed participants to get an up-close look at some of the 650 species that were documented during the event which provided an opportunity for the public to contribute to a scientific inventory while learning about the natural history of species found in the area.

#### **Study on a Population of Prairie Falcons at Pinnacles National Monument**

Shelley Buranek, Biologist, U.S. Fish and Wildlife, Sacramento, CA

In the years 2002 to 2004, Prairie falcons breeding in Pinnacles National Monument in California were studied used radio telemetry to determine home range, land use and ranging behavior. In addition to these data, the study uncovered some previously unreported Prairie falcon behaviors. These additional discoveries included year round residency in the Pinnacles National Monument area (all other reported populations of Prairie falcons are winter migrants) and a preference for using lands to the west of the Park boundaries despite similar habitat to the east (greater than 80% of prairie falcon telemetry location). The study relied on collaborations with the US Geologic Service, the California State University system, non-profits, county and state governments, and private landowners and occurred at the request of local counties seeking information on park species for development of county management plans.

#### **Abandoned Mine Closures that Preserve Cultural and Biological Values**

John Burghardt, Geologist, NPS Abandoned Mine Lands Program Coordinator, NPS Natural Resources Program Center, Geologic Resources Division, Denver, CO

Past mining has left an estimated 3,100 sites with 8,300 mined features in 126 units in the National Park System. These features raise management concerns for public safety and environmental degradation, as highlighted in a July 2008 DOI Inspector General audit report (<http://www.doi.gov/upload/2008-G-00241.pdf>). However, these sites are also assets for their historic / cultural values and for the critical wildlife habitat they often provide. The NPS Abandoned Mine Lands (AML) Program designs and installs closures on underground mines that not only protect the public and the environment, but which also preserve sites' historic integrity and provide habitat protection for resident species. For instance, "bat gates" allow significant bat colonies ingress and egress while preventing human entry, thereby not only protecting the public from hazards underground, but bats and other species are protected from human disturbance, and artifacts are protected from theft and vandalism. Various closure methods will be presented.

#### **Can Park Soundscapes be Adequately Understood in Simple Terms?**

Shan Burson, Ecologist: Soundscape, Yellowstone and Grand Teton National Parks, Moose, WY

The NPS has collected six thousand hours of recordings, and nearly 18 billion sound levels over five years and six thousand sampling days at Yellowstone and Grand Teton National Parks. Vast quantities of acoustic data are also being collected at other park units. Is it possible to reduce these data to readily understandable descriptions of park soundscapes? Examples from Yellowstone and Grand Teton illustrate that these data are extremely useful for creating a comprehensive record of current conditions and can help with "sound" management decisions. Digital recordings provide the means to identify and quantify the sources of common and uncommon sounds and can be tapped for information by biologists and planners alike. Acoustic metrics such as average, maximum and minimum sound levels, and even time above values, each impart a piece of the puzzle. But, can these be used to "understand" a park's soundscape? The answer is a resounding—"partially."

#### **In the Heart of a Dune**

David Bustos, Resource Manager, National Park Service, Holloman AFB, NM

Since White Sands National Monument (WHSA) was established, it has been known for the incredible beauty of its pure white gypsum dunes. However, in recent years it has been seen in a whole new way, attracting interest and collaboration from around the world. Exciting new discoveries have linked WHSA to distant planets, the Galapagos Islands, the fight against world hunger, giant megafauna, and prehistoric communities. As soon as gypsum dunes were found on the northern pole of Mars, exciting research began at WHSA. This research has provided important information for Mars and for the resource management of the monument. Numerous new species found at WHSA and our Mexican Sister Park Cuatrociénegas have had strong comparisons to the Galapagos Islands. In the last year numerous fossilized Mammoth track ways have been found throughout WHSA within ancient



lake beds that lie under the dunes. WHSA truly is an amazing place.

### **Exploring for Monitoring Priorities in Two of the World's Longest Caves**

Michael Bynum, Biological Science Technician, National Park Service Northern Great Plains I&M Program, Rapid City, SD

Rodney D. Horrocks, Physical Science Specialist, Wind Cave National Park, Hot Springs, SD

Michael E. Wiles, Cave Management Specialist, Jewel Cave National Monument, Custer, SD

Rene Ohms, Physical Science Technician, Jewel Cave National Monument, Custer, SD

Marc Ohms, Physical Science Technician, Jewel Cave National Monument, Custer, SD

Robert Gitzen, Post-doctoral Research Assistant, Department of Fisheries and Wildlife, University of Missouri, Columbia, MO

Joel Brumm, Data Manager, National Park Service Northern Great Plains I&M Program, Rapid City, SD

Jewel Cave National Monument and Wind Cave National Park, in the Black Hills of western South Dakota, protect the second and fourth longest caves in the world. As part of the NPS Inventory and Monitoring Program, the Northern Great Plains Network is developing objectives and protocols for monitoring critical resources in these two significant caves. To prioritize potential monitoring objectives, the NGPN I&M core staff worked closely with park cave management specialists to develop conceptual models for both caves. These models were used to identify cave stressors and evaluate which cave vital signs are most important to monitor on a long-term basis. These discussions and modeling efforts indicated that cave climate (e.g., airflow and temperature), water quality, and water quantity were the highest priorities for monitoring. These attributes have high value as indicators of overall cave condition, and they may readily demonstrate impacts from surface stressors.

### ***Batrachochytrium dendrobatidis* Occurrences in the Southeast Coast Network**

Michael Byrne, Terrestrial Ecologist, National Park Service, Southeast Coast Network, Saint Marys, GA

A chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), has been established as a causal factor in localized amphibian population declines and extinctions around the world. The Southeast Coast Network (SECN), in cooperation with the Savannah River Ecology Laboratory, began surveying for occurrences of Bd in a subset of our parks in 2006. Preliminary results indicated the fungus was present at these parks, which prompted further efforts across all SECN parks. These efforts were responsible for identifying occurrences in several other parks, including the first record of Bd in Alabama and the first record in a new species; results indicative of our current lack of knowledge of Bd distribution and species-specific susceptibility. This poster presents an overview of our current knowledge of Bd, a summary of the SECN's work thus far, and our upcoming plans.

### **Canoes on the Columbia, Travel and Life on the Rivers of the Northwest**

Robert Chenoweth, Curator, Nez Perce National Historical Park, Lapwai, ID

Nez Perce National Historical Park, on the Clearwater River in Idaho, preserves the largest collection of interior Northwest dugout canoes in the world along with its premier collection of Columbia Plateau material culture. Canoes were the primary means of travel, even after the introduction of the horse. Canoes linked families, bands and tribes together, allowed for trade, cultural exchange and the procurement of the rich resources necessary to sustain life. Canoes allowed the Nez Perce and other interior tribes to fish as far away as the great falls of the Willamette in the west to Kettle Falls on the Columbia in the North. NEPE's canoe collection provided the starting point for documentation (including measured drawings and photos) of over 40 dugout canoes preserved in museums and visitor centers all over the Pacific Northwest. Several of these are in the Willamette drainage and illustrate the connection between Plateau and Coastal life. This work has led to a new appreciation of the cultural significance of canoe making and use in the Northwest and has added to the rich heritage of canoe use in North America which stretches back more than 10,000 year.

### **The Grinnell Resurvey Project**

Leslie Chow, Data Manager, NPS Inventory and Monitoring Program/Sierra Nevada Network, Three Rivers, CA

James L. Patton, Emeritus, Museum of Vertebrate Zoology, University of California–Berkeley, Berkeley, CA

Emily Rubidge, Ecosystem Science Division, School of Environmental Science, Policy, and Management, University of California–Berkeley, Berkeley, CA

From 1914 through 1920, Joseph Grinnell and staff from the Museum of Vertebrate Zoology surveyed vertebrate fauna along a transect that included a 17 mile wide swath of Yosemite National Park. Their report, *Animal Life in the Yosemite*, published in 1924, remains the seminal account of Yosemite's vertebrate fauna. The original Grinnell Survey collected more than 4,000 specimens, produced nearly 3,000 pages of hand-written field notes, and took 700 photographs. These data represent a remarkable trove of information that serve as a baseline for assessing change in Yosemite's ecosystems. Beginning in 2003, staff from the Museum of Vertebrate Zoology and the US Geological Survey, with funding from the NPS Inventory and Monitoring Program, revisited sites sampled by the original Grinnell survey to determine if and what changes in the distribution of vertebrate fauna have occurred in the intervening 83 years. Our results are reported here.

### **Nearshore Monitoring in the Southwest Alaska Network (SWAN) of National Parks**

Heather Coletti, Marine Ecologist, National Park Service, Southwest Alaska Network I&M Program, Anchorage, AK

James L. Bodkin, Research Wildlife Biologist, US Geological Survey, Anchorage, AK

Thomas A. Dean, Marine Ecologist, Coastal Resources Associates, Oceanside, CA

The goal of the SWAN Nearshore Vital Signs Monitoring Program is to understand how nearshore resources within the parks will change over time and the potential causes for change. There are six designated nearshore vital signs within the program: Kelp and Seagrass, Marine Intertidal Invertebrates, Marine Birds, Black Oystercatcher (*Haematopus bachmani*), Sea Otter (*Enhydra lutris*), and Marine Water Chemistry. The program is designed to monitor at a variety of temporal (hourly to multiannual) and spatial (1/4 sq m quadrat to Park-wide) scales. The sampling design incorporates well known processes and ecological interactions within the nearshore, from primary production (kelps and seagrasses) to primary consumers (many invertebrates) to apex predators (sea otters, black oystercatchers and other marine birds) at spatially balanced, randomly selected sites within SWAN. The variety of temporal and spatial scales as well as the processes and species interactions inherent to the design will help to evaluate causes of change that are anticipated.



### **Impacts of Climate Change and Air Pollution on Plant Communities in the Eastern Sierra Nevada**

Amy Concilio, Ph.D. student, University of California–Santa Cruz, Santa Cruz, CA

Michael Loik, Associate Professor, Department of Environmental Studies, University of California–Santa Cruz, Santa Cruz, CA

Climate change and air pollution are likely to increasingly affect Sierra Nevada ecosystems. With changing conditions, invasive species may gain an advantage over natives. Of particular concern in the eastern Sierra is the spread of the exotic grass, *Bromus tectorum*, which has invaded much of the Great Basin Desert. Through a series of manipulation experiments, we are testing hypotheses about how changing patterns of snowfall and atmospheric nitrogen (N) deposition might affect the susceptibility of the sagebrush steppe ecosystem to *B. tectorum* invasion. In the first season, manipulations caused no change in plant species composition, but *B. tectorum* fecundity did increase with increased N and altered snowpack. Results will be used to inform land managers in and around the UC Valentine Eastern Sierra Natural Reserve about global change conditions that are most likely to result in displacement of native plants by *B. tectorum* so that control efforts can be focused.

### **Changes in Landbird Distribution and Abundance at Channel Islands NP**

Tim Coonan, Biologist, Channel Islands National Park, Ventura, CA

Linda Dye, Ecologist, Channel Islands National Park, Ventura, CA

To discern population trends among breeding landbirds at Channel Islands NP, we analyzed a long-term (15-year) dataset comprising both line transect and point count data, both of which included estimated distance to birds detected, at three levels: annual presence/absence of species, frequency on point-count transects, and density estimation via distance methods. Overall, trends were apparent for the 32 most abundant of the park's 44 breeding species, but the methods failed to detect trend for rare species. Although the density estimates were characterized by high inter-annual variability and high confidence intervals, regression of density over time provided trend results for a number of species. Changes in the distribution and abundance of some species over the 15-year period were related to management actions or ecological changes such as the cessation of cattle grazing on Santa Rosa Island, the decline of island foxes (*Urocyon littoralis*), and increases in peregrine falcon (*Falco peregrinus*) populations.

### **Recent Debris Flows at Mount Rainier National Park**

Beth Copeland, Department of Geosciences, Oregon State University, Corvallis, OR

Paul Kennard, Regional Geomorphologist, Mount Rainier National Park, WA

The first week of November of 2006 an intense rainstorm inundated the Pacific Northwest and triggered debris flows on many large volcanoes in the Cascade Range. At Mount Rainier National Park 45.7 cm of rain fell in 36 hours, triggering debris flows near 6 of 28 named-glaciers. Debris flows rapidly deposit material in stream channels, reducing the capacity to transport high flows. Storm damage from both flooding and debris flows led to an unprecedented six-month closure of the Park. Prior to 2001, debris flows were recorded in 4 drainages, but 3 additional drainages were first impacted 2001, 2005, and 2006, respectively. The activation of new initiation sites may relate to glacier retreat and climate warming, as melting glaciers expose volumes of steep-sided unconsolidated materials. The use of Northwest glaciated volcanoes for recreation, second homes, and transportation corridors necessitates the study of changing debris flows characteristics.

### **Road Corridor Surveys Alone May Not Reliably Detect Extent of Exotic Annual Plant Distributions**

Donovan J. Craig, Public Lands Institute, University of Nevada–Las Vegas, Las Vegas, NV

Jill E. Craig, Public Lands Institute, University of Nevada–Las Vegas, Las Vegas, NV

Scott Abella, Assistant Research Professor, University of Nevada–Las Vegas, Las Vegas, NV

A common land management goal is to minimize effects of exotic plants through surveys and control. In the Mojave Desert, roadside surveys have been a primary method of detection. We evaluated whether exotic species populations decline as distance from roadways increases. Twelve sites at Lake Mead National Recreation Area and adjacent public land were sampled for exotic and native plant composition and cover. Sampling of microsites (under shrubs and interspaces) was conducted at five distances out to 45 meters from roadways. Six common exotic species were detected throughout sampling. *Schismus* spp. were the most frequently encountered exotic annual followed by *Erodium cicutarium* and *Brassica tournefortii*. Overall exotic species cover diminished slightly as distance from roads increased; however, differences among distances were not significant. Microsite differences had the strongest effect ( $p < 0.05$ ). Disturbance and microsite conditions may be more likely to explain exotic species distributions than roads alone.

### **Remote Sensing Image Catalog (RSIC): Status of Digital Ortho Quarter-quads (DOQQ)**

Thom Curdts, Senior Remote Sensing /GIS Technician, Colorado State University, Lakewood, CO

As part of the NPS I&M Program, we have been busy obtaining and cataloging DOQQ images from NAIP and other programs. These images represent image acquisition dates from 2003 through 2007. The DOQQ status shapefile is intended as an image discovery tool and will be updated periodically as new imagery is obtained. The shapefile can be downloaded from the NPS Data Store. The version on this poster represents images held by the I&M Program in Denver as of February 2009. Initial distribution of the actual imagery will be of large, multi-state data sets via Regions or Networks who will further distribute subsets of the imagery to Parks as needed. Please keep in mind that these are uncompressed, individual DOQQ images, not compressed mosaics. Derived products are being generated by the I&M program office in Fort Collins and distributed through the Data Store as well.

### **Factors Affecting Community Based Conservation Programs**

Smriti Dahal, Student/Graduate Assistant, Texas A&M University, College Station, TX

Sanjay K. Nepal, Professor Texas A&M University, Department of Recreation, Parks and Tourism, College Station, TX

Community based conservation (CBC) started in the 1970s as a solution to protect the degrading natural resources around the world. Today CBC has become one of the most popular forms of resource management practices followed by communities in the developing countries. There have been examples of case studies where this approach has been successful in many countries. But on the other hand there are also cases where CBC has not been able to achieve its dual goal: to improve the livelihood of the local people as well as conserve biodiversity. This paper is a review of some of these case studies. By looking at both successful and unsuccessful

forms of CBC internationally, it is easier to understand some of the barriers that prevent CBC from achieving its goal. The paper puts forward key recommendations that are needed to make the CBC a successful initiative in communities.

#### **Response of Mule Deer to Water Availability in the Mojave Desert: Preliminary Results**

Neal Darby, Wildlife Biologist, Mojave National Preserve, Barstow, CA

Jason Dungan, Wildlife Biology Technician, Mojave National Preserve, Barstow, CA

Kelley Stewart, Professor, University of Nevada-Reno, Reno, NV

Vern Bleich, Senior Wildlife Biologist/Consultant, Dickinson, ND

James Sedinger, Professor, University of Nevada-Reno, Reno, NV

Debra Hughson, Science Advisor, Mojave National Preserve, Barstow, CA

Water for wildlife programs are popular with desert resource managers. They provide a critical habitat component clearly lacking and are believed to provide direct benefits to wildlife. However, these developments require considerable manpower and expense to maintain in the harsh desert environment. So how many developments are enough? Mojave National Preserve, University of Nevada-Reno, California Department of Fish and Game, Nevada Division of Wildlife, Safari Club International, and other wildlife conservation groups have initiated a long-term study focusing on mule deer (*Odocoileus hemionus*) to shed light on this question. At least 20 mule deer will be fitted with Global Positioning Systems telemetry collars each year for ten years to gather detailed movement patterns. Natural and artificial water sources have been documented and are monitored to determine water availability. Remote cameras have been set up at a subset of water sources. The first year of research is presented.

#### **Cumulative impacts of suppression decisions**

Brett Davis, GIS Specialist, Aldo Leopold Wilderness Research Institute, Missoula, MT

Carol Miller, Research Ecologist, Aldo Leopold Wilderness Research Institute, Missoula, MT

Decades of fire suppression in Yosemite and Sequoia-Kings Canyon National Parks have altered natural fire regimes and ecological conditions. Despite having Wildland Fire Use as a restoration tool, managers still suppress most natural ignitions. Unlike other management decisions, the long term cumulative impacts of suppression decisions are seldom evaluated. We evaluated the cumulative effects of fire suppression decisions in these two parks by simulating the spread and effects of lightning ignitions that were suppressed between 1994–2004 using the environmental conditions that occurred at the time of ignition and used these results to measure a variety of suppression impacts. Results suggest that the suppression decisions during these 11 years have dramatically changed landscape conditions. Results are helping managers prioritize fuels management activities and weigh both the costs and benefits of management strategies chosen on future incidents.

#### **An Analysis of Ecological Services Provided by Prince William Forest Park, Virginia**

Allen Dawson, Graduate Student, University of Maryland at College Park, College Park, MD

Giselle Mora-Bourgeois, Science Education Coordinator, Urban Ecology Research Learning Alliance, Center for Urban Ecology, Washington, DC

Joe H. Sullivan, Associate Professor and Coordinator, Urban Forestry, Department of Plant Science and Landscape Architecture, University of Maryland, College Park, MD

The Urban Forest Effects Model (UFORE) developed by the USDA Forest Service quantifies the ecological benefits of urban forests. UFORE has been used to analyze many urban areas, including NPS parkland in Washington, D.C., but has not been applied to natural forests. We conducted a UFORE analysis of Prince William Forest Park during 2007 for species composition and individual tree characteristics statistics including tree height, DBH, canopy architecture and general tree health. The results show that the over 6,287,000 trees growing within the park store 394,000 tons of carbon with an annual net sequestration rate of 12,300 tons. This forest also provides an annual air pollution abatement of 414 tons of key air pollutant removal. These results quantify and affirm to policy makers and the public the value and ecological importance of the forests managed by the NPS surrounding metropolitan Washington, D.C.

#### **The Kolob Fire: Two Years Later**

Cheryl Decker, Vegetation Program Manager, Zion National Park, Springdale, UT

Kelly Fuhrmann, Resource Management Chief, Bryce Canyon National Park, Bryce Canyon, UT

Karen Weber, Northern Arizona University, Flagstaff, AZ

The Kolob Fire was the largest wildland fire in the history of Zion National Park. It had the potential to type convert 10,000 acres of predominantly piñon-juniper woodland to a predominantly cheatgrass system. In an effort to break the cheatgrass fire cycle and to aid in the restoration of native species, a precedent setting aerial application of Imazipic was applied over 8,839 acres of the burn. This poster will present lessons learned from the project and results to-date from a three year study conducted by Northern Arizona University and funded through the Burned Area Rehabilitation program.

#### **Mapping and Assessing Wetlands in Small Parks in the Pacific West Region**

Marie Denn, Aquatic Ecologist, Pacific West Region, Point Reyes, CA

In 2006 The NPS Water Resources Division provided funds to assist selected small parks in the Pacific West Region obtain wetland information. The project's regional wetland biologist visited ten small parks, field mapped and classified park wetlands, and assessed the ecological health, or "condition" of these wetlands with a judgment-based rapid assessment methodology. This poster presents maps from the project, evaluation of the condition of wetlands in these selected small parks, and methodologies for mapping, classifying and assessing park wetlands.

#### **Combining Biophysical and Cultural Knowledge to Guide Extensive Aquatic Assessments of the Malheur, Burnt, and Powder Rivers**

Catherine Dickson, Principal Investigator, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR

Scott O'Daniel, Research Geographer, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR

Wenix Red Elk, Outreach Coordinator, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR  
Gene Shippentower, Research, Monitoring, and Evaluation Manager, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR

Hells Canyon Dam blocks anadromous fish from returning to the Powder, Burnt, and Malheur rivers. The Confederated Tribes of the Umatilla Indian Reservation supports restoring salmon beyond that point so that tribal members can fish in their usual and accustomed areas. Previous considerations of salmon restoration have focused on salmon alone, ignoring the critical link between salmon and people. We present an approach to the development of a physical, biological and cultural understanding of the aquatic habitats in these basins. We anticipate analyzing bio-physical processes at traditional fishing sites to characterize habitats. We combine information about the historical abundance, distribution, and health of salmon populations with characterizations of the current environment. We use traditional cultural knowledge, salmon population dynamics, and current aquatic habitat data to develop a model of where salmonids should thrive. Our focus is to augment ongoing and new biological research with relevant physical and cultural data, and through this approach increase the capacity of the Tribes to conduct more informed restoration activities throughout our ceded lands.

#### **Appalachian Trail MEGA-Transect**

Fred Dieffenbach, Environmental Monitoring Coordinator, Northeast Temperate Network/Appalachian National Scenic Trail, Woodstock, VT

Roger Moore, Interim Program Manager, Appalachian Trail MEGA-Transect/Appalachian Trail, Harpers Ferry, WV

Laura Belleville, Director of Conservation, Appalachian Trail Conservancy, Blacksburg, VA

The Appalachian Trail is a unique and fragile resource, where many of the higher elevation communities of the eastern United States are subject to pressure from surrounding population growth and associated impacts. The Appalachian Trail MEGA-Transect initiative seeks to unite partners for monitoring, understanding, and communicating the ecological health of the Appalachian Region. Monitoring a resource that measures nearly 2,180 miles and encompasses more than 200,000 acres is an ambitious goal that will be accomplished in many small steps and with the support of many partners. The MEGA-Transect coordinates a diverse range of scientific activities, designed and facilitated by institutions and individuals interested in learning about the environment of the Appalachian Trail. Federal agencies, local action organizations, research universities, schools and youth groups, and even individual projects can all contribute valuable information about the Appalachian Trail environment.

