the george wright society biennial conference

on parks, protected areas & cultural sites

st paul, minnesota | april 16–20, 2007

program guide & abstracts

what's inside

the week at a glance

Event start time	SUNDAY April 15	MONDAY April 16	TUESDAY April 17	WEDNESDAY April 18	THURSDAY April 19	FRIDAY April 20
7:00 am		• Registration (7:00 am–6:00 pm) • Poster session (continuous all day)	• Registration (to 7:00 am–6:00 pm) • Poster session (continuous all day)	• Registration (to 7:00 am–6:00 pm) • Poster session (continuous all day)	• Registration (7:00–6:00 pm) • Poster session (to 3:00 pm)	• Registration (7:00–9:00 am)
7:30 am						
8:00 am		CONFERENCE BEGINS • Plenary I — Lisa Graumlich (8:00–9:30 am)	• Plenary III — Native Peoples, Protected Lands panel (8:00–9:30 am)	• Plenary IV — Dan Ritchie (8:00–9:30 am)	• Plenary V — Elizabeth Arnold (8:00–9:30 am)	• Concurrents 132–146 (8:00–10:05 am)
8:30 am						
9:00 am						
9:30 am		• Coffee Break (9:30–10:00 am)	• Coffee Break (9:30–10:00 am)	• Coffee Break (9:30–10:00 am)	• Coffee Break (9:30–10:00 am)	
10:00 am		• Concurrents 1–14 (10:00 am–12:05 pm)	• Concurrents 27–40 (10:00 am–12:05 pm)	• Concurrents 69–80 (10:00 am–12:05 pm)	• Concurrents 91–104 (10:00 am–12:05 pm)	• Coffee Break (10:00–10:30 am)
10:30 am						• Plenary VII — Charles C. Mann (10:30 am–12:05 pm) CONFERENCE CONCLUDES
12:00 pm		• Lunch Break (12:05–1:30 pm)	• Lunch Break (12:05–1:30 pm)	• Lunch Break (12:05–1:30 pm)	• Lunch Break (12:05–1:00 pm)	
1:00 pm			• Student Scholarship Native Cuisine Luncheon (12:05–1:30 pm)		• Concurrents 105–118 (1:00–3:05 pm)	
1:30 pm	• Registration (1:30–9:00 pm)	• Plenary II: Harvey Locke (1:30–3:30 pm)	• Concurrents 41–54 (1:30–3:35 pm)	• Concurrents 81–90 (1:30–5:00 pm)		
3:00 pm					• Break (3:00–3:30 pm)	
3:30 pm		• Break (3:30–4:00 pm)	• Break (3:30–4:00 pm)		• Concurrents 119–132 (3:30–5:35 pm, except to 3:30–4:45 pm for day-cappers)	
4:00 pm		• Concurrents 15–26 (4:00–6:05 pm, except 4:00–5:15 pm for day-cappers