#### **Explicitly Incorporating Adaptive Management in Exotic Plant Management at Lake Mead NRA**

Sandee Dingman, Natural Resource Specialist, Lake Mead National Recreation Area, Boulder City, NV

Alice C. Newton, Vegetation Program Manager, Lake Mead National Recreation Area, Boulder City, NV

Carrie Norman, Exotic Plant Manager, Lake Mead National Recreation Area, Boulder City, NV

Lake Mead National Recreation Area has been actively engaged in exotic plant management for many years and has learned a great deal about what works and doesn't work. However, the Park's resource managers have come to realize that lessons of the past may be of limited value to the future. Given the inherently dynamic nature of desert plants, lowering lake levels, as well as the realized and anticipated impacts of climate change a new model is needed to speed up the learning process in a quickly changing landscape. To address this need, Lake Mead NRA is attempting to incorporate adaptive management into the Exotic Plant Management Plan currently under development. A series of decision flow charts have been developed to conceptualize how the outcomes of management actions will be analyzed and the lessons learned incorporated into future decisions in an iterative learning process.

#### **Fish Community Monitoring at Buffalo National River and Ozark National Scenic Riverways**

Hope Dodd, Fisheries Biologist, National Park Service, Heartland Inventory and Monitoring Network, Republic, MO

David Bowles, Aquatic Program Leader, National Park Service, Heartland Inventory and Monitoring Network, Republic, MO

Janice Hinsey, Aquatic Ecologist, National Park Service, Heartland Inventory and Monitoring Network, Republic, MO

Catherine Ciak, formerly Aquatic Ecologist, National Park Service, Heartland Inventory and Monitoring Network, Republic, MO

Buffalo National River (BUFF) and Ozark National Scenic Riverways (OZAR) were established to preserve the integrity of the Buffalo and Current Rivers through river corridor protection. However, the boundaries of these parks encompass only 11% and 5% of their watersheds, leaving much of the watersheds unprotected. Long-term annual fish monitoring began at OZAR in 2005 and at BUFF in 2006 along with collection of in-stream habitat data. In general, annual variability in species richness and abundance was low at each sample site, with the exception of sites where sampling gear or effort changed. In-stream habitat also varied little between years. This initial data demonstrates the importance of sampling effort and gear consistency in long-term monitoring programs. Furthermore, collection of physical habitat data can be valuable in eliminating habitat as a factor for variation in fish communities or can be used to explain true temporal changes in the biota.

#### **Perceptions of Marine Debris: Preliminary Findings from the Rachel Carson National Estuarine Research Reserve**

Chris Ellis, Social Scientist, NOAA Coastal Services Center, Charleston, SC

Marine debris presents a number of threats to marine life, ecosystem diversity, human health, and coastal economic vitality. Despite numerous associated risks, and the documented need to reduce marine debris on a global scale, there is a scarcity of research into the specific contributions to shoreline littering by specific user groups. Data presented will assess public knowledge and perceptions of the recreational sources of marine debris and impacts to coastal resources. Additionally, the study aims to understand local contributors to marine debris and to engage the public in developing and implementing mitigative approaches. This is part of a larger, NOAA-supported study of North Carolina's Core Sound region that will also assess commercial fishermen perceptions of marine debris, with a particular focus on derelict fishing gear. The Core Sound is home to an array of public trust lands, including Cape Lookout National Seashore and the Rachel Carson National Estuarine Research Reserve.

#### **Catching Thermals and Sharing Cliffs: Balancing Climbing Activities and Raptor Nesting at Pinnacles National Monument**

Gavin Emmons, Raptor Biologist, Pinnacles National Monument, Paicines, CA

Paul Johnson, Wildlife Biologist, Pinnacles National Monument, Paicines, CA



A successful balance has been achieved between recreation and resource protection at Pinnacles National Monument (PINN). Climbers and nesting raptors select the park's namesake rocks for very different reasons, which historically set the stage for conflicts. A potential lawsuit over climbing access was averted by implementing a raptor monitoring program in 1986 using current nesting season data to identify which cliffs to close while keeping the majority of climbing routes open. These voluntary closures were met with overwhelming support and compliance. Management action tied to monitoring helped park staff gain credibility with the climbing community and meet resource and recreational goals. Understanding this important link, the National Park Service (NPS) Inventory and Monitoring Program has provided support for this project since 2001. Twenty-two years of data will be presented that examine a long term data set analyzed and interpreted for population trends, changes in species composition and climbing access management.

#### **Glacier Recession as an Indicator of Mountain Protected Area Responses to Climate Change**

Daniel Fagre, Research Ecologist, U.S. Geological Survey, Northern Rocky Mountain Science Center, West Glacier, MT

Craig D. Allen, USGS Jemez Mountains Field Station, Bandelier National Monument, Los Alamos, NM

Jill S. Baron, USGS, NREL, Colorado State University, Fort Collins, CO

Andrew G. Fountain, Department of Geology, Portland State University, Portland, OR

Jeffrey A. Hicke, Department of Geography, University of Idaho, Moscow, ID

Don McKenzie, Pacific Wildland Fire Sciences Laboratory, US Forest Service, Seattle WA

Dennis S. Ojima, H. John Heinz Center for Science, Economics and the Environment, Washington, DC

David L. Peterson, US Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Seattle, WA

Nathan L. Stephenson, USGS Western Ecological Research Center, Three Rivers, CA

Christina Tague, Donald Bren School of Environmental Science and Management, University of California-Santa Barbara, Santa Barbara, CA

Mountain glaciers continue to retreat rapidly in western North America. At Glacier National Park, Montana, 150 glaciers were estimated to have existed at the end of the nineteenth century. Today there are only 25 glaciers left that are larger than 0.1 square kilometer (25 acres). The Western Mountain Initiative, a USGS-sponsored mountain ecosystem research network, has documented similar reductions in glacier ice in mountain protected areas throughout the American West. The reduction rates are 42% in Wyoming, 40% in Colorado, 56% in the Sierra Nevada of California, 30% for Oregon and 24–46% for various national parks and mountain ranges in Washington. Hydrological consequences are already evident as some mountain streams have become intermittent because late summer baseflows are no longer maintained by glacial meltwater. These changes have significant implications for the integrity of mountain ecosystems designated as protected areas.

#### **Eradication of Non-native Animals from Channel Islands National Park, California**

Kate Roney Faulkner, Chief, Natural Resources Management, Channel Islands National Park, Ventura, CA

Nonnative animals have been very destructive to the ecosystems of the five islands of Channel Islands National Park. Since the mid-1970s, the park and partners have undertaken eight successful projects to eliminate non-native animals from islands. Most recently, feral pigs and sheep were eliminated from 25,000 hectare Santa Cruz Island. Ecological monitoring documented the pervasive impact of the non-native animals and is now documenting widespread ecological recovery on the islands. Several non-native animals continue to be a focus of park management, particularly deer and elk on Santa Rosa Island, rats on San Miguel Island, and Argentine ants on Santa Cruz Island. Islands are highly vulnerable to the impacts of non-native species. It is possible to initiate ecosystem restoration through the removal of non-natives. However, substantial intervention still must occur in order to restore naturally functioning ecosystems and increase populations of very rare species.

#### **The Cooperative Ecosystem Studies Units Network: Maintaining Strong Partnerships for Public Resource Conservation**

Thomas Fish, National Coordinator, Cooperative Ecosystem Studies Units Network, Washington, DC

The Cooperative Ecosystem Studies Units (CESU) Network consists of seventeen CESUs representing biogeographic regions across the U.S. states and territories—from American Samoa to Maine and Alaska to the U.S. Virgin Islands. The network includes thirteen federal scientific and resource management agencies and over 240 universities, tribal and state agencies, and other nonfederal partners. Each CESU focuses on its unique regional research and management priorities to facilitate coordination between agency field managers and partner institution scientists, toward the development of collaborative applied projects. Each year, the CESU Network supports hundreds of diverse projects that address management and technical assistance needs, research and knowledge development, and education and capacity building in support of stewardship for public trust natural and cultural heritage resources. This presentation provides an overview of the CESU Network, its history, and future directions, including increasing emphasis on multi-institutional and landscape scale projects that transcend political and ecosystem boundaries.

#### **GIS Model to Predict Rare Plant Habitat at Big South Fork NRR**

Patrick Flaherty, Science Information Specialist, National Park Service, Asheville, NC

The recent I&M vegetation maps were produced for Big South Fork NRR. By using the Vegetation Map in GIS a model incorporating stream heads from a Digital Elevation Model produced a very accurate model for finding wet forest habitats. This habitat type may harbor an rare orchid species and proves to be newly described habitat type hosting a unique variety of species. This poster will illustrate the use of I&M data in association with other data in modeling and confirming special habitats, then incorporating new information into natural resource planning.

#### **Final Results: Western Airborne Contaminants Assessment Project (WACAP)**

Colleen Flanagan, Ecologist, National Park Service Air Resources Division, Denver, CO

Tamara Blett, National Park Service Air Resources Division, Denver, CO

In 2008, the NPS Air Resources Division released results from the six-year, multi-agency Western Airborne Contaminants Assessment Project (WACAP). The findings indicated that airborne contaminants were detected at measurable levels in twenty western US and Alaskan national park ecosystems in various environmental indicators. While concentrations of most of the airborne contaminants



detected were below levels of concern, others (e.g., mercury and DDT) appear to be accumulating in sensitive resources such as fish. In fact, some fish tested were found to have concentrations that exceeded fish-eating wildlife and/or human health consumption thresholds in all of the eight core parks studied. The evidence suggests that such toxic contaminants are carried in air masses from sources as far away as Asia, and as close as the local county. Results from this project add considerably to the state of the science concerning contaminant transport and subsequent biological and ecological effects in remote western US and Alaskan ecosystems.

#### **A Road Map for NatureBib and the Data Store**

Brent Frakes, Business Analyst, Office of Inventory, Monitoring and Evaluation, NPS, Fort Collins, CO

The I&M program is currently in the process of re-engineering two key natural resource information systems—NatureBib and the NPS Data Store. The former is concerned with the management of natural resource publications and their related citations while the latter is charged with storing data and the supporting metadata. This poster presents the long-term vision of how these systems will function and they fit into a larger information management framework envisioned by the I&M program.

#### **Interagency Management of Fossil Resources**

Ted Fremd, Paleontologist and Regional Science Advisor, National Park Service, Kimberly, OR

John Day Fossil Beds National Monument (NPS) initiated a program of cooperative management of fossil resources in 1987 that has grown to include all four BLM districts of eastern Oregon, and certain localities within Region 6 of the USFS. Scientific investigators representing museums, academic institutions, and federal agencies have been working in collaboration to meet common resource management goals of research and educational outreach. The many research projects that cover this 10,000 square-mile area have resulted in documentation of a complete composite stratigraphic section in eastern Oregon that preserves detailed records of 45 million years of global climate change. This “blurring of the boundaries” of scientific disciplines and stewarding agencies has allowed workers to understand the lateral and temporal variability of paleontological deposits. The maintenance of such useful data results in an environment in which researchers prefer to work in collaboration with the agencies, rather than as freelance permitted investigators.

#### **Hazard Tree Management in the Pacific West Region: An Updated Directive**

Erv Gasser, Natural Resource Specialist, National Park Service, Seattle, WA

The Pacific West Region has the only regional directive pertaining to hazard tree management. The objectives of the directive are to: minimize the threats to life and property from the failure of hazard trees within developed areas; and, to provide parks with a framework consistent with the NPS mission of conserving parks’ natural and cultural resources. Aspects covered in the directive include: rating systems, monitoring, documentation, disposition, compliance, and safety among others. This directive provides guidance and consistency to parks that deal with the issue of tree hazards on a regular basis.

#### **Interdisciplinary Process of a BAER Team on the 2007 Southern California Fires**

Erv Gasser, Natural Resource Specialist, National Park Service, Seattle, WA

During October–November, 2007, the Department of the Interior National Interagency Burned Area Emergency Response (BAER) Teams responded to the Harris, Witch, and Poomacha fires in Southern California. DOI lands affected by those fires included administered by the Southern California Agency, Pacific Regional Office Bureau of Indian Affairs (BIA), the California Desert District, Bureau of Land Management (BLM), and the San Diego National Wildlife Refuge, US Fish and Wildlife Service (FWS). The teams also worked in coordination with the US Forest Service, State, County, and private landowners. The BAER Team conducted an analysis of fire effects using aerial and ground reconnaissance methods throughout the fire areas. The Interdisciplinary team assessed and mapped the overall fire impacts on watershed conditions, archeological sites, vegetation resources, and Federally Threatened and Endangered species. Findings from the various disciplines were then written into an emergency stabilization plan. The team then initiated implementation of the plan.

#### **IPM in the NPS Involves Many Disciplines Working Together to Protect Resources from Pests**

Erv Gasser, Natural Resource Specialist, National Park Service, Seattle, WA

The National Park Service (NPS) implements integrated pest management (IPM) programs to reduce risks to people, resources, and the environment from pests and pest management related management strategies. In 1979 under Executive Order all federal agencies were directed by President Carter to implement IPM practices when managing pests on federal lands. Current Department of Interior policy states that all bureaus will implement an IPM approach when managing pests. The NPS has a dual mission: to preserve and protect natural and cultural resources and to provide for the enjoyment of the same for future generations. NPS provides for extensive front and back country services, luxury lodging, restaurants, camp grounds, agricultural leases, and recreational opportunities. Pest management occurs in natural areas, developed zones, ornamental plantings, turf, concessions operations, museums, historic landscapes, recreational areas, and public health concerns under IPM policy. It takes many disciplines in coordination to protect these resources from pests.

#### **Bat Communities at Abandoned Railroad Tunnels in the Chesapeake and Ohio Canal National Historical Park**

Edward Gates, Associate Professor, University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD  
Joshua Johnson, Graduate Student, University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD  
Aimee Haskew, Graduate Student, University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD  
Jennifer Saville, Graduate Student, University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD  
Scott Bell, Natural Resource Program Manager, Chesapeake and Ohio Canal National Historical Park, Hagerstown, MD

A proposed extension of the Western Maryland Rail Trail includes use of abandoned railway tunnels in the Chesapeake and Ohio Canal National Historical Park (CHOH). Because some bat species could be at risk from construction and operation of the Rail Trail, researchers proposed spring and fall surveys to document the occurrence of bats and their relative abundances. From information gained during the surveys, it is now known that the tunnels are hibernacula for several bat species including what is believed to be

the largest remaining colonies of the state listed Eastern small footed bats. This project highlights the difficulties in balancing historical, recreational, and natural resources at our national parks. Potential railway tunnel modifications, e.g., paving, water drainage, structural reinforcement, lighting, etc., and trail use, e.g., timing of access, noise, etc., would alter existing structural and microclimatic parameters and impact: 1) endangered bat species, 2) historic architecture, and 3) trail users.

### **Challenge Cost Share Funds Provide Partners, Prosperity, and Punch to the National Natural Landmarks Program**

Steve Gibbons, Natural Resource Specialist, National Park Service, Sedro Woolley, WA

The Challenge Cost Share Program (CCSP) was established in 1992 to support increased participation by neighboring communities and qualified partners in the preservation and improvement of National Park Service natural, cultural, and recreational resources. Not only is the program geared toward the potential benefit of park resources but just as importantly, the Challenge Cost Share Program includes all other authorized National Park Service *programs* and activities, both inside or *outside* park lands. As such, the Challenge Cost Share Program has provided a natural bridge or entrée for supporting public/private (e. g. non-Federal) stewardship activities within National Natural Landmarks (NNLs) throughout the United States and even its U.S. Territories. This uncanny marriage between a fund source and a nationally recognized program has resulted in a renewed sense of identity and a source of inspiration for National Natural Landmark owners and managers but especially for the American public.

### **Variability Produces Powerlessness in the Northern Great Plains**

Robert Gitzen, Post-doctoral Research Assistant, Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO

Amy Symstad, Research Ecologist, USGS Northern Prairie Wildlife Research Center, Wind Cave National Park, Hot Springs, SD

Cody Wienk, Fire Ecologist, NPS Midwest Regional Office, Omaha, NE

Joshua Millsbaugh, Associate Professor, Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO

A strong sampling design is based in part on realistic estimates of spatial, temporal, and measurement variability. To estimate the relative magnitude of these sources of variability in National Park Service units of the northern Great Plains, we fit mixed-effects models to vegetation data previously collected in these parks. We compared the power of alternative sampling designs to detect trends in four vegetation parameters. Park-wide year-to-year variation was so high that power to detect moderate trends would be low for the first decade of monitoring regardless of design. This yearly variation affects all sample sites, and adding more sample sites does not reduce its overriding effects on power to detect trend. Despite the insensitivity of this power to sample size, many sites will need to be sampled if trends vary substantially among sites or if precise estimates of status for specific subpopulations of interest are required.

### **An Approach To Good Communication between Ecologists and Data Managers When Building Monitoring Databases**

Whitney Granger, Science Information Specialist, NPS Inventory and Monitoring Gulf Coast Network, Lafayette, LA

Database management plays a vital role in ensuring long term success of any monitoring protocol by maintaining significance and integrity of the data. It is essential that the data manager understand the sampling methods, design, and data to be collected early on in the database development process. A core issue during database development is that data managers and ecologists may see different things; ecologists see paper field sheets with data in many data fields, while data managers must envision multiple tables and relationships. There must be an efficient and clear method to outline what data the ecologist wants to collect so the data manager can create a database that will normalize the data and create a logical work flow. This poster outlines the collaborative process and tools used to stream-line communication between the data manager and ecologist during development of an amphibian and reptile monitoring database.

### **Addressing Non-native Plant Invasion in National Park Service Units of California**

Christen Grant, Undergraduate Research Scholar, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Sibdas Ghosh, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Mietek Kolipinski, National Park Service, Pacific West Regional Office, Oakland, CA

Invasive non-native plants have been replacing species in a number of native plant communities, including some locations in California National Park Service Units. Seeds introduced to wildlands often spread by wind (aerial transport), water, and native as well as non-native animal vectors. Also, human activities result in accidental and sometimes purposeful plant introductions. These activities include road and trail construction, vehicles, equipment moving, movement of soil containing seeds, maintenance activities, logging, and hiking. We developed an educational resources kit addressing one category of activities: horse and equestrian use. This kit will guide park users, equestrians in particular, to use Best Management Practices. Specifically, this educational kit focuses on ways in which horse users can decrease spread of viable weed seeds and propagules. The kit provides information for equestrian day users, campers with horses, and park employees who use horses as a part of job duties.

### **Monitoring Landscape Dynamics of U.S. National Parks**

John Gross, Ecologist, I&M, National Park Service, Fort Collins, CO

Leona Svancara, Research Associate, Landscape Dynamics Lab, University of Idaho, Moscow, ID

Peter Budde, Natural Resources GIS Program Manager, National Park Service, Fort Collins, CO

Jason Bennett, Assistant Data Manager, I&M, National Park Service, Fort Collins, CO

Brent Frakes, Business Analyst, I&M, National Park Service, Fort Collins, CO

Shepard McAninch, Ecologist, CUPN I&M, National Park Service, Blacksburg, SC

Lisa Nelson, Ecologist, I&M, National Park Service, Fort Collins, CO

Tom Philippi, Ecologist, I&M, National Park Service, Fort Collins, CO

Mike Story, Remote Sensing Specialist, I&M, National Park Service, Denver, CO

Bill Thorp, Programmer, I&M, National Park Service, Fort Collins, CO

Changes in habitat quality, habitat fragmentation, and disturbance regimes are profoundly affecting species and ecosystems across the NPS system. We are evaluating a suite of landscape-scale measures for I&M parks that provide a consistent and comparable, base-

line evaluation of broad-scale factors that can strongly influence the condition of park resources. These measures, including metrics of the “human footprint,” areas of natural and modified land cover, and fragmentation and connectivity of habitat patches, provide information that is useful at the park, regional, and national level. We are deriving measurements from regional to national scale datasets that contain observations for many parks. By standardizing data acquisition, processing, analysis, and reporting, this project can efficiently and cost-effectively provide reports and the underlying data, algorithms, and standard procedures to facilitate protocol development and supplemental analyses that may be desired by parks or Networks.

#### **Overview of the NPS Vegetation Inventory Program, National Park Service Inventory and Monitoring Program**

Tammy Hamer, Vegetation Inventory Program Assistant, NPS, Natural Resource Program Center, Fort Collins, CO

Karl Brown, Vegetation Inventory Program Manager, NPS, Natural Resource Program Center, Fort Collins, CO

The NPS Vegetation Inventory Program is a cooperative effort by the National Park Service (NPS) and the U.S. Geological Survey (USGS) to classify, describe and map vegetation communities in more than 270 national park units across the United States. The program is an important component of the NPS Inventory and Monitoring Program, a long-term program to develop baseline data for national park units. The primary objective of the vegetation inventory program is to produce high-quality, standardized maps of the vegetation and other land cover occurring within national parks. Programmatic standards and stringent quality control facilitates effective resource management by ensuring compatibility and widespread use of the information at multiple geographic scales throughout the NPS as well as by other federal and state agencies. Standards for this inventory are based on the Federal Geographic Data Committee (FGDC) National Vegetation Classification Standard for the hierarchical description of both vegetation physiognomy and floristics to the Alliance level of detail. Further, this mapping effort is rendered in NAD 83 UTM at the nominal scale of 1:24,000 with a minimum mapping unit of 0.5 hectare, and a thematic map class accuracy standard of 80%. These maps and associated information are required to support a wide variety of resource assessment, park management, and conservation concerns.

#### **Ecological Condition of National Parks: Enabling Decision Support through Monitoring, Analysis, and Forecasting**

Andrew Hansen, Professor of Ecology, Montana State University, Bozeman, MT

Scott Goetz, Senior Scientist, Woods Hole Research Center, Falmouth, MA

John Gross, Ecologist, Inventory and Monitoring Program, National Park Service, Fort Collins, CO

David Theobald, Professor of Human Dimensions of Natural Resources, Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO

Forrest Melton, Research Scientist, NASA-Ames Research Center, Monterey, CA

Rama Nemani, Research Scientist, NASA-Ames Research Center, Monterey, CA

Nathan Piekielek, Doctoral Student of Ecology, Montana State University, Bozeman, MT

Most park units are subjected to rapid changes in and near park boundaries that affect the area or quality of critical habitats, modify water quality, quantity or flow, and alter natural disturbance regimes. These factors are critical to understanding key threats to park eco-systems and to evaluating appropriate responses to change. This project will identify NASA Earth-Sun Science products that are useful to park monitoring and a greater park ecosystem appropriate for landscape scale analyses. It will add value to NASA products through analysis and forecasting and provide a means of integrating these techniques and information into the NPS culture. Integration will be achieved in part through the production of a suite of standard operating procedures and recommendations which can be executed by park personnel in the future. Research scientists are working closely with the NPS Inventory and Monitoring program and are examining YELL, ROMN, YOSE, and DEWA as pilot sites.

#### **Vulnerability of U.S. National Parks to Land Use and Climate Change**

Andrew Hansen, Professor of Ecology, Director of Landscape Biodiversity Lab, Montana State University, Bozeman, MT

Cory Davis, Montana State University, Department of Ecology, Bozeman, MT

Steven Running, University of Montana, College of Forestry and Conservation, Numerical Terradynamic Simulation Group, Missoula, MT

Jessica Haas, University of Montana, College of Forestry and Conservation, Numerical Terradynamic Simulation Group, Missoula, MT

The National Park Service confronts the challenge of maintaining ecosystem function and biodiversity in the face of climate and land use change. The goal of this study is to assess park vulnerability to current and near-term future climate and land use change based on reconstructions and analyses of change and ecological response over the past 50–100 years. Included in the study is a set of approximately 60 US National Parks that are relatively large in area, are widely distributed relative to climate and land use gradients, and are managed for natural values. The larger ecosystem encompassing each park was delineated based on watersheds, contiguity of vegetation types, presence of unique habitats, and human land use. Potential drivers and ecosystem and biodiversity response are being quantified across ecosystems during the 1900s using satellite imagery, data, and models. We will report results on ecosystem delineation, climate change, and land use change.

#### **An Investigation of Surface Water/Ground Water Interactions, Great Sand Dunes National Park and Preserve**

James Harte, Hydrologist, National Park Service, Water Resources Division, Fort Collins, CO

Andrew Valdez, Geologist, Great Sand Dunes National Park and Preserve, Mosca, CO

Sharla Stevenson, Student Colorado State University c/o National Park Service, Water Resources Division, Fort Collins, CO

A seepage investigation to quantify base flows and identify gaining and losing stream reaches in Great Sand Dunes National Park and Preserve (GRSA) was conducted by the National Park Service, Water Resources Division during the Fall of 2004 and 2007. The investigation was initiated to provide calibration data for the GRSA ground water model. Seepage investigation methodology, consisting of discharge measurements made simultaneously at multiple cross sections along a given reach of stream, was used to determine base discharge and identify stream reaches that were “gaining” or “losing” discharge. The seepage investigation was conducted on Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek. The results of the seepage investigation indicated that, from upstream to downstream within the measured reaches, Deadman Creek was a losing stream, Sand Creek was a losing stream, Big Spring Creek was a gaining stream, and Little Spring Creek neither gained nor lost discharge.



### **Flying Foxes in National Park of American Samoa: A Monitoring Protocol**

Leslie HaySmith, Ecologist, National Park Service, Volcano, HI

Gail Ackerman, Research Corporation of the University Hawaii, Hawaii National Park, Volcano, HI

Adam Miles, University of Hawaii–Manoa, Botany Department, Honolulu, HI

Two species of frugivorous bats, the white-naped fruit bat (*Pteropus tonganus*) and the Samoan fruit bat (*P. samoensis*), frequent native forests in the National Park of American Samoa (NPSA). The Pacific Island Network has developed a long-term monitoring protocol to determine the relative abundance and distribution of these bats. Pilot studies were conducted from May–August 2007 and October–December 2008. Dawn vista survey methods were tested at several terrestrial and coastal/marine viewsheds. Variation occurs throughout the season, such as in 2007, a roost of 90+ males formed for 2 months, resembling a “lek.” This data illustrates the importance of understanding trend changes over seasons. Also, six colonies of *P. tonganus* ranging from 20 to >1000 bats have been surveyed. A detailed sampling design with mechanisms to reduce variability in bat counts in broadleaf tropical forests in nearly vertical terrain is critical to the success of a long-term monitoring protocol for fruit bats.

### **A Monitoring Protocol for ‘Ope‘ape‘a, the Hawaiian Hoary Bat, in Pacific Island National Parks**

Leslie HaySmith, Ecologist, National Park Service, Volcano, HI

Heather Fraser, Research Corporation of the University Hawaii, Hawaii National Park, Volcano, HI

Christopher Todd, Research Corporation of the University Hawaii, Hawaii National Park, Volcano, HI

The Hawaiian hoary bat (*Lasiurus cinereus semotus*), known ‘Ope‘ape‘a, is the only native, terrestrial, and now endangered mammal in Hawaii. Current information about natural history and populations are scarce. Therefore, the PACN has developed a monitoring protocol using acoustic bat detectors for six PACN parks to allow long-term trends analyses of Hawaiian hoary bats. The objectives are to: (a) better understand bat occupancy/use of parks including seasonal and elevational movements, and (b) assist parks in developing strategies for management of high occupancy/use areas. The protocol sampling design emphasizes random spatial allocation of bat detectors for a broader inference to park areas. This system is well-suited for the implementation of passive, long-term monitoring as it can be left remotely in the field for weeks. Activity patterns can serve as a surrogate for relative abundance, and indicate seasonal and spatial changes over time.

### **Development of Historical Topographic Models of the Beach/Dune System in Northeast Coastal Parks**

Rachel Hehre, Research Associate I, University of Rhode Island, Kingston, RI

Cheryl Hapke, U.S. Geological Survey, Woods Hole Science Center, Woods Hole, MA

The U.S. Geological Survey, in collaboration with the Northeast Coastal and Barrier Network (NCBN) of the National Park Service (NPS), is conducting a study to develop a baseline of historical topography that will be utilized in long-term topographic change analyses in four coastal National Parks in the Northeast U.S. The four National Seashores chosen for the project are Assateague, Gateway, Fire Island and Cape Cod. Topography, extracted from historical aerial photography using digital photogrammetric techniques, will be exceptionally useful to the parks for enhanced understanding of elevation and volumetric changes to the beach and dune system over the past half-century. Accurate volumetric change analyses will provide insight into the sediment budget of the islands and how this budget has responded not only to changing environmental conditions but to changes in land use and resource management of the parks.

### **Aren't You Guys Done Yet? After 140 Park Maps, the Geologic Resources Inventory Status**

Bruce Heise, Geologist, GRI Coordinator, Geologic Resources Division, National Park Service, Denver, CO

The Geologic Resources Inventory Team, National Park Service, Denver, CO and Colorado State University, Fort Collins, CO

In 1998 the Geologic Resources Inventory Program was given \$35k to initiate the seemingly modest task of delivering a digital geologic map to each of the 270 I&M parks. Since then the program has scoped 220 parks, generated maps for 140 parks, and produced geologic reports for 50 of them. The effort so far has required involvement by a broad array of park staff, fifteen GIS specialists, 39 state surveys, 5 CESUs, over 30 universities, and a small army of USGS scientists. While parks have used these products for traditional applications such as geologic research, facility siting, groundwater modeling, and cave and paleontological resource management, products have also been unexpectedly utilized in fire histories, fish habitat, climate change studies, and rare plant and animal distribution. Significant effort has gone into mapping coastal park units and submerged geologic resources as well. Examples of these and other uses will be displayed.

### **Providing Maps to the Coastal Parks: Getting beyond the Q, Yellow, and Blue**

Bruce Heise, Geologist, GRI Coordinator, Geologic Resources Division, National Park Service, Lakewood, CO

The Geologic Resources Inventory Team, National Park Service, Denver, CO and Colorado State University, Fort Collins, CO

Traditional geologic maps commonly depict barrier islands as elongate yellow blobs adjacent to unidentified blue expanses. Further elucidation may label the yellow “Q” for Quaternary (younger than 1.8 million years) and the blue “water.” While undoubtedly accurate, this information is of limited value to park resource managers. To provide more useful information, the Geologic Resources Inventory in concert with park staff and other coastal geologists, developed a series of protocols for mapping barrier island landforms. The GRI has produced maps incorporating these protocols for PAIS, CANA, CALO, and CAHA with ongoing work at GUIS and ASIS. Additionally, many coastal parks expressed an understandable interest in maps of the submerged areas concealed by the mysterious blue shapes abutting the terrestrial components of their parks. The Inventory has also produced a map integrating the bedrock geology and benthic habitat for NPS units on St. Croix, USVI.

### **Water for Cave Life: New Cave-adapted Species Discovered at Great Basin National Park**

Margaret Horner, Biological Science Technician, Great Basin National Park, Baker, NV

Gretchen Baker, Ecologist, Great Basin National Park, Baker, NV

Great Basin National Park contains over 40 caves, including several that contain water, an essential element in cave-forming processes that provides nutrients and habitat for cave biota. Due to the lack of biological information from park caves, bioinventories were initiated to determine the occurrence and distribution of cave biota by building on previous discoveries of two endemic cave species.



Bioinventories were conducted from 2003-2008 in 22 caves, recording 155 taxa. At least three new cave-adapted species were discovered along with clarification of the genera and habitats that are key components in the park's cave communities. Ecosystem monitoring that includes the caves, the overlying watersheds, and connected groundwater is needed to protect these unique species that have evolved to specific habitat conditions. Additional surveys are also needed to determine the distribution and habitat requirements of these new species outside of the park and to establish conservation strategies to protect them.

#### **Anthropogenic and Climate Change Threats to Water Resources in the Mojave National Preserve**

Debra Hughson, Science Advisor, Mojave National Preserve, Barstow, CA

Boris Poff, Hydrologist, Mojave National Preserve, Barstow, CA

Long periods of drought punctuated by infrequent, sometimes severe storms characterize the Mojave Desert. Nearly all the water used by people is imported through aqueducts or extracted from slowly recharged aquifers. Sparse groundwater dependent wetlands sustain wildlife and often endemic biota. Compounding the stress on ecosystems from human modification is changing climate. Global climate models generally agree that a drying trend is already under way in the desert southwest and will continue through the century. Variability, especially in precipitation, is expected to increase. The proportion of precipitation that comes from extreme events is expected to increase as well as the duration and intensity of droughts. The two driest years on record (2002 and 2007) and the wettest year on record (2005) have already caused significant impacts, including the largest wildfire in the park's history. Understanding and maintaining resources through these changes is one of the great challenges facing resource managers.

#### **Collaboration on the Vertical Frontier: Yosemite National Park's ATBI Gets a Helping Hand from Mountaineers**

Martin Hutten, Botanist, Yosemite National Park, El Portal, CA

Linda C. McMillan, American Alpine Club, San Rafael, CA

Niki Stephanie Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA

Yosemite's imposing cliff faces are so prominently colored that they appear to have been streaked with paint. The nature of these streaks has been debated: are they mineral stains, or are they alive? Far beyond reach of National Park Service (NPS) biologists, it has been difficult to investigate. In 2007, Yosemite launched a lichen inventory project supported by the Yosemite Fund and the NPS Centennial Challenge Initiative. The American Alpine Club, a worldwide organization older than the NPS, brought in more than 25 volunteers and extended the project's reach to the vertical cliff faces. The AAC volunteer lichen collectors ranged from students to professors, and even included a Mt. Everest veteran. Hundreds of specimens are now being identified in collaboration with Oregon State University lichenologists. The project has already yielded many species not previously recorded from the Park.

#### **Biodiversity of Bees in California National Park Service Units**

Winnie Jacobs, Undergraduate Research Scholar, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

James Cunningham, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Réjine Rominguet, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Mietek Kolipinski, National Park Service, Pacific West Regional Office, Oakland, CA

Sibdas Ghosh, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

We are conducting a bee biodiversity project that involves National Park Service Units in the San Francisco Bay Area. The project aims at evaluating distribution and populations of bees. Bees and flowering plants rely on one another through established, complex relationships. We have data from sampled locations including Point Reyes National Seashore (PORE), Golden Gate National Recreation Area (GOGA), and John Muir National Historic Site (JOMU). We are determining relationships among native and non-native bees and native as well as non-native plants they pollinate. Bees are important in naturally functioning ecosystems, yet little is known about their life histories in habitats we are studying. We have learned through study and literature research that some bees pollinate one plant species, while others pollinate an array of flowering plants. Over 1200 species of bees are present in California, and they vary considerably in their seasonal periods of activity. One study reported a high occurrence of 397 bee species in Pinnacles National Monument. Other scientists carried out a preliminary assessment of bees of Mount Wanda in JOMU in 2002. There, they collected 70 species of bees in 26 genera. For comparison another study team surveyed bee diversity in restored habitats in The Presidio (GOGA). They reported 56 species representing 23 genera in 2005. We compared occurrences of bee taxa in GOGA and JOMU.

#### **Status of a Keystone Species: Whitebark Pine in the Greater Yellowstone Ecosystem**

Cathie Jean, Program Manager, NPS Greater Yellowstone Network, Bozeman, MT

Erin Shanahan, Greater Yellowstone Network, Montana State University, Bozeman, MT

Dan Reinhart, Yellowstone National Park, WY

Jodie Canfield, Gallatin National Forest, Bozeman, MT

Steve Cherry, Department of Mathematical Sciences, Montana State University, Bozeman, MT

Charles Schwartz, Interagency Grizzly Bear Study Team, Montana State University, Bozeman, MT

Gregg A. DeNitto, Missoula Field Office, USDA-Forest Service, Forest Health Protection, Missoula, MT

Shannon Podruzny, Interagency Grizzly Bear Study Team, Montana State University, Bozeman, MT

A significant outbreak of mountain pine beetle is currently taking place in the Greater Yellowstone Ecosystem (GYE) and research scientists, silviculturists, plant ecologists and wildlife biologists are working together to address the status, trends and restoration of this important tree species. New research has shown that mountain pine beetle activity increases significantly in whitebark pine with heavy white pine blister rust infection. Monitoring through the NPS I&M program has established that blister rust infection is wide-spread, albeit at low proportions through the GYE. Working through the Greater Yellowstone Coordinating Committee (GYCC), staff from the Greater Yellowstone Network and the USGS Interagency Grizzly Bear Team completed an unprecedented level of monitoring to document and report on the amount of mortality taking place during the current outbreak. The results from monitoring will be used by the GYCC whitebark pine subcommittee who are developing an ecosystem wide restoration plan.

### **Monitoring Northern Spotted Owls in Marin County, California**

Heather Jensen, Wildlife Technician, San Francisco Bay Area Inventory and Monitoring Program, Point Reyes Station, CA

Bill Merkle, National Park Service, Golden Gate National Recreation Area, San Francisco, CA

David Press, National Park Service, San Francisco Bay Area Inventory and Monitoring Program, Golden Gate National Recreation Area, San Francisco, CA

The National Park Service has been monitoring the federally threatened northern spotted owl (*Strix occidentalis caurina*) population on public lands in Marin County, California, since 1998. The Marin study area represents the southern limit of the northern spotted owl's range and has one of the highest reported fecundity rates within the northern spotted owl's range. Although fecundity has been relatively stable since 1998, the first non-breeding season was documented for this population in 2007. While Marin County does not face large scale habitat alterations from logging, the spotted owl habitat is under continual pressure from urban development, intense recreational pressures, and habitat change as a result of diseases such as Sudden Oak Death. In addition, possible genetic isolation, West Nile Virus, and the continued range expansion of the barred owl (*Strix varia*) are all threats to spotted owls in this region. Barred owls were first detected in Marin County in 2002. The first barred owl pair was detected in 2005, and the first successful breeding by barred owls was confirmed in 2007 within a historic spotted owl territory. Currently, at least five known barred owls are residents of federal lands in Marin County.

### **Presence Based Species Occurrence Modeling at Great Smoky Mountains National Park**

R. Todd Jobe, Postdoctoral Researcher, Community Ecology and Biogeography, Department of Geography, University of North Carolina, Chapel Hill, NC

Benjamin Zank, Cartographic Technician, Great Smoky Mountains National Park, Gatlinburg, TN

Modeling of species distributions in parks holds many values for the scientific community, but for stewardship of resources it is critical.

Only having species occurrences as points is of limited usefulness, since managers cannot infer what is between the points. The biological complexity, interactive stressors and limited agency resources at Great Smoky Mountains National Park, make knowing where to take the most effective actions imperative. Maxent is a method for generating predictive distributions given a set of occurrence data and known environmental variables at those locations. Taken from Phillips et al. (2006), Maxent 1) requires only presence data, not presence/absence data, 2) can use both continuous and categorical variables, 3) the optimization is efficient, 4) has a concise probabilistic definition, 5) it avoids over-fitting, 6) can address sampling bias formally, 7) output is continuous, and 8) is generative rather than discriminative which makes it better for small sample sizes.

### **Advising Noah: A Legal Analysis of Assisted Migration**

Julie Joly, Assistant Professor of Resources Law and Policy, University of Alaska Fairbanks, Fairbanks, AK

Nell Fuller, Fish and Wildlife Biologist, Division of Federal Assistance, US Fish and Wildlife Service, Portland, OR

Climate change will likely lead to dramatic transformations of habitats critical to many species. The ecological niches on which species depend may shift or disappear, though many species will not be able to shift with their habitats. One proposed solution to this problem is assisted migration. No federal agency has yet developed any rules specifically regarding assisted migration in response to climate change. However, the existing laws, regulations, and policies do provide guidance that would affect any federally sponsored or permitted assisted migration program. This work examines these laws, regulations, and policies currently in place that may challenge or facilitate assisted migration programs. Given this legal structure, we find that assisted migration is a legal option on most federal lands under certain circumstances. Understanding the existing legal realities will enhance the possibility of implementing assisted migration efforts and effecting on-the-ground species conservation. (In press 2009, *Environmental Law Reporter*.)

### **Variability in Native Plant Species Richness and Diversity in Grasslands in the Central United States**

Jayne Jonas, Post-doctoral Researcher, Brighton, CO

Amy Symstad, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Wind Cave National Park, Hot Springs, SD

Deborah A. Buhl, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, ND

Native plant species richness and diversity are important metrics of grassland ecosystem health. Although grassland I&M networks are, or soon will be, monitoring these parameters, there is surprisingly little information on the variability of these metrics through time or in response to specific stressors or ecological factors. To overcome this information gap, we are synthesizing information from available literature on the effects of grazing, fire, or climate on grassland native plant species richness and diversity. In addition, we are using eight long- and short-term datasets from throughout the central United States to assess variability of native plant species richness and diversity and to determine the predictive value of factors such as weather, soil characteristics, grazing, and fire for changes in native plant richness and diversity. Understanding these relationships will provide park managers with a tool to better understand the significance of fluctuations in native grassland plant communities.

### **A Strategy to Enhance Your Water Quality Monitoring Capabilities**

Tahzay Jones, Aquatic Ecologist, Pacific Island Inventory and Monitoring Network, Hawaii National Park, HI

Water quality monitoring of physical parameters is frequently done through a method involving a series of point sample collections at each given location or by using an extended deployment (ED) sonde to collect information at a single location. Point samples miss monitoring the diel variability of the water body while fixed point extended deployment misses the spatial variability. Point samples are also susceptible to increased variability generated through time of day physical parameter changes. By combining point sampling with extended deployment it is possible to generate correction factors for a water body that will create a mathematical picture of the diel variations in the water body with the spatial and statistical rigor of your point sampling design. Sampling both ED-sonde locations and point sample stations, the diel variability of the waterbody can be accounted for and standardized using the ED-sonde and point sample measurement value variations.

### **Connecting People and Protected Places in a Changing World**

Damien (Phil) Joseph, Visual Information Specialist, National Park Service, Denver Service Center, Denver, CO

Michael Rees, NPS Natural Resource Specialist, National Park Service, Denver Service Center, Denver, CO

Linda Ray, Planning Communications Group Branch Chief, National Park Service, Denver Service Center, Denver, CO

This poster will visually capture in a collage the four conference themes, and also relate the themes to the mission of the National Park Service. It is intended to represent, through the visual arts, the critical interface between planning, science and communities in protecting resources and providing for visitor experiences within the national park system.

#### **New Satellite-based Methods to Document Landscape-scale Changes in Western National Parks**

Robert Kennedy, Research Associate, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

Zhiqiang Yang, Research Associate, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

Warren B. Cohen, Research Forester, PNW Research Station, USDA–Forest Service, Corvallis, OR

Linda Mutch, Inventory and Monitoring Coordinator, Sierra Nevada Network, Sequoia and Kings Canyon National Parks, Three Rivers, CA

Bill Kuhn, Landscape Ecologist, Yosemite National Park, El Portal, CA

Amy Miller, Ecologist, Southwest Alaska Network, Anchorage, AK

Chris Lauver, Ecologist, Southern Colorado Plateau Network, Flagstaff, AZ

Despite their protected status, large national parks in the western U.S. are subject to stressors within and outside park boundaries, including climate change, pollution, development, and resource extraction. Manifestations of these pressures include increased vegetation mortality, shifts in type or position of ecological communities, and loss of critical habitat. Here, we describe how new analytical methods for satellite image analysis are being used to map a wide range of these landscape-scale processes in and around parks, with special focus on Katmai, Yosemite, Sequoia, Kings Canyon, and Zion National Parks. The new analytical methods leverage the full historical archive of Landsat Thematic Mapper imagery from the mid 1980s to present, and allow mapping of subtle disturbance, long-term mortality, and variability in regrowth or encroachment of vegetation, as well as of the abrupt, large disturbances (such as fire) that are currently available.

#### **Monitoring Vegetation Impact on the Summit of Cadillac Mountain Using Multi-spectral Post-Classification Change Detection Analysis: 2001 and 2007**

Min Kook Kim, Ph.D. Candidate, Research Assistant, University of Maine, Orono, ME

John J. Daigle, Associate Professor, School of Forest Resources, Parks, Recreation and Tourism Program, University of Maine, Orono, ME

The purpose of this study was to evaluate efficacy of site/visitor management strategies to reduce vegetation impact in the vicinity of the summit loop trail on Cadillac Mountain, Acadia National Park. Post-classification change detection technique based on supervised classification and field investigation was applied to identify vegetation changes using multi-spectral high resolution remote sensing datasets between 2001 and 2007. The rates of increased and decreased vegetation were analyzed and compared with those in two control sites having no management regime, while maintaining similar environmental conditions with the experimental site. The statistical results supported the effectiveness of the employed management strategies to reduce vegetation impact in the experimental site. Throughout all spatial scales (small, medium, and large), it was verified that the rates of increased vegetation biomass were same or higher in the experimental site at the 95% confidence interval. In addition, it was investigated that the rates of decreased vegetation biomass were same or lower in the experimental site at the 95% confidence interval. However, it was also identified that the employed management strategies in the experimental site were ineffective in terms of augmenting vegetation diversity.

#### **A Glacier Monitoring and Research Strategy for Kenai Fjords National Park**

Frederick Klasner, Natural Resources Program Manager, Kenai Fjords National Park, Seward, AK

Chuck Lindsay, Physical Science Technician, Southwest Alaska Network, Seward, AK

We present a strategy for monitoring and research of the Harding Icefield and outflowing glaciers. Kenai Fjords National Park enabling legislation is unusual even among Alaska National Interest Lands Conservation Act (ANILCA) parks—with glaciers explicitly identified as a resource along with their connection to coastal fjords, biologic, and ecologic resources. Additional legislation highlights the Icefield's water resources and provides for both scientific and educational opportunities. Recognizing this mandate, and the evolving impacts from climate change, the park is developing a strategy that builds upon existing investigations, including Vital Sign monitoring, university research, and research by other federal agencies. The strategy supplements resource management planning efforts and integrates USGS glacier monitoring structure and Vital Signs monitoring framework—linking physical science investigations to ecological and coastal/ocean systems. Developing a glacier monitoring strategy highlights the broader ecosystem management implications of the Harding Icefield and is helping the park better define management issues.

#### **A Cooperative Effort: NSF-Project Pathways, NPS-Big Thicket National Preserve, the Big Thicket Association and the All Taxa Biological Inventory (ATBI)**

Carl Knight, Principal Investigator for NSF Pathways, Eastfield College, Forney, TX

The National Park Service-Big Thicket National Preserve NPS-BTNP), the National Science Foundation-Project Pathways (NSF-PP), and the Big Thicket Association (BTA) have brought academia, governmental agencies and nonprofits together to support a common goal, to inventory species of living organisms for the All Taxa Biological Inventory (ATBI) project. Scientists from major universities provide expertise for specimen identification; students from Eastfield College, supported by the NSF-PP work with the researchers to collect specimens and assist in their identification using standard identification techniques and scanning electron microscopes; the BTA and the NPS-BTNP provide research facilities for student research at the Big Thicket Research Station (BTRS). The Big Thicket Summer Research Institute (BTSRI) has been in operation for two years and plans are being made to expand the BTSRI project from 9 to 15 students per year. BTSRI research Projects are found online at <http://www.efc.dcccd.edu/red/NSF/research.htm>.

#### **Three-dimensional Characterization and Dynamics of Gypsum Dunes at White Sands National Monument Using Airborne LiDAR**

Gary Kocurek, Professor, University of Texas at Austin, Austin, TX



Ryan C. Ewing, Graduate Student, University of Texas at Austin, Department of Geological Sciences, Austin, TX  
David Mohrig, Associate Professor, University of Texas at Austin, Department of Geological Sciences, Austin, TX  
Aymeric Peyret, Graduate Student, University of Texas at Austin, Department of Geological Sciences, Austin, TX  
David Bustos, Biologist, White Sands National Monument, Holloman AFB, NM

A time-series of high-resolution airborne LiDAR surveys of a representative 39-sq-km area of the gypsum dune field at White Sands NM was utilized in order to quantify the dune pattern and document dune dynamics (i.e., interactions, migration rates and deformation). This approach addresses the dynamics of dune-patterns and provides a basis for detecting change in dune structure over time. Dune dynamics was a Vital Sign identified as a high priority for monitoring by the CHDN Inventory & Monitoring Program. Monitoring this Vital Sign will assist White Sands NM in resource assessment and management. Dune parameters characterized include spatial parameters (i.e., dune spacing, crest length, interdune shape) and 3-D parameters (i.e., dune volume and shape). Results show a strong control on dune form and field-scale pattern by boundary conditions that include the topography of newly discovered shorelines of paleo-lake Otero, and a newly recognized range of dune interactions.

#### **Inventory and Mapping Strategies for Submerged Marine Resources in National Parks of the Northeast Region**

Blaine Kopp, Oceanographer, US Geological Survey, Patuxent Wildlife Research Center, Augusta, ME  
Rebecca Bannon Research Associate, Environmental Data Center, University of Rhode Island, Kingston, RI  
Mark Christiano, GIS Specialist, Gateway National Recreation Area, Staten Island, NY  
Roland Duhaime, Research Associate, Environmental Data Center, University of Rhode Island, Kingston, RI

Within the NPS Northeast Region (NER) numerous parks have subtidal marine and estuarine resources either contained within their boundaries or otherwise significant to park character and value. Four parks with extensive subtidal holdings are the National Seashores at Cape Cod, Assateague Island, and Fire Island, and Gateway National Recreation Area. The NER Ocean Stewardship Task Force has identified high priority information needs to guide conservation and management of submerged marine resources. These include, bathymetry, basic hydrography, surface sediments and subaqueous soils, sediment contaminants, hydrogeologic framework, water chemistry and submerged habitats. We have prepared an inventory of existing data addressing these priorities at ten coastal parks and a catalog of geospatial data sets. From these, we have developed a detailed strategic plan to guide future data acquisition. The plan includes guidance on habitat classification standards, recommendations on mapping standards, resolution, and minimum mapping units, and evaluation of appropriate technologies and approaches.

#### **Scientific Discovery in the Big Thicket National Preserve, Texas**

Dale Kruse, Curator, S. M. Tracy Herbarium, College Station, TX

Initial results from an All Taxa Biodiversity Inventory of the Big Thicket National Preserve have proven to be very positive. The Preserve is located in the extreme southeast corner of Texas; a region of the state which has been heavily impacted by development, agriculture, oil and gas exploration, and nature itself over the past two centuries. However, despite this complex mix of historical and contemporary impacts, local and regional scientists have been able to describe several species new to science. In addition, numerous new state and county level distribution records have been documented. After only two years of investigation, it seems clear this region of the state may have much more to reveal about its resident biodiversity than anticipated.

#### **New Approaches to Applying the National Vegetation Classification**

Chris Lea, Botanist, NPS, Vegetation Inventory, Denver, CO

The National Park Service (NPS) Vegetation Inventory has had mixed success in applying the National Vegetation Classification (NVC) to mapping and management. Field tests and analysis of vegetation plot data collected in NPS units showed that the NVC is inconsistent in taxonomic resolution, with western models for plant associations being significantly more finely "split" than eastern models. This inconsistency has led to cost overruns and unnecessary complexity in western NPS units. To correct the problem, we propose a scale-appropriate/ground-up approach be employed. Association models are developed strictly from field data collected from the projects ("ground-up"), without regard to rules that a "top-down" approach might prescribe. "Scale-appropriate" for a given NPS unit can be estimated by functions derived from Whittaker's gamma and alpha diversity metrics as calculated from the site plot data. Once these units are developed, they are crosswalked to the best fit in the NVC.

#### **SSACgnp Module: Calculating the Volume of Water in Crater Lake from a Bathymetric Map**

Heather Lehto, Graduate Student, Department of Geology, University of South Florida, Tampa, FL

According to the National Park Service the volume of water at Crater Lake is 5 trillion gallons. How do you calculate this number, or more importantly how do you teach a student to calculate this number? The module presented here, which is part of the Spreadsheets Across the Curriculum project, is aimed at doing just that. Students start with the 1999 bathymetric map (USGS-NPS) and lake-level data. They overlay a 3D grid of prisms that extend from the lake bottom to the surface, calculate the volume of each prism, and then sum the prism volumes to find the total volume of water in the lake. This module not only teaches important math skills, but also provides an introduction to bathymetric maps. I am seeking suggestions and materials on how to relate the module to park management issues at Crater Lake and other lakes in national parks.

#### **From ATBI to Bioblitz: A National Approach to Engaging Citizens and Biodiversity in Parks**

Kirsten Leong, Human Dimensions of Biological Resources Program Manager, Biological Resource Management Division, NPS, Fort Collins, CO

Elaine Leslie, Deputy Chief, Operations, Biological Resource Management Division, National Park Service, Fort Collins, CO

With increasing global threats, National Park Service (NPS) units are becoming critical preserves of biodiversity. Many NPS units engage in efforts to improve knowledge about biodiversity within parks using various approaches, primarily with the assistance of citizen scientists. These efforts range from the long-term, taxonomically focused All-Taxa Biodiversity Inventories (ATBI), to large-scale short-duration Bioblitzes, and everything in-between. As part of the Centennial Challenge, parks engaged in citizen science biodiversity efforts have come together to develop a national strategy to ensure that individual park surveys contribute broadly across the National Park System. The goal of this national approach is to cultivate a support network that allows parks to learn from each



other's experiences, to develop best practices for the range of citizen science biodiversity efforts, and to coordinate data management and sharing. This poster highlights progress to date, avenues and tools to share information, existing resources, and opportunities for involvement.

#### **SSACgnp Module: Let's Take a Hike at Catoctin Mountain Park**

Meghan Lindsey, Graduate Student, Department of Geology, University of South Florida, Tampa, FL

Ever wondered how many calories you burn on a hike while observing geology at a national park? This Spreadsheets Across the Curriculum module has students calculate an answer for a five-mile loop trail in Catoctin Mountain Park near Washington D.C. The module starts with a topographic map and a trail map and divides the loop into multiple straight-line segments. Students build a spreadsheet to calculate slopes and hiking times (from hiking rates and distances) along each of the segments. With information from a graph of energy expenditure rate vs. slope and hiking rate, they modify their spreadsheet to calculate the calories expended in each segment. After summing these values, they obtain the total number of calories and find that the hike (at 2 mph) would burn off only a single Big Mac! I am seeking suggestions on how to adapt this module to other geological excursions at other parks.

#### **Centennial Challenge Ocean Education Program at Point Reyes National Seashore**

Jessica Luo, Ocean Education Coordinator, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Ben Becker, Director and Research Coordinator, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Jennifer Stock, Education and Outreach Coordinator, Cordell Bank National Marine Sanctuary, Olema, CA

John Dell'Osso, Chief of Interpretation and Resource Education, Point Reyes National Seashore, Point Reyes Station, CA

An ever-increasing body of science documents a precipitous decline in the health of our oceans. The State of California is developing a network of marine protected areas (MPAs) by 2011 that will affect Point Reyes National Seashore (PRNS) and several other California coastal National Parks. However, a major knowledge gap exists in nearby communities about the importance of ocean protection. Through the National Park Service Centennial Challenge, we have collaboratively initiated a public education program focused on the importance of protecting our productive waters and the critical and timely need to establish a system of MPAs in the marine ecosystems adjacent to the park. This program supports the publication of educational newsletters, a film and lecture series, development of mobile interpretive displays, a marine science school program for local and national high school students, and interpretive programs for park visitors on the ocean resources surrounding the park.

#### **Science Communication Internships as a Model for Enhancing Communication in National Parks**

Jessica Luo, Ocean Education Coordinator, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Marcus Koenen, I&M Network Coordinator, San Francisco Bay Area Network, Sausalito, CA

Ben Becker, Director and Research Coordinator, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Christie Anastasia, Education Coordinator, Murie Science and Learning Center, Denali National Park and Preserve, Denali National Park, AK

National Parks have been utilizing Research Learning Centers and Inventory and Monitoring (I&M) Networks as active collaborators in producing scientific knowledge to inform natural resource management decisions. The critical need for effective science communication to internal and external audiences has risen. Over the last two years, the Pacific Coast Science & Learning Center and SF Bay Area I&M Program have collaboratively and individually sponsored nine science communication interns to tackle a broad spectrum of projects and needs. Projects include 1) creating research project summaries, newspaper articles, newsletters, science blog, and other products on current NPS projects and outside research at Parks; 2) creating 5-to-7-minute audio and video podcasts highlighting research and monitoring projects; and 3) developing an ocean interpretive program. These internships are a highly successful model because they harness the creativity and innovation of a younger user group and provide training and experience for aspiring science communication professionals.

#### **One Big State Park: Two Centuries of Shifting Visions for the Oregon Coast**

Steve Mark, Historian, National Park Service, Crater Lake, OR

This presentation compares three very different ideas for how a 400-mile coastline was to function as part of the American nation state. In finally supplanting agriculture and then competing with wood products for supremacy, tourism on the Oregon coast became viable when a highway running the full length of it was completed during the 1930s. An unusually successful acquisition program started by state parks superintendent Sam Boardman eventually grabbed the consciousness of Oregonians, in that access to all parts of the coast became a "birthright" to residents of the state. The vision for "one big state park" has had consequences, as the parks fed such an overwhelming image of naturalness that private property values soared almost everywhere on the coast. To better contextualize Boardman's vision, it must be contrasted with efforts to provide parks and access to beaches in Washington and California.

#### **Recent Trends and Current Conditions within Aspen Stands of Lassen Volcanic National Park**

Sarah McCullough, Graduate Student, University of California-Davis, Davis, CA

Kenneth Tate, Plant Sciences Department, University of California-Davis, Davis, CA

Anthony O'Geen, LAWR, University of California-Davis, Davis, CA

Michael Whiting, California Space Institute (CalSpace), University of California-Davis, Davis, CA

The Klamath Network I&M Program identified quaking aspen as a potential keystone species through the Vital Signs process. Aspen is an early seral species that depends on disturbance for successful reproduction. One management concern is that conifer cover within aspen stands in western North America is increasing due to disruption of natural fire regimes, causing changes in stand conditions. We measured forest structure, understory vegetation, and soil surface factors in 30 aspen stands at Lassen Volcanic

National Park. Analysis of aerial photos from 1952 through 2002 allowed us to determine trends in conifer cover. Data were analyzed to identify associations between trend in conifer cover and current aspen stand conditions. Preliminary analysis indicates that conifer canopy cover was negatively associated with understory richness and diversity ( $p < 0.001$ ). We will present full results with interpretation for managers facing decisions about prioritization of aspen restoration projects.

#### **The Rocky Mountain National Park WaterBlitz: A Snapshot of Water Quality Across 185 Sites**

James McCutchan, Associate Director, Center for Limnology, University of Colorado, Boulder, CO

Cheri Yost, Research Logistics Coordinator, Rocky Mountain National Park, Continental Divide Research Learning Center, Estes Park, CO

Leigh Cooper, Ph. D. Candidate, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO

Thomas Detmer, Ph.D. Candidate, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO

Judy Visty, Research Coordinator, Rocky Mountain National Park, Continental Divide Research Learning Center, Estes Park, CO

The chemical composition of stream water reflects patterns of atmospheric deposition, mineral weathering, nutrient uptake, and human perturbations. Spatial variation in water quality also affects the distribution and abundance of stream organisms, including algae, aquatic insects, and fish. In order to capture a snapshot-in-time of water quality across Rocky Mountain National Park, NPS staff, volunteers, and researchers at the University of Colorado collected 185 stream-water samples on a single date in August, 2008. Water samples were analyzed for pH, concentrations of major ions, and other water-quality parameters. Although spatial patterns in water quality were related to multiple factors, forest disturbance, including wildfire and a recent outbreak of mountain pine beetle, has affected stream chemistry in many watersheds. This study provides a baseline for evaluating future changes in water quality across Rocky Mountain National Park and also could aid in the design of new research and monitoring programs.

#### **Where is that Plant? Uncertainty in Georeferencing Current and Historical Plant Locations at Channel Islands National Park**

Kathryn McEachern, Senior Plant Ecologist, USGS Western Ecological Research Center, Channel Islands Field Station, Ventura, CA

Ken Niessen, La Luna Biological Consulting, Ojai, CA

In rare plant I&M studies at Channel Islands National Park we need to relocate historical collection sites, or provide the locations of newly documented sites. Georeferencing is the technique of giving geographic coordinates to the location of a site. Georeferencing has been done historically in verbal descriptions, or with field maps accompanying voucher collections. However, a major obstacle to relocating plant populations is the lack of error information for the given location. GPS and GIS technology give us better tools for mapping and storing location information, but error still exists, and even modern locations can still be uncertain. We review the concepts of error, precision, accuracy and uncertainty, compare systems for cataloging uncertainty, and present the system we are using at the Channel Islands. We do need to be clear about our location uncertainty, so information we share with our partners provides a firm foundation for rare plant work.

#### **Bringing National Parks into the Classroom: Are Spreadsheets a Gateway to Quantitative and Geoscience Literacy?**

Dorien McGee, Graduate Student, Department of Geology, University of South Florida, Tampa, FL

A Spreadsheets Across the Curriculum (SSAC) module was integrated into the USF online course Geology of the National Parks in Spring 2007. This course is offered each semester, with an optional 1-hour recitation per week in fall and spring. We are collecting pre- and post-module test data in conjunction with module grades to examine whether student success on the module translates to gains in quantitative and/or geoscience literacy, and whether addition of a recitation section enhances gains; preliminary analyses are positive. Student feedback suggests, unsurprisingly, that learning gains depend on familiarity and comfort with spreadsheets. Accordingly, the course now plans to add several modules. These new modules will be developed in the new project Spreadsheets, Quantitative Literacy and Natural Resources, in which USF faculty and graduate students will work with Resource Learning Centers to focus module-making activities on environmental geology and the Natural Resource Challenge.

#### **Geology of the National Parks and Quantitative Literacy**

Judy McIlrath, Instructor and Undergraduate Advisor, Department of Geology, University of South Florida, Tampa, FL

Geology of the National Parks (GNP) is an introductory-level geology course for non-science majors at many colleges and universities. GNP is designed to teach geology by capitalizing on student interest in parks where geologic features and histories are so well displayed. At USF, GNP is delivered online (with/without recitation section) in a succession of exercises. Most exercises involve virtual field trips and include writing assignments addressing specific questions about the trip. We are revamping GNP to add a quantitative literacy dimension. One of the two new quantitative exercises is a Spreadsheets Across the Curriculum module in which students plan a trip to the Colorado Plateau region and work with unit conversions, percent increase, and other foundation mathematics. The second is a virtual earthquake exercise where students calculate the magnitude and find the epicenter of an earthquake. I am seeking suggestions for more GNP exercises and modules involving foundation mathematics.

#### **Promoting Public Understanding of Climate Change through High Quality Maps**

Jean McKendry, Principal Scientist, University of Idaho, Moscow, ID

The National Park Service (NPS) has a leadership role in anticipating and describing climate change and its impacts on ecosystems. Maps and other graphics are essential tools for communicating information, such as changing sea levels and temperature, to the public. Yet, the importance of graphic design in organizing and presenting complex scientific information is often overlooked. In particular, the cartographic design and quality of climate change maps have not been critically assessed. Poor map design can hinder effective understanding and decision-making. Evaluating the quality of climate change maps is timely and essential. In this poster, a "high visibility" climate change map is evaluated using commonly accepted cartographic design principles. The goals of this example are to demonstrate the value of cartographic critique and to make a case that compelling, high quality maps are needed to effectively educate policymakers and the public about climate change and its consequences for national parks.

#### **Restoration of the Upper Kawuneeche Valley in Rocky Mountain National Park**

Paul McLaughlin, Ecologist, Rocky Mountain National Park, Estes Park, CO

Ben Bobowski, Chief, Division of Resource Stewardship, Rocky Mountain National Park, Estes Park, CO

Mark Vanmouwerik, Restoration Project Manager, National Park Service EQD

The Grand Ditch, a trans-basin, water-diversion canal, breached its bank on May 30, 2003, causing extensive injury to the upper Kawuneeche Valley area in Rocky Mountain National Park, Colorado. The breach saturated an adjacent hillslope which gave way, sending a massive (~40,000 cubic meter) mud- and rock-slide down into a creek and the headwaters of the Colorado River damaging upland, stream, riparian and wetland habitat over an approximately 1.5-mile distance and 26-acre area. In 2008, the NPS won a \$9 million settlement from the Water Supply and Storage Company, owners of the ditch, to restore the damaged resources. This is the largest settlement ever reached under the 1990 Park System Resource Protection Act. The poster includes a description of injuries, a summary of assessment research and a presentation of preliminary restoration alternatives for the site.

#### **The State of Ethnographic Resources in Our National Parks**

Erin McPherson, Cultural Resource Program Manager, Center for State of the Parks, National Parks Conservation Association, Fort Collins, CO

Kat Byerly, Cultural Resources Program Coordinator, Center for State of the Parks, National Parks Conservation Association, Fort Collins, CO

Cathy Norris, Program Assistant, Center for State of the Parks, National Parks Conservation Association, Fort Collins, CO

One of the National Park Service's mandates is the protection of our nation's cultural resources. NPS often shares this stewardship responsibility with indigenous people and cultural groups who have cultural, spiritual, and subsistence connections to park resources. The National Parks Conservation Association's Center for State of the Parks assesses the condition of cultural resources in National Park System units using a methodology based on NPS' Director's Order #28. One focus of this methodology is the state of ethnographic resources, referring to cultural and natural resource features assigned significance in the cultural system of a traditionally associated group. Based upon 56 assessments to date, we will address what we have learned about the condition of ethnographic resources and park relationships with traditionally associated people in the National Park System, communication and partnership strategies between such communities and park managers, and efforts to integrate traditional knowledge, values, and interests into park management.

#### **Assessing Visitor Related Impacts to Archeological Site Condition at Yosemite National Park**

Jessica Middleton, Archeologist, Yosemite National Park, El Portal, CA

Laura Kirn, Branch Chief of Anthropology and Archeology, Yosemite National Park, El Portal, CA

Yosemite National Park has initiated a program to assess and monitor the impacts related to visitor use on archeological site condition under the User Capacity Management Monitoring Program, a framework for adaptive management designed to address user capacity at Yosemite National Park. During this pilot effort, protocols were developed for Yosemite-specific site assessments to allow for monitoring of visitor-related impacts at archeological sites. Data collection methodologies are explored, and results and analyses of two field seasons of data collection at over 130 archeological sites are presented. Additionally, issues related to the complexities of measuring and quantifying impacts to archeological site integrity and significance (including data potential) are examined.

#### **Simulations and Field Data Guide Development of Vegetation Monitoring in the Southwest Alaska Network**

Amy E. Miller, Ecologist, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

William L. Thompson, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

Dorothy C. Mortenson, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

The Southwest Alaska Network is using a combination of remote sensing, field data, and simulations to develop methods for vegetation monitoring. Ground-based monitoring will target changes in vegetation that are too subtle to be detected by aerial photos or satellite imagery alone. We first use a generalized random-tessellation stratified design to select monitoring plots from accessible areas delineated in a GIS. Simulations are then used to estimate sample size and frequency, based on assumptions regarding rates of change drawn from difference images, photographic time series, field data, and the literature. Unlike conventional power analyses, our simulations provide the sample size and frequency required to detect different magnitudes of change across a range of coefficients of variation (CVs) for a specified time interval. We compare these simulation results with CVs for species cover and frequency measured during a 2007–2008 pilot study to establish a realistic sampling design for monitoring.

#### **Forest Breeding Bird Monitoring in Northeast Temperate Network parks**

Brian Mitchell, Program Manager, Northeast Temperate Network, National Park Service, Woodstock, VT

Steve Faccio, Conservation Biologist, Vermont Center for Ecostudies, Hartford, VT

Adam Kozlowski, Biologist/Data Manager, Northeast Temperate Network, National Park Service, Woodstock, VT

The Northeast Temperate Network of the National Park Service Inventory and Monitoring Program has initiated forest breeding bird monitoring in northeastern parks, in cooperation with the Vermont Center for Ecostudies. Five to ten 10-minute point counts (separated by 250 m) have been conducted at one to five study sites per park since 2006. Point count data includes minute of detection, distance band, and species of each bird detected during the count, and is suitable for analysis using removal, distance, and occupancy approaches. Using data from 2006 and 2007, we present a snapshot of bird species detected at several national park sites, including an index of biological integrity based on guilds of bird species. We also present analyses of the data using removal and distance modeling, and compare the efficacy of the two approaches.

#### **Civic Engagement: What Does it Mean to Us? A Perspective from Park Break! 2008**

Michelle Moorman, Graduate Student, North Carolina State University, Raleigh, NC

Timia D. Thompson, Department of Parks, Recreation & Tourism Management, North Carolina State University, Raleigh, NC

Ryan Sharp, Department of Natural Resources, Recreation and Tourism, University of Georgia, Athens, GA

Wes R. Wong, School of Forestry and Natural Resources, University of Michigan, Ann Arbor, MI

Edgar Espinoza, Department of Geography and Regional Studies, University of Miami, Coral Gables, FL

Min Kook Kim, School of Forest Resources, University of Maine, Orono, ME



Abril Padilla, Department of Forestry, Colorado State University, Fort Collins, CO

We provide a synopsis of our view on civic engagement in the context of the Park Break forum, with a specific emphasis on U.S. National Parks. Our consensus during Park Break was in agreement with the National Park Service; it is their duty to ensure that Americans of all ages and ethnicities are engaged in natural resource conservation in order for parks and other protected areas to be relevant and sustainable in the 21st century. Furthermore, there is a need for parks to better incorporate the vast diversity of the American demographic in their parks which is why alternative methods of engagement may be necessary. This will require pushing the envelope to form strategic partnerships and actions, actively engaging America's youth in parks, promoting research on perceptions, attitudes and beliefs regarding National Parks and ensuring fair access to all to America's parks.

#### **Atmospheric Deposition Monitoring in the National Park Service: Current Measurements, Gaps and Future Directions**

Kristi Morris, Physical Scientist, Air Resources Division, Denver, CO

In sensitive ecosystems, the atmospheric deposition of nitrogen may contribute to acidification or fertilization effects and the deposition of mercury may contribute to bioaccumulation in the food chain. Estimating the atmospheric inputs of nitrogen and mercury is the current focus of the Air Resources Division's Atmospheric Deposition Monitoring Program. Wet deposition is monitored at over 30 NPS units through the National Atmospheric Deposition Program, some having records extending over 25 years. Dry deposition is monitored through the Clean Air Status and Trends Network which measures pollutants in the air and then estimates deposition based on models. Winter deposition to high-elevation ecosystems in the Rocky Mountains is also measured by snowpack sampling. Data from these networks will be presented. Difficulties in estimating total deposition of nitrogen and mercury will be identified and results from recent studies addressing these difficulties will be presented.

#### **Successful Removal of the Invasive Jellyfish *Cassiopea andromeda* from Two Sites on Hawaii Island**

Rebecca Most, Biological Science Technician, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

Cecile T. Walsh, AIS Research Associate, Division of Aquatic Resources, Hilo, HI

Sallie Beavers, Marine Resource Manager, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

Lindsey Kramer, Aquatic Technician, Inventory & Monitoring, National Park Service, Kailua-Kona, HI

Joseph Bybee, Field Project Technician, Kaloko-Honokohau National Historical Park, Kailua-Kona, HI

The upside-down jellyfish, *Cassiopea andromeda*, is a non-indigenous marine invertebrate in the Hawaiian Islands. Since its unintentional introduction to Oahu in 1961, it has become invasive throughout the Main Hawaiian Islands, primarily in protected soft-bottom embayments. *Cassiopea andromeda* was discovered in two new locations on Hawaii Island: Kapoho Tidepools, Puna (February 2006) and Kaloko Fishpond, Kaloko-Honokohau National Historical Park (April 2008). A rapid response removal effort was conducted at each site by the State of Hawaii Department of Natural Resources Division of Aquatic Resources and the National Park Service. Removal methods included repeated efforts of manual removal, removal of perimeter alien vegetation, and subsequent surveys, to successfully eradicate the medusa and polyp phase jellyfish from these locations. The total number of jellyfish removed at Kapoho tidepools was 187 and 1110 at Kaloko Fishpond. These case studies demonstrate the effectiveness of early detection and rapid response to controlling invasive species.

#### **A New Lake Monitoring Program in Sierra Nevada Network Parks**

Linda Mutch, Physical Scientist, Sierra Nevada Network, Three Rivers, CA

Leigh Ann Harrod Starceovich, Statistical Consulting, Corvallis, OR

James Sickman, University of California-Riverside, Department of Environmental Sciences, Riverside, CA

Meryl Goldin Rose, Sierra Nevada Network, Yosemite National Park, El Portal, CA

Donald Schweizer, Sequoia and Kings Canyon National Parks, Three Rivers, CA

Andi Heard, Sierra Nevada Network, Sequoia and Kings Canyon National Parks, Three Rivers, CA

The Sierra Nevada Network (SIEN) Inventory & Monitoring Program recently completed and field-implemented its long-term lake monitoring protocol for Sequoia, Kings Canyon, and Yosemite National Parks. The lake protocol captures three of the SIEN's high priority vital signs: water chemistry (primary vital sign that drove protocol design), surface water dynamics, and amphibians. Lake ecosystems were selected for monitoring because they are valued for their ecological importance, recreational opportunities, and importance to regional water supplies, are threatened by multiple stressors, and are sensitive to change. SIEN lakes are habitat for three amphibian species that are candidates for listing as endangered under the federal Endangered Species Act—mountain yellow-legged frog (*Rana muscosa* and *Rana sierrae*) and Yosemite toad (*Bufo canorus*). We use a probabilistic sample design that addresses access challenges in remote areas and balances temporal and spatial sampling objectives. The protocol was developed collaboratively by SIEN, Yosemite, and Sequoia and Kings Canyon Park staff and cooperators from multiple universities and state and federal agencies.

#### **Seagrass Monitoring in the Northeast Coastal and Barrier Network**

Hilary Neckles, Research Ecologist, USGS Patuxent Wildlife Research Center, Augusta, ME

Blaine Kopp, USGS Patuxent Wildlife Research Center, Augusta, ME

Brad Peterson, SUNY at Stony Brook, Stony Brook, NY

Penelope Pooler, Virginia Tech, Blacksburg, VA

Sara Stevens, NPS Northeast Coastal and Barrier Network

Three parks in the Northeast Coastal and Barrier Network include extensive seagrass resources: Cape Cod National Seashore, Assateague Island National Seashore, and Fire Island National Seashore. Vital Signs monitoring in these parks includes estimates of seagrass status and trends at three spatial scales. Existing state mapping programs provide large-scale information on seagrass distribution; rapid assessments of plant cover, shoot morphometry, and water depth at random stations throughout each system provide bay-wide estimates of seagrass abundance; and intensive measurements of seagrass condition (cover, density, biomass, shoot morphology, epiphytes, wasting disease) and environmental characteristics within reference seagrass beds provides information on potential causes of system change, particularly estuarine nutrient enrichment. Use of permanent sampling stations for bay-wide and intensive measurements allows efficient temporal comparisons, and integration across scales permits bay-wide estimation



of eelgrass biomass from easily measured parameters.

#### **Water for Ocean Life: Interactions of Nutrient Pollution and Sea-level Rise in Salt Marshes**

Joanna Nelson, Ph.D. Candidate, Environmental Studies Department, University of California–Santa Cruz, Santa Cruz, CA  
Erika Zavaleta, Assistant Professor, Environmental Studies Department, University of California–Santa Cruz, Santa Cruz, CA  
Kerstin Wasson, Adjunct Professor, Ecology and Evolutionary Biology, and Research Coordinator, Elkhorn Slough National Estuarine Research Reserve, University of California–Santa Cruz, Santa Cruz, CA

Estuaries are vulnerable to eutrophication and sea-level rise: these perturbations will affect the extent and function of salt marsh, living marine resources, and concomitant delivery of ecosystem services on the central California coast. Elkhorn Slough is the second largest tract of salt marsh in the state: the Slough encompasses a National Estuarine Research Reserve (NERR) and flows into the Monterey Bay National Marine Sanctuary. I investigate the role of threatened salt marsh habitats as a “coastal filter,” improving water quality of runoff as it flows into the coastal ocean; plant biodiversity and ecosystem response to manipulated tidal height and nitrogen amendments; and microbial communities’ rates of denitrification, through experimental and observational work. Supporting marsh sustainability in the face of changing dynamics on land and at sea is recognized as a priority by coastal managers nationally, by the NERR system, and in Elkhorn Slough’s collaborative scientist-citizen wetland conservation.

#### **Assessing and Monitoring Habitat Fragmentation from Informal Trail Networks in Meadows**

Todd Newburger, Biologist, User Capacity Monitoring Program Manager, Yosemite National Park, El Portal, CA  
Yu-Fai Leung, Associate Professor, Parks, Recreation, and Tourism Management, North Carolina State University Raleigh, NC  
Bret Meldrum, Branch Chief, Visitor Use and Social Sciences, Resources Management and Science Division, Yosemite National Park, El Portal, CA  
Marci Jones Messick, Biological Technician, Vegetation and Restoration, Resources Management and Science Division, Yosemite National Park, El Portal, CA  
Brittany Woiderski, Biological Technician and Americorps Member, Resources Management and Science Division, Yosemite National Park, El Portal, CA

Yosemite National Park has been engaged in a meadow monitoring program which includes studying visitor impacts in meadows. Not only do meadows play a key role in ecological functions, they provide visitors with recreational opportunities and access to scenic vistas. In an effort to establish standards and management strategies for visitor use of these sensitive meadows, park managers have been monitoring numbers and extent of informal trails in meadows for five years. In order to better assess the impacts of these trails to meadow ecology and to characterize changes from existing conditions, we have integrated new meadow monitoring techniques and GIS analysis to calculate extent of habitat fragmentation. This new approach provides: fragmentation percentage, patch size, a better understanding of the ecological effects of trails; and information to guide park management decisions. This poster will demonstrate how patch size and fragmentation indices are critical to determining standards for visitor use in fragile meadows.

#### **Meeting NPS Geoscience Needs With the GeoCorps Geoscientists-in-the-Parks Program: A Program Overview**

Lisa Norby, Geologist, Geoscientists-in-the-Parks Program Manager, National Park Service, Lakewood, CO  
Wesley Hill, Geocorps America Program Manager, The Geological Society of America, Boulder, CO  
The Geoscientists-in-the-Parks Program, created in 1996 by the Geologic Resources Division places geoscientists in NPS units on a short-term basis to provide geoscience research, inventory, monitoring, impact mitigation, interpretation, and education assistance. Since the program’s inception, more than 500 geoscientists have assisted over 100 parks with their geoscience needs. The GIP Program enables parks and central offices to meet many of their physical and integrated science needs that cannot be accomplished with existing staff. The majority of the GIP participants are placed through the Geological Society of America’s GeoCorps America Program. Parks, regions, and central office staff annually propose projects and program partners recruit qualified geoscientists to work for 3-months to 1-year at a minimal cost to the agency. The poster will provide a program overview and showcase several exemplary GIP projects.

#### **Using Indicators of Hydrologic Alteration (IHA) to Report on Streamflow in the Greater Yellowstone Network**

Susan O’Ney, Resource Management Biologist/Hydrologist, NPS, Grand Teton National Park, Moose, WY  
The Greater Yellowstone Network plans to analyze and interpret streamflow data from selected gages (within the existing network of permanent gaging stations that are being monitored by the United States Geological Survey National Stream Gaging Program) through the use of the analysis program “Indicators of Hydrologic Alteration,” or IHA, that was developed by The Nature Conservancy. IHA is a software program that was developed to facilitate hydrologic analysis in an ecologically meaningful manner. This software program assesses 67 ecologically relevant statistics derived from daily hydrologic data. Comparative analysis can then help statistically describe how these patterns have changed for a particular river or lake due to abrupt impacts such as dam construction or more gradual trends associated with land, water use, and climate changes. The IHA provides a relatively simple way to create informative graphics to assist park resource managers in interpreting and managing their surface water resources.

#### **A Long Term Monitoring Protocol for Invasive Species in the Klamath Network Parks**

Dennis Odion, Research Associate, Southern Oregon University, Klamath Network Parks, Ashland, OR  
Daniel A. Sarr, National Park Service, Klamath Network Coordinator, Southern Oregon University, Ashland, OR  
Ayzik Solamesheh, Department of Plant Science, University of California–Davis, Davis, CA  
Rob C. Klinger, USGS-BRD, Yosemite Field Station, Bishop, CA

Invasive species ranked as the number one Vital Signs monitoring priority for the Klamath Network. During protocol development, the Network quickly realized the number of invasive plant species greatly outstrips available monitoring resources. Therefore, the protocol focuses on early detection of infestations of carefully prioritized species in targeted locations of each park. USGS and NPS scientists using a quantitative ranking system developed the prioritization process. The field sampling targets road and trail corridors across an array of biophysical environments in each park. The design allows not only rapid detection of invasive plant infestations, but also will allow future modeling of invasion risk across the sample frame. Here, we describe the protocol and illustrate

how it successfully performed when tested in Redwood National Park. The design is sufficiently general to be usable in most parks with similar invasive species monitoring goals.

#### **Input of Current-use Pesticides to National Parks and Coastal Areas from Nearby Urban Areas**

James Orlando, Hydrologist, U.S. Geological Survey, Sacramento, CA

Michelle Hladik, Research Chemist, U.S. Geological Survey, Sacramento, CA

Kathryn Kuivila, Research Hydrologist, U.S. Geological Survey, Sacramento, CA

As urbanization increases throughout the United States, national parks and coastal areas may be adversely affected by the input of contaminants. A wide variety of pesticides are applied in urban environments for multiple uses, including gardens, golf courses, lawns, roadsides, structures, and vector control. Runoff from rainfall and irrigation transports these pesticides into surface waters in dissolved form and in association with suspended sediments. Two classes of pesticides, pyrethroid insecticides and conazole fungicides, were detected in the Golden Gate National Recreation Area and the Presidio of San Francisco in a 2006 baseline study. These same compounds were also detected in a California coastal area that receives runoff from residential areas and golf courses. An understanding of pesticide-use patterns combined with spatial analysis using GIS will be used to assess potential runoff of pesticides from urban areas and prioritize national park units and coastal areas for future water quality studies.

#### **Evaluation of Distance Sampling Methodology for Monitoring Landbirds in the Greater Yellowstone Area**

Stacey Ostermann-Kelm, Ecologist, National Park Service, Bozeman, MT

Sue Wolff, Wildlife Biologist, Grand Teton National Park, Moose, WY

Cathie Jean, I&M Program Manager, Greater Yellowstone Network, Bozeman, MT

William Gould, Professor, Department of Economics/IB and University Statistics, New Mexico State University, Las Cruces, NM

The Greater Yellowstone Network (GRYN) pilot landbird monitoring protocol uses a three-prong approach of estimating species-specific density, occupancy, and community dynamics to monitor the status and trends of landbirds in focal habitats during the breeding season. The GRYN pilot protocol was designed to provide a high likelihood of detecting a 20% decline in density over a 15-year period for birds having moderate abundance within the parks. Here, we present results from density estimation using distance sampling methodology. We analyzed point count data collected during 2005–2008 in Grand Teton National Park and evaluated the feasibility of obtaining sufficient sample sizes to meet program objectives. We also consider the tradeoffs required when collecting data for three objectives using a single field visit. Lastly, we provide recommendations for changes to the program to maximize efficiency and ensure that program objectives are achieved.

#### **Game-Theoretic Insights into Effective Collaboration between National Parks and Indian Tribes**

Robert Pahre, Professor, Department of Political Science, University of Illinois at Urbana-Champaign, Urbana, IL

Recent decades have seen park managers move toward a greater emphasis on partnerships with their neighbors, including many Indian Reservations. The practice of collaboration has moved much faster than the theory, reported in case studies that often have weak analytical foundations. This practice makes it hard to identify the salient features of novel collaboration problems. Stronger theory can play a role in helping both scholars and practitioners understand collaboration problems better. This paper examines the strategic setting of collaboration through simple games such as Prisoners' Dilemma, Chicken, Coordination, or Stag Hunt. In many cases, the strategic setting is a variety of Deadlock, in which we should not expect any collaboration at all. Cases from ecosystem management, migratory species, and cultural interpretation illustrate the usefulness of this approach for understanding collaboration problems better.

#### **From Backyards to Rare Communities: Modeling Off-Site Threats to Water Resources in the Potomac Gorge**

Dawn Parker, Assistant Professor, Department of Computational Social Science, George Mason University, Fairfax, VA

Robin Brake, Department of Environmental Science and Policy, George Mason University, Fairfax, VA

Ryan Albert, Department of Environmental Science and Policy, George Mason University, Fairfax, VA

Susan A. Crate, Department of Environmental Science and Policy, George Mason University, Fairfax, VA

R. Christian Jones, Department of Environmental Science and Policy, George Mason University, Fairfax, VA

Giselle Mora-Bourgeois, Urban Ecology Research Learning Alliance, National Park Service, Washington, DC

We need to understand spatially explicit human-natural resource interactions to sustain ecosystems in urbanized landscapes. For urban parks, communicating effectively to neighbors about how their land management practices impact adjacent protected areas is essential to effectively preserve park resources. Using a participatory model that combines social science and ecological tools and data, we are integrating quantified neighbors' practices with land use and water quality models. We show how those linkages are achieved by providing examples of how answers to a survey can be translated into inputs for a water quality model. The scenario-based participatory modeling tool will be used to explore realities and promote best management practices in communities surrounding the Potomac Gorge, a 15-mile portion of the Potomac River that is a biodiversity hotspot crossing two national parks, state and county parks, and residential and commercial properties in Maryland, Virginia, and the District of Columbia.

#### **Responses to Cessation of Fish Stocking Among Lakes of Lassen Volcanic National Park**

Michael Parker, Professor of Biology, Southern Oregon University, Department of Biology, Ashland, OR

Hartwell Welsh, Jr., Research Wildlife Ecologist, USDA–Forest Service, Redwood Sciences Laboratory, Arcata, CA

Daniel Sarr, Inventory and Monitoring Coordinator, Klamath Network, National Park Service, Ashland, OR

Cessation of fish stocking in the 1970s within national parks and wilderness areas has resulted in many lakes returning to a fishless condition. Results of an extensive survey of lentic habitats in Lassen Volcanic National Park revealed that >90% of lakes historically stocked with trout have reverted to a fishless condition. Fish-bearing lakes were on average larger, deeper, and occurred at lower elevations than fishless lakes and included 6 of the 10 largest lakes in the park. Chlorophyll-a concentrations were 6 times greater, Secchi depth 50% lower, and hypolimnetic oxygen depletion greater in fish-bearing than fishless lakes. Comparisons of benthic and planktonic invertebrate assemblages show significantly higher densities of large-bodied, active taxa in fishless lakes suggesting that these components of lake communities are relatively resilient to major shifts in top predator populations, but strong, trophically-

mediated fish effects are likely to persist within the few remaining fish-bearing LNVP lakes.

### **Using 3D to Showcase Marine Resources in Dry Tortugas National Park**

Judd Patterson, GIS Specialist, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

Dry Tortugas National Park lies approximately 70 miles west of Key West, FL. Except for seven small islands, the park's 64,700 acres are underwater. Within these waters are some of South Florida's most spectacular marine communities including coral reefs. The majority of the park's 60,000–80,000 annual visitors tour historic Fort Jefferson and snorkel only in areas immediately surrounding the fort. The South Florida/Caribbean Network is offering glimpses into the remainder of the park by merging its inventory and monitoring data with powerful 3D visualization software. The results incorporate a LIDAR/interferometric sonar model of underwater terrain, a new benthic habitat map, and coral monitoring transect data to ensure the creation of accurate and realistic scenes. The final results are being packaged as high resolution stills and fly-through videos to showcase underwater resources that were previously known only by a few park visitors.

### **Three-pronged Attack on Early Detection of Invasive Exotic Plants**

Dustin Perkins, Program Manager, Northern Colorado Plateau Network, National Park Service, Grand Junction, CO

Dana Witwicki, Northern Colorado Plateau Network, Arches National Park, Moab, UT

Rebecca Weissinger, Northern Colorado Plateau Network, Arches National Park, Moab, UT

Invasive exotic plants fragment native ecosystems, displace native biota, and alter ecosystem function. Regular, comprehensive monitoring of the distribution and abundance of all exotic plants within Northern Colorado Plateau Network (NCPN) units is beyond current fiscal capabilities. Therefore, NCPN is using a three-pronged attack for early detection of invasive plants. First, NCPN will concentrate routine monitoring routes along the most likely areas for invasive plants to occur: riparian corridors, roads, trails, areas of high visitor impact, and park borders. Second, 25% of the annual effort can be directed towards extra-area searches in places that parks need a quick rapid inventory. Third, "Monitoring Light" will collect important information on invasive species through the use of personnel that may not have comprehensive knowledge of the local flora, but can reliably detect high priority species. NCPN reports on the first season of this monitoring effort at Golden Spike NHS and Fossil Butte NM.

### **Adapting to Climate Change through Science-Management Partnerships in the Western United States**

David Peterson, Research Biologist, U.S. Forest Service, Pacific Northwest Research Station, Seattle, WA

Craig D. Allen, USGS Jemez Mountains Field Station, Bandelier National Monument, Los Alamos, NM

Jill S. Baron, USGS, NREL, Colorado State University, Fort Collins, CO

Daniel B. Fagre, USGS Northern Rocky Mountain Science Center, Glacier National Park, West Glacier, MT

Andrew G. Fountain, Department of Geology, Portland State University, Portland, OR

Jessica Halofsky, U.S. Forest Service, Seattle, WA

Jeffrey A. Hicke, Department of Geography, University of Idaho, Moscow, ID

Don McKenzie, U.S. Forest Service, Pacific Northwest Research Station, Seattle, WA

Nathan L. Stephenson, USGS Western Ecological Research Center, Three Rivers, CA

Christina Tague, Donald Bren School of Environmental Science and Management, University of California–Santa Barbara, Santa Barbara, CA

Adaptation to climate change is just beginning on federal lands in the western United States. The Western Mountain Initiative is working with the U.S. Geological Survey and land management partners in the U.S. Forest Service and National Park Service to develop general principles and specific management strategies for adapting to a warmer climate. Initial efforts focus on the Olympic Peninsula (Washington), Sierra Nevada (California), and Rocky Mountains (Wyoming), with a national forest and national park participant at each location. Scientist-manager dialogues are being used to elicit information on potential resource effects and management responses that will reduce vulnerability and increase long-term resilience. Adaptation options will be fully implemented in the management operations and planning at each forest and park. We will build on adaptation principles and options compiled through this process to develop a manager's guide to adaptation that will be applicable throughout the West.

### **Using a Carbon Inventory in the Park Planning Process**

Brad Phillips, Outdoor Recreation Planner, National Park Service, Pacific West Regional Office, Oakland, CA

Parks everywhere are being impacted by climate change, but are also often contributors to the very same problem. The carbon footprint of a park is a product of its design and operation which, in turn, are guided by park planning. This project applied a carbon footprint analysis to management alternatives in the Lava Beds National Monument General Management Plan (GMP) process. The Climate Leadership in Parks (CLIP) tool was used to establish a baseline carbon inventory. The proposed alternatives to the park's current management and design were then analyzed and compared to the baseline. Finally, the resulting carbon footprint comparison of the alternatives was used in the development of a preferred alternative. This new use of the CLIP tool, examining GMP alternatives in light of their carbon footprint, aided the discussions by illuminating the actual sources of carbon emissions in the park and the relative impact of various mitigation alternatives.

### **Stakeholder Involvement in the Development of Social Science Research: ORVs at Big Cypress National Preserve**

Robert Powell, Assistant Professor, Department of Parks, Recreation, and Tourism Management, Clemson, SC

Wade Vagias, Postdoctoral Research Associate, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

Collaboration between park managers, researchers, and stakeholders can reduce tension, develop support for research activities, and assist meeting management objectives. While frequently promoted, providing meaningful stakeholder involvement can be a challenging task for researchers and managers. In 2008 researchers and NPS managers sought ORV (off-road vehicle) stakeholders' involvement and support for a study to be conducted at Big Cypress National Preserve (BICY) that examines the use of education for reducing ORV impacts. ORV management is very contentious at BICY so stakeholder involvement was thought to be essential. A graphic representation of the specific steps undertaken to develop support and involvement will be presented which included



public presentations and discussions as well as collaborative review and refinement of the research. Finally, benefits of participatory processes in the development of social science research are presented.

#### **Monitoring Weather on Five Park Islands in Southern California**

Paula Power, Ecologist, Channel Islands National Park, Ventura, CA

Kathryn McEachern, Botanist, USGS, Ventura, CA

Linda Dye, Biologist, Channel Islands National Park, Ventura, CA

Rocky Rudolph, GIS Specialist, Channel Islands National Park, Ventura, CA

Channel Islands National Park, comprised of the five northernmost islands in the California bight, spans a major transition in climate caused by the mix of cool ocean currents from the north and warm currents from the south. As a result, each island has unique climatic conditions. Climate plays a crucial role in driving or regulating many biological and physical processes. Rainfall, temperature, fog, and cloud cover are primary factors that affect an ecosystem's structure and function. Additional factors include long-term climate patterns: the length and intensity of weather events, seasons in which they occur, and amount of variability between and among years. Together, these dynamics greatly influence where and what types of plant species occur, the ways in which nutrients are cycled, and the relationships between soil, plants, and water availability.

#### **Monitoring Coastal Topography in the Northeast Coastal and Barrier Network**

Norbert Psuty, Director of the Sandy Hook Cooperative Research Programs, Institute of Marine and Coastal Sciences, Rutgers University, Sandy Hook, NJ

Tanya Mendes Silveira, Sandy Hook Cooperative Research Programs, Institute of Marine and Coastal Sciences, Rutgers University, Sandy Hook, NJ

Sara Stevens, Coordinator, Northeast Coastal and Barrier Network, National Park Service, University of Rhode Island Coastal Institute in Kingston, Kingston, RI

Dennis Skidds, Data Manager, Northeast Coastal and Barrier Network, National Park Service, University of Rhode Island Coastal Institute in Kingston, Kingston, RI

Coastal parks are highly dynamic systems, and geomorphologic change is a basic concern of the NPS Northeast Coastal and Barrier Network (NCBN). Multiple approaches are used to monitor the spatial and temporal variability (both periodic and event-driven) in dune/beach topography in the NCBN's coastal parks. Profile surveys are used to characterize cross-shore variations and evaluate the two-dimensional aspect of beach variability. High-resolution topographical surveys are used to create Digital Elevation Models that evaluate three-dimensional changes in morphodynamical behavior in areas that are critical to the parks. These data sets are also analyzed to establish sediment budgets for the beach-dune system over the seasonal, annual, and long-term scale. This monitoring program provides crucial information to park managers on the dynamic nature of coastlines, and represents the scientific foundation for management decision-making.

#### **Monitoring Dall's Sheep Abundance and Distribution in the Central and Western Brooks Range, Alaska**

Kumi Rattenbury, Ecologist, NPS Arctic Network, Fairbanks, AK

Jim Lawler, Coordinator, NPS Arctic Network, Fairbanks, AK

Brad Shults, Wildlife Biologist, Pilot, NPS Western Arctic Parklands, Fairbanks, AK

Josh Schmidt, Data Manager, Central Alaska Network, Fairbanks, AK

The Brooks Range in Alaska (67° to 68°45 min north) is the northernmost extent of Dall's sheep (*Ovis dalli*). Dall's sheep are a management and monitoring priority for the National Park Service in this region because of their value for subsistence and sport hunting and wildlife viewing, and because sheep are relatively sedentary and sensitive to local environmental conditions. Aerial surveys were conducted in 2005, 2006, and 2007 to obtain a population estimate based on stratified random sampling methods. Initial estimates ( $\pm 95\%$  CI) for the region's ~41,000-sq-km sheep habitat are 9950 ( $\pm 2568$ ) sheep in 2005, 9304 ( $\pm 3265$ ) in 2006, and 8115 ( $\pm 3134$ ) in 2007. A long-term monitoring protocol will be developed to detect changes in abundance and distribution of sheep while being adaptive to the difficulties of surveying in this remote area.

#### **Restoring Natural Conditions in Lehman Cave**

Ben Roberts, Natural Resource Program Manager, Great Basin National Park, Baker, NV

Great Basin National Park has begun to restore sections of Lehman Cave, a popular tourist attraction since 1885, to its natural condition. This work includes inventorying areas for endemic cave species, removing abandoned lighting and trail systems, and restoring the natural cave floor to its pre-disturbance condition.

#### **Three Decades of Vegetation Change in the Newberry Mountains of the Eastern Mojave Desert**

Christopher L. Roberts, Public Lands Institute, University of Nevada-Las Vegas, Las Vegas, NV

Scott Abella, Assistant Research Professor, University of Nevada-Las Vegas, Las Vegas, NV

James S. Holland, Lake Mead National Recreation Area, Boulder City, NV

Utilizing long-term data sets with repeatable methodology can provide opportunities for insight into ecological community change. We resurveyed 106 plots from a vegetation community study established in 1979 in Lake Mead National Recreation Area in southern Nevada. Plots encompassed an elevation gradient of 120 to 1,700 m from Colorado River lowlands to pinyon-juniper woodlands in the Newberry Mountains. We remeasured plots in 2007–2008 by repeating the original plant community sampling methods. In comparing 1979 and 2008 data sets we wanted to know if changes have occurred in the vegetation community and if the degree of change differs with elevation and individual species. Significant changes have occurred on this landscape, such as a decrease in the density of long-lived shrubs even in the absence of acute disturbance. For example, *Coleogyne ramosissima* (blackbrush) decreased from an average of 330 plants/ha in 1979 to 180 plants/ha in 2008.

#### **Multi-season Occupancy Models for NPS Inventory and Monitoring Data**

Thomas Rodhouse, Ecologist, National Park Service Upper Columbia Basin Network, Bend, OR



Advancements in estimation and modeling of species occupancy have made this a useful approach for a wide range of applications involving presence/absence data, such as habitat modeling and trend detection. It provides a flexible and convenient means of dealing with several challenging issues, including detectability, and is readily integrated into existing modeling tools used to develop resource selection functions (e.g., logistic regression). Multi-season data can be incorporated into these models to address temporal changes in state variables such as occupancy, extinction and colonization. Hypotheses of underlying processes can be explicitly evaluated as well. Within the NPS Inventory and Monitoring Program, occupancy models are being used with existing inventory data as well as with (rapidly) accruing long-term monitoring data. This poster briefly reviews fundamentals of occupancy modeling, focuses on the unique aspects of multi-season models, and presents several examples from terrestrial vertebrate datasets collected by the NPS Inventory and Monitoring Program.

#### **Virtual Learning Centers: Greater Yellowstone Science Learning Center and Learning Center of the American Southwest**

Ann Rodman, GIS Coordinator, Yellowstone NP, Yellowstone NP, WY

Ben Becker, National Research Learning Center Coordinator, Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA

Robert E. Bennetts, Coordinator, Southern Plains I&M Network, New Mexico Highlands University, Las Vegas, NM

Kathy Tonnessen, Research Coordinator, Rocky Mountains CESU, University of Montana, College of Forestry and Conservation, Missoula, MT

Virtual learning centers are an exciting, web-based manifestation of the Research Learning Center (RLC) program goal of communicating the results of science to park managers, partners, and other audiences. These web sites will be the definitive source of information about the important resources in their associated parks regardless of who paid for or conducted the original research. Besides the obvious benefit of having all resource information available from one source, government mandates and the limitations of NPS fiscal resources demand that we constantly strive to increase efficiency. This strong collaboration between Natural Resource Challenge programs (Cooperative Ecosystem Studies Units, I&M, RLC), individual parks, and our non-NPS partners promotes efficiency by reducing a duplication of effort among programs. These sites provide the partners with a template for posting reports and data, the ability to rapidly report results to inform management decisions, and a forum to increase awareness of research needs.

#### **The Santa Monica Mountains BioBlitz and Celebrate Biodiversity Festival**

Raymond Sauvajot, Chief of Planning, Science, and Resource Management, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA

Timothy Watkins, Program Officer, Research, Conservation, and Exploration, National Geographic Society, Washington, DC

Lena Lee, Inventory & Monitoring Data Manager, Mediterranean Coast Network, Thousand Oaks, CA

Mark Christmas, Media Outreach Manager, Research, Conservation, and Exploration, National Geographic Society, Washington, DC

Margaret Steigerwald, Outdoor Recreation Planner, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA

Lisa Okazaki, Park Ranger, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA

John Francis, Vice President, Research, Conservation, and Exploration, National Geographic Society, Washington, DC

The Santa Monica Mountains BioBlitz, held over 24 hours on May 30–31, 2007, was a ground-breaking event for the Santa Monica Mountains National Recreation Area. Jointly sponsored by the National Park Service and National Geographic Society in cooperation with many other agencies and organizations, the BioBlitz provided opportunities for the public to work directly with scientists as they combed the more than 150,000-acre Santa Monica Mountains searching for species representing all taxonomic groups. Over 6,000 people participated in the two-day event, including 120 scientists and 1,400 K-12 students. In addition to species inventories, BioBlitz attendees also participated in fun and educational activities as part of the concurrent Celebrate Biodiversity Festival. The BioBlitz species count is now over 1,700, including documentation of species never before surveyed in the park. Post-BioBlitz excitement continues, with schools continuing their involvement in park science activities and researchers following up with new species inventories targeting under-studied groups.

#### **Collecting and Using Attended Audibility Logging Data for Soundscape Management and Planning and Avian Surveys**

Dave Schirokauer, Biologist, Natural Resources Program Manager, Klondike Gold Rush National Historical Park, Skagway, AK

Emma Lynch, Acoustic Technician, Natural Sounds Program, Fort Collins, CO

Attended audibility logging is the practice of listening and logging the duration of natural and anthropogenic sound events during a set listening session. These data are summarized as the percent time audible, mean sound event duration, and number of events for each sound type. Also calculated, the noise free interval is time during which natural, or intrinsic, sounds are uninterrupted by anthropogenic, or extrinsic, sounds. This paper will present a handheld computer (Palm PDA) tool and database for the collection, storage, and analysis of attended listening data for the purpose of soundscape management and planning. This tool also functions as a platform for recording data during point count bird surveys.

#### **Monitoring Air Quality in Southeast Alaska: Linking Ambient and Depositional Pollutants with Ecological Effects**

Dave Schirokauer, Biologist, Natural Resources Program Manager, Klondike Gold Rush National Historical Park, Skagway, AK

Results of a 1998–99 pilot study in Klondike Gold Rush NHP revealed that local lichens had higher levels of heavy metals and sulfur in lichen tissues than baseline values established on the surrounding Tongass National Forest. In 1998–99 the KLGO–Skagway area exceeded lichen tissue air pollution indicator thresholds set by the USDA-Forest Service for heavy metals, sulfur and other elements. Since then, visitation and the associated transportation needs (busses, trains, and cruise ships) have increased by 57%. This presentation will describe the follow-up study underway in the southeast Alaska network designed to: 1) Track trends in air quality; 2) Contribute to the development of models linking ambient conditions to concentrations of pollutants in lichen tissue by deploying passive air concentration and deposition samplers; 3) Assess the effects of air pollution on lichen community composition; 4) Collect data on lichen community composition for future trends analysis.

#### **Enabling Quantitative Management of the Virginia Coastal Bays at Assateague Island National Seashore**

Courtney Schupp, Coastal Geologist, NPS Assateague Island National Seashore

Darlene Wells, Coastal Geologist, Maryland Geological Survey  
Sara Stevens, Northeast Coastal and Barrier Network

ASIS partnered with the Maryland Geological Survey (MGS) to collect bathymetry and sediment data for the Virginia Coastal Bays. Funding was provided by the NPS Northeast Coastal and Barrier Network Inventory and Monitoring Program. With this data set, ASIS can manage and protect all of its estuarine waters equally and as one holistic system. The information will be integrated into ongoing research efforts to address several specific management concerns in a quantitative manner. Following the successful methods used by MGS in the Maryland Coastal Bays, ASIS collected sediment samples, and MGS conducted bathymetric surveys and analyzed sediment samples.

#### **How Vital is It? Periphyton Based Bioassessment of Near Pristine Oligotrophic Glacier NP Streams**

Billy Schweiger, Ecologist, Rocky Mountain Inventory and Monitoring Network, Fort Collins, CO

Loren Bahls, Senior Scientist, Hannaea Consulting, Helena, MT

Patrick Kociolek, Professor and Director, Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO

Isabel Ashton, Ecologist, Rocky Mountain Network, National Park Service, Fort Collins, CO

Donna Shorrock, Ecologist, Rocky Mountain Network, National Park Service, Fort Collins, CO

Ric Hauer, Professor of Limnology, University of Montana, and Flathead Lake Biological Station, Polson, MT

A key but poorly addressed goal of the NPS Vital Signs program is to conduct scientifically rigorous interpretation of monitoring results.

ROMN stream monitoring attempts to do this through a variety of approaches; we present a summary of ongoing bioassessment using periphyton assemblages. Our protocol includes a diverse suite of response measures at probabilistic survey and targeted sample sites. Park-scale estimates of condition are derived from surveys and site-level trend from targeted sites. Periphyton autecology make them ideal for integrative monitoring and assessment. Tools such as multimetric and observed to expected models augment these capabilities by incorporating response to stressors that often vary in subtle ways and may be potentially confused with natural variability in near pristine oligotrophic parks like Glacier. Our survey allows delineation of empirical reference condition distributions to which we calibrate bioassessment models. Finally, we assess measured park periphyton assemblages using existing ecoregional and state scaled biocriteria.

#### **Land Use Change Early Warning System**

Martha Segura, Network Coordinator/Gulf Coast Network, National Park Service, Lafayette, LA

Development adjacent to parks contributes to increased presence of invasive species, habitat fragmentation, litter and debris, visitor impacts, and impacts to water and air resources on parks. Remote sensing-based approaches provide a record of changes in the landscape, but do not provide managers the ability to react before, or as changes are occurring. The GULN protocol augments the historic approach by providing "early warning" of upcoming changes in land use. The system compiles publicly available information about changes in land use and provides the park information in a format that is geographically linked, easy to use, and able to be frequently updated. The intent is to give managers information needed to plan for upcoming changes in land use near the park, providing information as near "real time" as possible while also compiling changes in ownership or zoning status that will provide larger trends in land use change over time.

#### **Accuracy Assessment of the 2008 Terrestrial Vegetation Map of Biscayne National Park (BISC), FL**

Brooke Shamblyn, Vegetation Technician, National Park Service, South Florida Caribbean Network, Palmetto Bay, FL

Kevin R.T. Whelan, Ecologist, National Park Service, South Florida Caribbean Network, Palmetto Bay, FL

Judd Patterson, GIS Specialist, National Park Service, South Florida Caribbean Network, Palmetto Bay, FL

Andrea Atkinson, Quantitative Ecologist, National Park Service, South Florida Caribbean Network, Palmetto Bay, FL

The terrestrial vegetation of 41 mangrove-dominated islands as well as the mangrove-dominated mainland shoreline of Biscayne National Park was mapped using a vector based approach. Photo-interpretation was based on 2005 aerial imagery (30cm, 5-band) as well as 2002 LIDAR data (mainland only). The map of the 20,913 terrestrial acres had 4,998 polygons representing 103 vegetation classes. During map creation, 1,081 field verification points were visited by boat, on foot, or by helicopter. To determine the final map accuracy within the vegetation map categories we randomly selected 392 accuracy assessment points across all classification types. Assessment consisted of helicopter visitation to each selected point by two botanists and agreement that the observed vegetation community corresponded to the map attribute. To accomplish this we used "on the fly" processing, utilizing ARCMAP from a laptop computer connected to a GPS unit to determine percent accuracy by map category and of the overall map.

#### **Upland Vegetation and Soils Monitoring in Rocky Mountain Region Parks: Lessons Learned and Future Challenges**

Donna Shorrock, Ecologist, National Park Service, Rocky Mountain I&M Network, Fort Collins, CO

Isabel W. Ashton, Ecologist, National Park Service, Rocky Mountain I&M Network, Fort Collins, CO

The Rocky Mountain I&M Network has identified upland vegetation composition, structure, and soils (VCSS) as one of twelve high priority Network Vital Signs. Vegetation and soil communities characterize the landscape and are fundamental determinants of basic ecosystem function and wildlife habitat quality. In 2006, we developed and began pilot testing the VCSS protocol in grassland, shrubland, and pine-juniper woodland systems in four Network parks (LIBI, GRKO, FLFO, GLAC). Throughout the pilot study process, we characterized current vegetation communities and soil conditions, compared and refined field methods, and started to establish "normal" seasonal variability. Over time, the protocol aims to monitor changes in the biophysical structure and function of target communities as they are affected by systemic drivers. Using analyses integrated with other Vital Signs data (e.g., weather and climate, landscape dynamics), we expect to establish correlation between observed changes in target communities and drivers and stressors of ecosystem function.

#### **Estimating Brown Bear Abundance and Occupancy in the NPS Arctic Network**

Brad Shults, Wildlife Biologist, Pilot, National Park Service, Western Arctic National Parklands, Kotzebue, AK

Jim Lawler, Arctic Network Inventory and Monitoring Coordinator, National Park Service, Fairbanks AK

Mark Lindberg, Institute of Arctic Biology and Department of Biology and Wildlife, University of Alaska–Fairbanks, Fairbanks, AK  
Managing brown bear populations presents biological, cultural, and legal challenges for park managers. Baseline ecological data are lacking for brown bear populations in the Arctic Monitoring Network (ARCEN) despite increasing harvest, viewing demands from the public, and increasing bear-human interactions. The purpose of this project is to develop a population monitoring protocol that has statistical validity, is cost-effective, and can be implemented across the network. Population monitoring objectives include both abundance and occupancy estimation. To develop this technique and associated protocol, we have completed 4 brown bear abundance/occupancy aerial surveys since 2005 in 3 of 4 proposed survey areas within the ARCEN park units. During 28 May–6 June 2008, an aerial, direct-count survey was completed in a 20,772-sq-km area of the lower Noatak River drainage that includes all lands within CAKR and the western portion of NOAT. We employed a stratified, simple random sample design with double-sampling to estimate the abundance of brown bears and to determine brown bear occupancy. During 233 hrs of aerial surveys, we surveyed 68 sample units (i.e. 37% of sample units) and double-sampled 44% of completed sample units. Protocol development will be completed and fully implemented during 2009.

#### **Mapping and Classifying Shallow-water Marine Habitats at Fire Island National Seashore, New York**

Emily Shumchenia, Graduate Student, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI  
John King, Professor of Oceanography, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI  
Marisa Guarinello, Graduate Student, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI  
Charles Roman, Director, National Park Service Cooperative Unit, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI

Carol Gibson, Marine Research Specialist, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI  
The purpose of this study was (1) to assess the effectiveness of traditional habitat mapping tools in very shallow water (< 5 meters) environments; and (2) to develop a pilot habitat classification scheme for Fire Island National Seashore subtidal habitats. Our study was conducted in a small area of Great South Bay, NY that represented several types of benthic habitats, including sea grass beds. We tested several acoustic tools for habitat mapping, including side scan sonar, interferometric sonar, and single beam sonar. Ground-truthing was attempted using underwater video, a sediment profile imagery (SPI) camera, and sediment grab samples. All of the acoustic tools were used successfully for shallow water mapping, and all ground-truthing methods except underwater video were effective. Resulting data were incorporated into a multi-layer, GIS habitat map, and organized using NOAA's draft classification scheme "Coastal and Marine Ecological Classification Standard" (CMECS).

#### **Northeast Coastal and Barrier Network: Long-term Monitoring of Shoreline Position in Four Northeastern Coastal Parks**

Dennis Skidds, Data Manager, NPS Northeast Coastal & Barrier Network, University of Rhode Island, Kingston, RI  
Sara Stevens, Coordinator, NPS Northeast Coastal & Barrier Network, University of Rhode Island, Kingston, RI  
Norbert Psuty, Director, Sandy Hook Cooperative Research Programs, Rutgers University, Institute of Marine and Coastal Sciences, Sandy Hook, NJ  
Tanya Silveira, Research Associate, Sandy Hook Cooperative Research Programs, Rutgers University, Institute of Marine and Coastal Sciences, Sandy Hook, NJ  
Aaron Love, Research Associate, Sandy Hook Cooperative Research Programs, Rutgers University, Institute of Marine and Coastal Sciences, Sandy Hook, NJ

Understanding the magnitude and rate of change in shoreline position is necessary to the management of coastal parks. Shoreline change can impact the structure and function of natural resources, as well as pose challenges to the management of cultural resources and park infrastructure. In order to make effective decisions, resource managers need accurate, long-term data and scientific understanding about the temporal and spatial patterns of shoreline change within a park. The Northeast Coastal and Barrier Network (NCBN) has partnered with Rutgers University's Institute of Marine and Coastal Sciences to develop a protocol for tracking shoreline position using highly accurate Global Positioning Systems (GPS). The focus is to characterize the variability in shoreline position; identify areas of management concern; and describe seasonal, annual, and long-term trends. This protocol represents the first of several geomorphological monitoring protocols to be implemented in NCBN parks.

#### **A Flora of Lava Beds National Monument**

Sean Smith, Biological Technician–Plants, Klamath Network, National Park Service, Ashland, OR  
Daniel Sarr, Inventory and Monitoring Coordinator, Klamath Network, National Park Service, Ashland, OR  
Lava Beds National Monument is located near the junction of the Sierra, Klamath, Cascade, and Great Basin geological provinces in northeast California. This modest-sized park has historically had limited ability to support long-term botanical expertise in-park. The Klamath Network Inventory and Monitoring Program provided funding to Southern Oregon University to develop a floristic manual that could aid seasonal employees in quickly learning the park ecology and flora. Over three summers we conducted back-ground research and extensive floristic fieldwork in the park. The resulting flora, while largely representative of the Great Basin floristic province, also reflects elements of the adjacent Cascade and Klamath/Siskiyou regions. This project added 91 species to the Lava Beds National Monument vascular plant list. In total, 368 vascular plant species (including subspecific taxa) have been collected from Lava Beds National Monument. We are currently pursuing publication of the flora with Oregon State University Press.

#### **Engaging Native Alaskan Students and Their Community in Local Hot Springs Research**

Wendy Smythe, Graduate Student, Portland State University, Cornelius, OR  
Sherry L. Cady, Assistant Professor, Department of Geology, Portland State University, Portland, OR  
Representatives from Portland State University are working closely with Haida Native Communities to achieve a better understanding of the physical, chemical, and biological processes active within Southeast Alaska hot spring ecosystems. A carbonate depositing spring, situated on one of the native islands located along the Pacific Ocean near Hydaburg, is the project focus. Our approach—to integrate Traditional Ecological Knowledge and Western Science education—will provide Native American/Alaskan Native communities a broad context within which to learn about Pacific Northwest hydrothermal ecosystems. The main project goal is to



demonstrate that a better understanding of this microbially dominated ecosystem will encourage Native students at the high school and middle school levels to pursue advanced degrees and careers in geoscience and natural resources.

### **Interesting Results from the First Five Years of Climate Monitoring in the Central Alaska Network**

Pamela Sousanes, Physical Scientist, National Park Service, Denali Park, AK

Over the past five years the Central Alaska Inventory and Monitoring Network (CAKN) has been monitoring weather conditions at sixteen new remote locations in Denali, Wrangell-St. Elias and Yukon-Charley Rivers. This represents one of the few networks in the state that has an array of sites at higher elevations. These data are providing information on the persistent winter inversions that are common from late October through March in the continental interior of Alaska. The average monthly temperatures at these locations are consistently warmer than the surrounding lowland areas. Current data trends at long-term stations show some of the warmest periods have occurred within the past seven years. Within this same time frame there were also record cold months. When compared with climate normals from long-term sites, the data from the new CAKN sites reveal interesting information on seasonal variations and elevation gradients within the parks.

### **A Strategy for Success: Developing the Climate Monitoring Vital Sign in the Alaska Region**

Pamela Sousanes, Physical Scientist, National Park Service, Denali Park, AK

The Alaska Region Inventory and Monitoring Program has taken a collaborative approach to developing the climate vital sign for the four networks of Alaska. Together, the Central Alaska, Southwest Alaska, Arctic, and Southeast Alaska networks, cover over 54 million acres of national park lands. The Central Alaska Network developed protocols that were based on interagency partnerships and support from the existing climate knowledge base in the state. By combining resources, sharing protocols, and taking a regional approach rather than an individual network approach, the Alaska region can be more efficient and consistent in methodology and results. The strategy works because of partnerships with the Western Regional Climate Center, the Natural Resources Conservation Service, U.S. Geological Survey, and the National Weather Service. Together we can provide the expertise and staffing levels to make this a successful long-term monitoring effort.

### **Managing Data from Continuous Water Quality Monitors in the Upper Columbia Basin Network**

Eric Starkey, Biological Technician, National Park Service, Upper Columbia Basin Network, Moscow, ID

As an increasing number of Inventory and Monitoring Networks use continuous water quality monitors there is an increased need for efficient data processing and analysis. In 2008, continuous water quality datasondes were deployed in Lapwai Creek at Nez Perce Historical Park, Idaho and Mill Creek at Whitman Mission Historical Site, Washington. Water chemistry data was recorded hourly between June and November resulting in 6 months of time series data. In an effort to more efficiently manage water quality data the UCBN agreed to pilot test Aquarius Time-Series Software produced by the Aquatic Informatics Company in Vancouver, British Columbia. The Aquarius program streamlines record processing and allows tracking of data corrections and deletions. A number of additional features will also prove useful for analysis and record compilation. The UCBN anticipates that Aquarius Time-Series Software will help standardize the processing and QA/QC of continuous water quality data within the National Park Service.

### **Effect of Persuasive Messages on Campers' Littering Behavior at Dispersed Campsites**

Paulina Starkey, Graduate Student, University of Idaho, Moscow, ID

Troy Hall, Associate Professor, College of Natural Resources, University of Idaho, Moscow, ID

Two persuasive signs targeting littering were installed at dispersed campsites in the Wenatchee National Forest, Washington. One focused on beliefs regarding the effects of litter on wildlife ( $n=38$ ), and the other emphasized social norms (the effect on other campers;  $n=45$ ); these were compared to a control in which there was no message ( $n=39$ ). During the data collection period, visitors' characteristics were recorded, and after sites were vacated, litter items were sorted and weighed. Results showed a significant difference between the control and the two treatments: the normative sign was the most effective (Med = 7 pieces of litter, 0.05 kg of litter), while the signs focused on effects to wildlife (Med = 20 pieces of litter, 0.16 kg of litter) and the control (Med = 32 pieces of litter, 0.11 kg of litter) were less effective. Further analysis will include group characteristics and their effects on the results.

### **Exploring the Fire-Archeology Interface in the Midwest Region**

Jay Sturdevant, Archeologist, National Park Service, Midwest Archeological Center, Lincoln, NE

Rod Skalsky, Fire Management Officer, Theodore Roosevelt National Park, Medora, ND

Cody Wienk, Regional Fire Ecologist, National Park Service, Midwest Regional Office, Omaha, NE

This multi-disciplinary project was designed to provide scientific data on the fire/archeology interface in the Midwest Region. Previous studies have demonstrated that fire can significantly impact the archeological record. Therefore, a region-wide, multipark, multi-environment study was developed to provide data relevant to the fire management and archeological resource needs specific to the Midwest Region. The objective of this project was to conduct experimental burns at six Midwest Region National Park Service units to collect data on fire conditions and observe the impacts to surface archeological materials. Two parks were selected from three distinct environmental zones in the Midwest Region. Experiments were designed to accurately model the typical prescribed fire conditions and archeological resources at each park. Results from these experiments include (1) accurate data on fire conditions, (2) an assessment of the impacts on archeological resources, and (3) recommendations for reducing the impacts to the archeological record.

### **Developing Thresholds for Salt Marsh Fish and Vegetation for the Northeast Coastal and Barrier Network**

Jeffrey Swanson, Graduate Student, University of Rhode Island, Narragansett, RI

Mary-Jane James-Pirri, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI

Under the National Park Service Vital Signs Monitoring program long-term sampling of salt marsh ecosystems has been conducted at coastal park units from Maine to Virginia in the Northeast Coastal and Barrier network. Nekton (free swimming fish and crustaceans) and vegetation data were collected using a established National Park Service protocols at 77 marshes and the resulting database contains species densities in 7,939 individual nekton samples and vegetation percent cover from 4,221 sample plots. The



data are to be analyzed using multivariate statistical techniques to identify patterns in community structure related to region, level of hydrologic impact, and watershed development. Early analyses indicate a relationship between nekton guilds and some aspects of watershed development. Development of these thresholds will assist the National Park Service Inventory and Monitoring program in the detection of long-term changes of salt marsh ecosystems within their park units.

#### **Plant Community Composition and Structure Monitoring Protocol for the Northern Great Plains Network**

Amy Symstad, Research Ecologist, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Hot Springs, SD

Robert A. Gitzen, University of Missouri, Department of Fisheries and Wildlife Sciences and NPS Northern Great Plains Inventory and Monitoring Network, Rapid City, SD

Cody L. Wienk, National Park Service, Midwest Regional Office, Omaha, NE

Daniel S. Licht, National Park Service, Midwest Regional Office, Rapid City, SD

Andy D. Thorstenson, National Park Service, Northern Great Plains Fire Ecology Program, Rapid City, SD

Michael Bynum, National Park Service, Northern Great Plains Inventory and Monitoring Network, Rapid City, SD

Kara J. Paintner, National Park Service, Northern Great Plains Inventory and Monitoring Network, Rapid City, SD

Upland plant communities and riparian plant communities will be two core vital signs of the Northern Great Plains Inventory and Monitoring (I&M) Network. Monitoring of these vital signs will be conducted according to the plant community composition and structure protocol. Developed in collaboration with the Northern Great Plains Fire Ecology Program and coordinated with the Heartlands and Southern Plains I&M Networks, the protocol is slated for review and revision in 2008–2009 and implementation in 2010. This poster briefly describes the objectives, sampling and response design, field methods, and data management and analysis components of the NGPN vegetation protocol, as well as the pilot studies, sample size analyses, and motivations that drove the decisions made regarding these components.

#### **Discovering User Stories for a Vegetation Map Website**

Judy Teague, Vegetation Ecologist Project Manager, NatureServe, Durham, NC

Diane Pavak, Research Coordinator, Urban Ecology Research Learning Alliance, Washington, DC

Giselle Mora-Bourgeois, Science Education Coordinator, Urban Ecology Research Learning Alliance, Washington, DC

The National Capital Region (NCR) is working in partnership with NatureServe (a conservation-based nonprofit organization) to classify, describe, and map the plant communities of 11 of NCR's parks, using the U.S. National Vegetation Classification System. A collaborative project through the Urban Ecology Research Learning Alliance, NCR's Research Learning Center, is translating the highly technical vegetation maps and plant community descriptions into understandable interpretive and educational products. Park staff, visitors, and the public will be able to retrieve vegetation maps and plant community information from an interactive website. Focus sessions unveiled user stories from park managers; planners; interpreters; education specialists; researchers; volunteers in visitor centers, leading walks, and photographing; online junior rangers, and the general public such as birders, home schooled children, and gardeners. These user stories revealed the multiple applications of these data sets. This poster presents examples of the value and potential uses of vegetation maps.

#### **A Conceptual Framework for Developing Effective Sampling Designs for Monitoring Natural Resources**

William Thompson, Ecologist, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

Amy E. Miller, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

Dorothy C. Mortenson, National Park Service I&M Program, Southwest Alaska Network, Anchorage, AK

We describe an iterative, three-phased process of developing sampling designs for monitoring natural resources. The first phase generates a sampling frame that encompasses the resource(s) and area of interest, and delineates those portions where resource condition(s) could be effectively monitored by remote imagery, aerial surveys, or ground sampling. A key component of this phase is to identify major technological, budgetary, and access constraints that could limit the type and scope of the sampling design. The second phase identifies which units to sample (combined spatially balanced random sampling and targeted nonrandom sampling), how often to sample them, and the relevant magnitude(s) of change and time period of interest. The third phase uses simulations and empirical data to evaluate how well the proposed design can detect trends of a specified magnitude and statistical confidence. We provide examples from monitoring programs being developed for southwest Alaska parks to illustrate our approach.

#### **Geospatial Techniques for Crime Analysis in National Forests**

Jo Tynon, Assistant Professor, Recreation Resource Management Program, Oregon State University, Corvallis, OR

Michael G. Wing, Associate Professor, Forest Engineering Department, Oregon State University, Corvallis, OR

Evidence indicates that crime is also a part of the natural resource setting. Crime has significant impacts not only to visitor experiences but also to staff safety. We examined spatial patterns of crime incidents in national forests in the Pacific Northwest by analyzing a crime database of felonies, infractions, and misdemeanors during two calendar years at several spatial scales. We applied several geospatial analytical techniques to investigate crime patterning including quadrat analysis, nearest neighbor analysis, and nearest neighbor hierarchical clustering. These geospatial tools were beneficial in identifying crime incident relationships. Specifically, nearest neighbor analyses confirmed spatial patterning of crime incidents in three national forests. We believe spatial statistical analysis of crime incidents can help resource managers understand the relationships between crime patterns, natural resources, and infrastructure. Spatial statistical analysis can also contribute to natural resource law enforcement by identifying where crime is prevalent and where it occurs with greatest frequency.

#### **Thinking Like a Researcher and a Fact Sheet: Collaboration with Researchers for Education Outcomes**

Lucy Tyrrell, Research Administrator, Denali National Park and Preserve, Denali Park, AK

Researchers are accustomed to sharing results in specialized journals or as technical posters and talks. I have worked with researchers after their experiences in Denali to create fact sheets for a general audience. The researcher provides text and figures to show methods and results, and I edit the text, create a two-page layout, and email a draft PDF to the researcher with questions and comments. The researcher(s) and I work back and forth, until we are satisfied that the message is clear and accurate. The outcomes are (1) a

printed fact sheet about the research process and results, and (2) an increased ability by the researcher to share data in a straightforward, simplified manner. When researchers working in national parks are able to clearly communicate their research results, they connect people with park resources, build support for research in parks, and provide information for science-based management of protected areas.

#### **Nekton as Indicators of Salt Marsh Restoration Success: The Cape Cod Experience**

Megan Tyrrell, Research and Monitoring Coordinator, Cape Cod National Seashore, Wellfleet, MA

Holly Bayley, Aquatic Ecology Technician, Cape Cod National Seashore, Wellfleet, MA

As part of the North East Coastal Barrier network vital signs monitoring, Cape Cod National Seashore has been conducting nekton sampling in tidally restricted ecosystems. Due to their high mobility, nekton are frequently monitored to assess the success of a tidal restoration. We present nekton monitoring data from East Harbor and Moon Pond, a freshwater lagoon and wetland, respectively, which were partially restored in 2002. We analyzed a suite of metrics (species richness, diversity, salinity tolerance, density, and length frequency distribution) for pre- and post- restoration nekton data. Long term water quality monitoring is also presented in context of changes in nekton community structure. Key indicator nekton species and metrics for Cape Cod National Seashore are presented and compared with similar studies in the region.

#### **Response of a Dragonfly Assemblage to Hydrology and Vegetation in Freshwater Marshes of the Everglades**

Raul Urgelles, Wildlife Technician, National Park Service, South Florida/Caribbean Network, Palmetto Bay, FL

Joel C. Trexler, Professor, Florida International University, Department of Biological Sciences, Miami, FL

Dragonfly larvae are important predators of other aquatic animals and can have significant impacts on aquatic communities and food-web structure. Abiotic conditions such as hydroperiod not only have direct effects on larval dragonflies through mortality caused by periodic dry-downs, but also indirectly affect them by changing habitat structure, which can bring about subsequent changes to the assemblage composition. In the Florida Everglades, water management practices have resulted in an altered hydrology that has changed the spatial and temporal distributions of fish and aquatic invertebrates, with cascading effects on higher trophic levels such as wading birds. We used 11 years of regional monitoring data to determine the effects of hydrology and vegetation on the absolute and relative abundances of the larvae of fifteen dragonfly species. Understanding the associations between the dragonfly assemblage and these environmental variables will allow us to use larval dragonflies as biological indicators.

#### **Spreadsheets Across the Curriculum: Developing a Geology of National Parks Collection**

H.L. Vacher, Professor, Department of Geology, University of South Florida, Tampa, FL

Spreadsheets Across the Curriculum (SSAC) is an NSF-funded project (DUE 0442629) in which college educators came together in workshops to create educational modules to teach quantitative literacy (QL) in non-mathematics context. The modules are stand-alone ca. 15-slide PowerPoint presentations that guide students to build Excel spreadsheets to study quantitative concepts "in context." The modules are housed in the General Collection of the SSAC Website ([http://serc.carleton.edu/sp/ssac\\_home](http://serc.carleton.edu/sp/ssac_home)) hosted by the Science Education Resource Center (SERC). SSAC has now been funded (NSF DUE 0836566) to bring the SSAC pedagogy into the widely taught Geology of National Parks course for non-science majors. The new project is funded to build a Geology of National Parks collection for the SSAC collection in collaboration with eight NPS Research Learning Centers. We aim to focus on environmental-geological content that comports with the science to support the management philosophy of the NPS Natural Resource Challenge.

#### **Deer Management at Apostle Islands NL: Efforts to Protect Rare Plant Communities**

Julie Van Stappen, Branch Chief, Natural Resources, Apostle Islands National Lakeshore, Bayfield, WI

Jim Nepstad, Chief, Planning and Resource Management, Apostle Islands National Lakeshore, Bayfield, WI

Deer management within the park is complex. The park's 21 islands have a diverse deer history. A few islands were not historically impacted by browsing and contain rare forest communities dominated by Canada yew (*Taxus canadensis*), a species nearly extirpated on the mainland. Hunting is allowed within the park's enabling legislation and deer management is closely coordinated with both the State and local tribes. A Wildlife Management Plan and EA for Harvestable Species was recently completed. Consistent with the plan, the park has begun to implement aggressive culling activity to reduce the numbers of deer on islands that are being heavily impacted by overbrowsing. Various techniques are being used including: State hunting (hunting is allowed within APIS); NPS cullers; volunteer cullers; and the use of clover traps. This paper will discuss the park's approach to this difficult and complex natural resource issue as well as lessons learned.

#### **New Approaches to Benthic Habitat Mapping for Biscayne National Park**

Robert Waara, Marine Bio Tech, South Florida/Caribbean Network, Miami, FL

Benjamin Ruttenberg, South Florida/Caribbean Network, Miami, FL

The South Florida/Caribbean Network (SFCN) has partnered with the Florida Wildlife Research Institute to create a benthic habitat map for Biscayne National Park. The map was created from 1 foot resolution aerial photography collected in 2006. Habitats are classified as coral reefs, seagrass beds, bare sand, or exposed rock or pavement. The SFCN performed an accuracy assessment of the various map attributes in order to evaluate map thematic accuracy. A LIDAR survey was flown in Fall 2008 to add an additional map layer of high resolution bathymetry, or depth. These two products will be synthesized to provide a realistic three dimensional view of the underwater resources. Both datasets will be instrumental in the stratification, evaluation, and expansion of marine benthic community monitoring of coral reefs, seagrass, reef fish, lobster, and other marine Vital Signs in the park.

#### **Long-Term Vegetation Monitoring in South Florida and the Caribbean**

Steve Wathen, Post-doctoral Researcher, Florida International University and South Florida Caribbean Inventory and Monitoring Network, National Park Service, Palmetto Bay, FL

Kevin R. T. Whelan, South Florida Caribbean Inventory and Monitoring Network, National Park Service, Palmetto Bay, FL

Brooke Shamblyn, South Florida Caribbean Inventory and Monitoring Network, National Park Service, Palmetto Bay, FL

Judd Patterson, South Florida Caribbean Inventory and Monitoring Network, National Park Service, Palmetto Bay, FL

Long-term vegetation monitoring will detect changes through time in plant community composition and structure in four South Florida and three Virgin Island national parks. At the local scale, we will detect changes using permanent belt transects across plant community ecotones and within individual community types. At the landscape scale, we will detect change using differences between past, current, and future aerial photographs and vegetation maps. We are creating a geodatabase to spatially display historic and current vegetation plot locations and areas covered by vegetation mapping. At the local scale, we will be resampling several historic vegetation study plots using both historic and newly developed protocols to detect change over the same time period. At the landscape scale, we are undertaking a proof of concept test using historic and current aerial photographs and vegetation maps to detect changes in part of Everglades National Park over the past 30 years.

### **Integrating Science, Planning, and Management, Role and Contributions of the Water Resources Division's Planning Program**

Don Weeks, Hydrologist, National Park Service, Water Resources Division, Denver, CO

David Vana-Miller, National Park Service, Water Resources Division, Denver, CO

Over the past four years, the NPS Water Resources Division (WRD) has taken a close look at the coordination and integration between science, planning, and park management. Using the NPS 2004 Park Planning Program Standards as the guide, WRD is participating with NPS regions, planners, and parks to: 1) better understand the various elements of the NPS planning framework and how they are developed for parks, 2) learn the water-related questions being asked of parks through these various planning efforts, and 3) providing answers to those questions, which can be incorporated into the park planning documents and ultimately applied to science-based management decisions. In FY08, WRD teamed with other Natural Resource Program Center divisions, including the NPS Inventory and Monitoring networks, on select park-planning efforts to incorporate additional natural resource information (geologic, air, etc.) into the various planning products.

### **Disturbance Impacts on Aquatic Macroinvertebrate Assemblages in Springs and Seeps of the Colorado Plateau**

Rebecca Weissinger, Ecologist, National Park Service, Northern Colorado Plateau Network, Moab, UT

Dustin Perkins, National Park Service, Northern Colorado Plateau Network, Biology Department, Mesa State College, Grand Junction, CO

Dave Thoma, National Park Service, Northern Colorado Plateau Network, Zion National Park, Springdale, UT

Springs and seeps are isolated pockets of biodiversity in the arid environments characteristic of the Colorado Plateau and have been selected as a vital sign of regional ecosystem health. Aquatic macroinvertebrate assemblages can serve as indicators of water quality, habitat diversity, and disturbance history for these sites. Due to the natural variation in water quality and habitat diversity available at springs, the Northern Colorado Plateau Network (NPCN) sampled springs at six national park units and in surrounding public lands to determine macroinvertebrate response to a gradient of natural and anthropogenic disturbances. Water quality, aquatic macroinvertebrate, and site impact data were collected at 35 sites, from highly disturbed areas to relatively pristine springs. Data are summarized to indicate which variables correspond to a reduction in key indicators for springs and seeps. These indicators will be incorporated into NPCN's long term springs and seeps monitoring program.

### **Our Natural Wonders are Cultural Landscapes: Re-evaluating U.S. World Heritage Sites, A Yosemite Case Study**

Louis Wertz, Student, Master's Program in World Heritage Studies, Brandenburg Technical University-Cottbus, San Francisco, CA

In 2003, the UNESCO World Heritage Center concluded a conference report on cultural landscapes by calling on State Parties to reassess their World Heritage sites to "ensure that cultural landscape potential is recognized through re-nomination if appropriate."

In the summer of 2008 Yosemite National Park completed such a re-assessment, which demonstrated that Yosemite is a prime candidate for re-nomination to the World Heritage List. The park's cultural landscape is, among other things, illustrative of the history of the protected area movement. Re-nomination of Yosemite presents a unique opportunity for the United States to recall its role in founding and spreading that immensely powerful idea, and for the World Heritage community to ratify the universal importance of a type of land-use fundamental to its mission. This paper will present the arguments for re-nomination in the context of recent trends in the World Heritage community and the National Park Service's centennial and examine the benefits to other parks of pursuing a similar re-assessment.

### **Accuracy Assessment of Vegetation Map for Western Big Cypress National Preserve and Everglades National Park**

Kevin R. T. Whelan, Community Ecologist, South Florida/Caribbean Inventory and Monitoring Network, Miami, FL

Andrea Atkinson, Quantitative Ecologist, South Florida/Caribbean Inventory and Monitoring Network, Miami, FL

We assessed the accuracy of the 124,607 ha terrestrial vegetation map of the Florida Panther National Wildlife Refuge, western one-third of Big Cypress National Preserve and of NW Everglades National Park. The raster map (50m x 50m grid cell) was based on photointerpretation of 1:24,000 film-based color infrared aerial photography and annotated using the Vegetation Classification System for South Florida Natural Areas. The total project was divided into four sections. Accuracy assessment was accomplished using independent classification (double blind) by two professional botanists of a raster cell via helicopter survey concurrent with mapping effort. A total of 922 accuracy assessment points were probabilistically distributed. Each section was individually assessed for classification accuracy of at least 80% with 90% confidence and each section was returned to the contractor for improvements at least twice. Final map accuracy by section varied from 78% to 84%. Categorical classification accuracy was determined after all sections were complete.

### **Acoustical Recordings for Monitoring Natural Soundscapes**

Marcia Wilson, NPS Northern Great Plains I&M Network, Rapid City, SD

David Hanni, Rocky Mountain Bird Observatory, Fort Collins, CO

Russell Charif, Bioacoustics Research Program, Cornell Lab of Ornithology, Ithaca, NY

Robert Gitzen, Department of Fisheries and Wildlife, University of Missouri, Rapid City, SD

Blake Hossack, USGS-NRMSC, Aldo Leopold Wilderness Research Institute, Missoula, MT

Stephen Corn, USGS-NRMSC, Aldo Leopold Wilderness Research Institute, Missoula, MT



The NPS Inventory & Monitoring Program is investigating automated digital recording systems (ADRS) for monitoring natural soundscapes. Our evaluation focuses on anthropogenic sounds and the presence of anurans (frogs and toads) and breeding songbirds. Compared to direct-observer surveys, ADRS provides greater ability to capture temporal variability in anuran or avian calling, to potentially remove biases associated with observer disturbances, and to reexamine recordings to detect errors in species identification. In 2006, we field-tested ADRS at Theodore Roosevelt National Park and found that peak calling times for anurans varied among species from mid April through mid June. Diurnal variation in calling can hinder effectiveness of short direct surveys. Evaluations in 2008 will compare ADRS efforts with standard direct-observer methods for monitoring breeding birds. Currently, subsampling of continuous recordings is used to prevent prohibitive analysis costs. Development of automated signal recognition software has the potential to reduce these costs in the future.

#### **Coral Monitoring Using Thumbsplus Data Entry with Access Reporting**

Brian Witcher, Data Manager, South Florida/Caribbean Network, Miami, FL

As part of the South Florida/Caribbean I&M Network's Coral Disease monitoring efforts we collect photographic and tabular data documenting the status of the coral reef at each of our sample sites. In an effort to both catalog images and insure accurate relationships between the original photo and tabular data collected at the time of monitoring our office has developed a Thumbsplus database that enjoys a direct relationship to a Geodatabase. This combination allows for data relating to each photo to be entered in Thumbsplus, stored and analyzed in MSAccess, and displayed within a GIS application.

#### **Ecological Site Delineation for Long-term Ecological Monitoring of Uplands in Northern Colorado Plateau Parks**

Dana Witwicks, Ecologist, Northern Colorado Plateau Network, Arches National Park, Moab, UT

Rebecca Weissinger, Ecologist, Northern Colorado Plateau Network, Arches National Park, Moab, UT

Dustin Perkins, Program Manager, National Park Service, Northern Colorado Plateau Network, Biology Department, Mesa State College, Grand Junction, CO

Long-term monitoring of upland ecosystems is a central component of the Northern Colorado Plateau Inventory and Monitoring (NCPN) monitoring program. Ecological sites provide an effective way to stratify upland ecosystems by taking into consideration soil geomorphology, landform, and climate in addition to vegetation characteristics. Unfortunately, spatial data currently available are not mapped explicitly to ecological site, but ecological site maps can be derived using a combination of existing spatial data and field scouting. Enhancing maps reduces the number of misclassified sampling sites, improves efficiency of establishing monitoring sites, and fine-tunes the area of inference. Based on spatial data available for each park (soil, vegetation, geology, elevation, and/or slope) and other park-specific factors, NCPN determines the most appropriate method to delineate ecological sites. Methods used thus far include feature extraction modeling, classification and regression trees, and enhancing existing maps on a polygon-by-polygon basis using field reconnaissance.

#### **Fifty Years of Woodland Dynamics, Chisos Mountains, Big Bend National Park**

Steve Wondzell, Research Aquatic Ecologist, Pacific Northwest Research Station, Olympia Forestry Sciences Lab, Olympia, WA

John Ludwig, Honorary Fellow, CSIRO Sustainable Ecosystems, Atherton, Queensland, Australia

Esteban Muldavin, Division Leader, Natural Heritage, New Mexico Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, NM

Concern over the die-off of trees during the 1950s drought in the Chisos Mountains prompted the establishment of 11 monitoring plots in the piñon-juniper woodlands in 1955. Today, concern focuses on the risk of uncharacteristically severe wildfires resulting from past decades of fire suppression. These long-term plots in Big Bend National Parks provide a unique opportunity to examine woodland and forest dynamics in the absence of many anthropogenic influences. Repeat measurements of these woodland plots were made in October 2008. Preliminary results suggests that relatively little change has occurred over the last half century. Major die-off of trees was not observed on these plots nor over most of the higher elevation woodlands of the Chisos Mountains following the 1950s drought. Since then, neither understory regeneration nor substantial increases in tree density have occurred. Are results from these few plots broadly representative of woodland and forest dynamics in the Chisos Mountains?

#### **Politics and Partnerships: Wildlife Waters in Mojave National Preserve**

Danette Woo, Environmental Compliance Specialist, Mojave National Preserve, Barstow, CA

Debra Hughson, Science Advisor, Mojave National Preserve, Barstow, CA

Water is scarce in the Mojave Desert. Every source has been enhanced, diverted, and used for human purposes. Historic and current uses include mining, cattle ranching, game species propagation, and wildlife reintroduction. Since its inception in 1994, Mojave National Preserve has been a lightning rod for debate over the presence and sustainability of artificial wildlife waters. The issues of conservation of desert bighorn sheep, perpetuation of small game, and maintenance of mule deer populations, have shaped a relationship between the National Park Service, California Department of Fish and Game, and a cadre of volunteer organizations around sustainable desert waters for wildlife. Projects include the inspection and maintenance of guzzlers and desert springs, annual surveys of springs, and research into mule deer needs for artificial waters. This diversity of perspective and opinion is evolving gradually from contention to cooperation for the benefit of wildlife conservation in shrinking desert wildlands.

#### **Has It Changed? Change Detection Modes in the GULN LiDAR-based Vegetation Monitoring Protocol**

Robert Woodman, Network Ecologist, NPS Gulf Coast I&M Network (GULN), Lafayette, LA

Jeff Bracewell, GIS Specialist, GULN, Lafayette, LA

The GULN vegetation monitoring protocol centers on LiDAR-based models representing park vegetation as mosaics of geospatially explicit, structural patches. For park management, the key questions for monitoring are "Did my vegetation change?" and "If so, how?" For the protocol, these become "How are changes in model patches detected over time?", and "If change is detected, what changed in the patch?" Two levels of change-detection are currently in development. The first addresses change in patch size, location, and mean complexity. This could tell a park whether a stand or patch of vegetation expanded or contracted, or changed in general condition. The second level is a detailed, pixel-based look at a selected patch. This may reveal specific events, such as tree-



fall or pest outbreak or an invasive species occurring within a patch. Both levels of change detection envisioned for the GULN Vegetation Protocol are presented.

#### **Prairie Dog Digs! Developing a Monitoring Strategy for Northern Great Plains Parks**

John Wrede, Biological Science Technician, National Park Service, Northern Great Plains I&M Program, Rapid City, SD

Robert Gitzen, Post-doctoral Research Assistant, Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO  
Black-tailed prairie dogs occur in five NPS units of the Northern Great Plains Inventory and Monitoring Network (NGPN).

Management of this species is contentious due to its ecological effects and its unpopularity with many adjacent landowners. The NGPN is evaluating ways to improve the efficiency and accuracy of current prairie dog monitoring in these parks. Park managers identified the spatial extent and distribution of active prairie dog colonies as their highest information need. Density also is a priority at one park with a history of intensive monitoring. A robust protocol for monitoring these attributes must address major sources of variability and measurement uncertainty. Even a seemingly simple attribute such as active colony size has to be defined and measured consistently under a broad range of ecological conditions. An efficient protocol could combine remote-sensing based mapping of active colonies, ground truthing and calibration, and estimates of density for colonies where needed.

#### **The SECN Shorebird Monitoring Database Facilitates Adaptive Management with Access to Near Real-time Data**

Christina Wright, Biologist/Data Manager, National Park Service, Southeast Coast Network, Atlanta, GA

Emma Thompson, Database Programmer, National Park Service, Southeast Coast Network, Atlanta, GA

Mike Byrne, Terrestrial Ecologist, National Park Service, Southeast Coast Network, Cumberland Island National Seashore, St. Marys, GA

Given the very dynamic beach-closure situation at Cape Hatteras National Seashore and the park's desire to balance recreation with conservation, real-time information is imperative for park managers to make appropriate beach-closure decisions. Key to the ability to make these decisions is access to quality data and information products (e.g., graphs, maps, tables). In support of these requirements, the Southeast Coast Network (SECN) developed a shorebird monitoring database; created in SQL server 2005 that supports data entry, storage, and integrated data quality-assurance procedures. In addition, this system provides real-time feedback to park management on locations of shorebirds of management concern, such that managers can utilize real-time data and information products from a standardized and systematic monitoring protocol to facilitate day-to-day management decisions. Therefore, the SECN shorebird monitoring database serves as the prototype system for SECN monitoring protocols—supporting the link between near real-time data and park adaptive management decisions.

#### **The Writing on the Wall: Understanding the Meanings Associated with Graffiti in Parks and Protected Areas**

Emily Zivot, Research Assistant, Parks, Recreation, and Tourism Department, Clemson University, Amherst, MA

Elizabeth Baldwin, Assistant Professor, Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC

Graffiti is most often seen as depreciative behavior in parks, costing time and money to clean or cover. However, could it be a symbol to represent the importance of parks in the lives of people? The purpose of this research is to gain insight to the meaning of graffiti in parks and protected areas in order to more fully understand the breadth of park user groups. In the fall of 2008 parks along the Blue Ridge Escarpment were sampled for all possible graffiti in outdoor settings; rock faces with extensive graffiti were sampled using a grid technique. Field notes and photos were collected at each site. Major themes were messages of love, pride, friendship, and love of specific place. The importance of our parks in the lives of people is represented in a diversity of ways and understanding park graffiti is another opening to that diversity.

### **COMPUTER DEMOS**

#### **Application of the NASA Terrestrial Observation and Prediction System to Facilitate Use of Satellite Data and Ecosystem Models in Protected Area Management**

Forrest Melton, Research Scientist, California State University–Monterey Bay, and NASA Ames Research Center, Moffett Field, CA

Sam Hiatt, Software Engineer, California State University–Monterey Bay, and NASA Ames Research Center, Moffett Field, CA

Rama Nemani, Research Scientist, NASA-Ames Research Center, Monterey, CA

Scott Goetz, Senior Scientist, Woods Hole Research Center, Falmouth, MA

John Gross, Ecologist, Inventory and Monitoring Program, National Park Service, Fort Collins, CO

David Theobald, Professor of Human Dimensions of Natural Resources, Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO

Nathan Piekielek, Doctoral Student of Ecology, Montana State University, Bozeman, MT

U.S. national parks and international protected areas are subject to increasing pressure from environmental change within and adjacent to park boundaries. Protected areas are often sparsely instrumented, however, making it difficult for resource managers to quickly identify trends and changes in landscape conditions within parks. Remote sensing and ecosystem modeling offer protected area managers important tools for monitoring of ecosystem conditions. These tools, however, can generate large data volumes and can require labor-intensive data processing. Application of the NASA Terrestrial Observation and Prediction System (TOPS) can facilitate automated data processing and visualization, as well as detection of trends and anomalies in key indicators of ecosystem conditions within parks. We present a browser-based data gateway and case studies in the use of TOPS to provide data and information to support monitoring of key indicators, including climate, phenology, and ecosystem productivity.

#### **“Views of the National Parks:” A Hands-on Virtual Journey through Our National Parks**

Bruce Nash, Ecologist, National Park Service, Lakewood, CO

David Krueger, Information Technology Specialist, National Park Service, Lakewood, CO

Erika Matteo, Multimedia Specialist, University of Colorado–Denver, and National Park Service, Lakewood, CO

Kristen Nein, Education Specialist, University of Colorado–Denver, and National Park Service, Lakewood, CO

This free multimedia educational program by the National Park Service has a new interface, many new features, and several new modules. Take a virtual hike along the Permian Reef Trail at Guadalupe Mountains, explore ecosystems and history at Palo Alto Battlefield, and examine the geology of the Grand Canyon. Fly through the Grand Canyon on Earth and Valles Marineris on Mars. Look at key sites in 360 degree panoramas, listen to soundscapes, watch interviews and movies, walk through historic landscapes, and learn about park resources with interactive graphics. In the Views Teacher's Lounge read the many lesson plans and educational curriculum guides. And if you speak Spanish, be sure to explore the Spanish version of the Wilderness module. Join the NPS Views Team and its partners for a hands-on virtual journey of exploration through the national parks, and learn how your park can be included.

#### **Visualizing Vital Signs through Video and a Web Based Drill-down System**

Corbett Nash, Science Communications and Outreach Coordinator, Pacific Island Network (I&M), Research Corporation of the University of Hawaii, Hawaii National Park, HI

Short web-based informational videos, sometimes referred to as podcasts, are increasingly popular with the NPS and other organizations with education components. The Pacific Island Network (PACN) has created five videos in a series of 14 depicting Vital Signs monitoring (justification for choosing resource, fieldwork, and resource footage). These videos, intended to reach youth and other groups, are available for download at the PACN website, and can be broadcast in classrooms or at NPS visitor centers. Connecting the individual resources to the ecosystem through science is a primary goal of this initiative. In addition, the PACN is creating a user friendly web-based drill-down system for the delivery of Vital Signs monitoring information on a park by park basis. This system will be a one-stop-shop for the dissemination of Vital Signs monitoring data to audiences ranging from park managers to students.

#### **Climate Change in the National Parks: Climate Friendly Parks Leading the Way**

Shawn Norton, Chief of Sustainable Operations in Climate Change, National Park Service, Washington, DC

National Parks, because of their unique, protected resources, are places where the effects of climate change are particularly visible to a wide audience. This context enables the parks to take action by leading the fight against climate change and teaching visitors about actions they can take outside of the park. The Climate Friendly Parks (CFP) Program, a collaboration of the National Park Service and the U.S. Environmental Protection Agency, provides national parks the support to address climate change both within park boundaries and the surrounding community. To achieve this goal, the program provides national parks with management tools and resources to address climate change. The program has a three pronged approach: 1) measure park-based greenhouse gas (GHG) emissions, 2) develop sustainable strategies to mitigate emissions and adapt to climate change impacts, and 3) educate the public about these efforts and what they can do to address the issue.

#### **Communicating Climate Change: A Partnership between Montana State University and the National Park Service**

Regina Rochefort, Science Advisor, North Cascades National Park Service Complex, Sedro-Woolley, WA

Kathy Jope, Regional Program Chief, Pacific West Region, National Park Service, Seattle WA

Paula Ogden-Muse, North Cascades National Park, Sedro-Woolley, WA

Ronald Tobias, Professor, Montana State University, Program in Science and Natural History, Bozeman, MT

Stephani Gordon, MFA Candidate in Science and Natural History Film, Montana State University, Bozeman, MT

Jim Tharp, MFA Candidate in Science and Natural History Film, Montana State University, Bozeman, MT

Climate change models predict conditions that may significantly alter natural ecosystems and cultural resources in national parks. In 2007, the Pacific West Region Challenge Cost Share Program provided funding to develop a series of videos to communicate how resources may be affected and what the NPS is doing to mitigate climate change. Stephani Gordon, Jim Tharp, and Ronald Tobias of Montana State University's Science and Natural History Filmmaking Program worked the National Park Service to develop three videos on climate change in the Pacific West Region: coastal ecosystems, mountains, and deserts. The three videos will be presented during demo session.

#### **Indigenous Geography: A Case Study of Shared Authority**

Amy Van Allen, Outreach Manager, Smithsonian Institution, National Museum of the American Indian, Washington, DC

Shannon Quist, Program Assistant, Smithsonian Institution, National Museum of the American Indian, Washington, DC

Sunnie K. Hu'eu, Program Director, Neighborhood Place of Wailuku, Wailuku, HI

Indigenous Geography/Geografía Indígena, a bilingual English/Spanish electronic initiative of the National Museum of the American Indian (NMAI), welcomes visitors to a virtual world where they are introduced to environmental and geographic origins of cultures. Photographs, sound clips, narration, and geographic data present a larger view of indigenous ways of life, and issues affecting indigenous people today. Essays by community members address the themes of community, economy, ritual, seasons, origins, the living world, place, and family. Indigenous Geography shares a diversity of indigenous voices with site visitors, offering a comparative glossary of 100 words in English, Spanish, and a variety of indigenous languages. Of special interest to educators are curriculum guides to complement each community profile. Come visit the site and discuss one way that the NMAI empowers community voice in a global setting, while making use of technology and building community skills and relationships.

#### **A Web-Based Biodiversity Atlas for Acadia National Park**

Peter Vaux, College of the Atlantic, Bar Harbor, ME

Ivan Willig, College of the Atlantic, Bar Harbor, ME

David Manski, Acadia National Park, Bar Harbor, ME

This computer demonstration will illustrate a user-friendly and Internet-based interactive mapping interface to display BioBlitz and other species inventory data at Acadia National Park. The interface provides users with an entry point to locate and explore information about the taxa collected during BioBlitz events and other species inventories. Users can query the database by species and/or geographic location and map their search results. In addition, links are also provided to selected external web sites that provide users with photographs and information about the biology and ecology of these species. The goal of this project is to allow

past bioblitz participants and other interested public to explore and learn about biodiversity at the park.

## EXHIBITS

### **National Natural Landmarks Program**

Judy Alderson, Wilderness/NNL Regional Program Coordinator, National Park Service, Anchorage, AK

This free standing display presents information about the National Natural Landmarks (NNL) program, a partnership program of the National Park Service. The display highlights the purpose of the program, shows the diversity of sites protected, and gives examples of successful conservation achievements through voluntary landowner participation in the NNL program. Program literature and 2009 wall calendars will also be available as handouts.

### **Managing Invasive plants in the National Park Service**

Rita Beard, Invasive plant Coordinator, National Park Service BRMD, Fort Collins, CO

This exhibit highlights the invasive plant challenges and accomplishments on NPS units across the country. It depicts the ecological changes that are occurring within natural landscapes with biological invasions and some of the success parks and the Exotic Plant Management Teams are having in meeting this challenge.

### **Wilderness.net**

Tim Devine, Wilderness Training Manager, National Park Service, Missoula, MT

Wilderness.net is recognized and sanctioned by the Federal wilderness management agencies (Bureau of Land Management, Fish and Wildlife Service, Forest Service, National Park Service) as “the” source for online wilderness information. Preservation of wild lands is often achieved by effectively using and disseminating information. Since preservation of wild places is directly related to the degree to which people know, understand and value them, Wilderness.net disseminates information designed to help land managers and the public take better care of wilderness lands. Wilderness.net provides fast, reliable, anytime access to key resources including maps; wilderness system statistics; issue-based toolboxes on topics such as monitoring air quality, using and suppressing wildfire, eradicating invasive species, managing visitor use, and using traditional tools; current research projects and scientific publications; laws, policies, and other documents guiding wilderness decision-making; and, teaching resources and curricula. Wilderness.net continues to make a significant contribution to collaboration and communication in wilderness stewardship.

### **HDR Exhibit**

HDR, Inc.

Conference supporter’s exhibit.

### **Human Dimensions of Condor Recovery**

Denise Louie, Chief of Resource Management and Research, Pinnacles National Monument, Paicines, CA

California Condor reintroduction at Pinnacles National Monument, within the central coastal mountains of California, is received by the community with both great support and wariness. Although condors do not conflict with ranching and hunting activities directly, animosity exists when condors are blamed for attracting unwanted governmental interference and legal regulations for lead ammunition. One of the major causes of condor fatalities is from lead poisoning due to ingestion of spent ammunition. The local landscape is a minefield of carcasses possibly laden with lead bullet fragments. Part of the solution for condor survival relies not just on science, but on the human dimension. Following the proactive community outreach program in Arizona, Pinnacles NM and the Institute for Wildlife Studies are helping lead a similar collaborative effort among governmental agencies, wildlife conservation organizations and sport gun clubs in California to lessen preventable threats to condor health through communication exchange and innovative programs.

### **National Park Service Natural Resources Program Center**

National Park Service

Conference co-sponsor’s exhibit.

### **Fostering Management Excellence in Protected Areas: The Center for Park Management**

Jodie Riesenberger, Program Director, Center for Park Management, Fort Collins, CO

Cyndi Szymanski, Director, Center for Park Management, Washington, DC

Hayley Mortimer, Director, Center for Park Management, Helena, MT

The National Parks Conservation Association formally established their independent Center for Park Management (CPM) in 2002, following on the success from the National Parks Business Plan Initiative. CPM works with the National Park Service and other protected areas to provide fact-based analysis and management expertise. Rather than simply providing recommendations, CPM helps implement strategies that result in meaningful, systemic improvement, and more effective management of protected areas. The National Park Service and the Center for Park Management have entered into a multi-year collaborative agreement to conduct a series of significant system wide projects to establish and maintain management excellence within the Park Service. This collaboration—the Management Excellence Partnership—is itself an example of effective partnership, but more importantly is designed to improve the agency’s overall management capacity. The exhibit will provide general information about the ongoing partnership and examples of projects and management tools.

### **BAER: Burned Area Emergency Response**

Richard Schwab, National Burned Area Rehabilitation Coordinator, NPS, Fire Management Program Center, Boise, ID

This display presents the message that many wildfires cause little damage to the land, but some create situations that require special efforts to prevent further catastrophic damage from events such as erosion, flash floods and debris flows. The Burned Area

Emergency Response (BAER) program addresses these situations with the goal of protecting life, property, water quality, and deteriorated ecosystems.

### **Experiencing Your America: A New Dimension**

Brett Seymour, Audiovisual Production Specialist, National Park Service Submerged Resources Center, Santa Fe, NM

High definition television (HDTV) has been brought to the masses. With the size and quality of broadcast images going up, the National Park Service (NPS) must ensure its messages about “crown jewels left unimpaired for future generations” are presented in a manner that does them justice. At the 2009 George Wright Society Conference the NPS Submerged Resources Center will present innovations in three dimensional (3D) HDTV stemming from a partnership with Woods Hole Oceanographic Institution. These advances in 3D HDTV have the potential to revolutionize how future generations are educated and engaged in our resources by transcending traditional education and interpretation and becoming an immersive experience. Addressing both themes “Water for Life” and “Keeping it Real,” the SRC will showcase 3D media captured underwater where this immersion is particularly appropriate. For the first time, the public can actually experience underwater sites including the sunken battleship USS Arizona at Pearl Harbor, the submerged B29 Superfortress at Lake Mead NRA and the geo-thermal activity just beneath the lakes surface at Yellowstone National Park.

### **Joint Fire Science Program**

Tim Swedberg, Communications Director, Joint Fire Science Program, Boise, ID

We will introduce and make available copies of JFSP publications such as Fire Science Digest and highlight research used by Park Service managers such as Monitoring Trends in Burn Severity (MTBS), FFI Ecological Monitoring Utilities, and much more. We actively seek input from conference attendees about priority fire research needs from the managers’ perspective. We very much appreciate the opportunity to meet with conference participants.

### **USGS Exhibit**

U.S. Geological Survey

Conference co-sponsor’s exhibit.



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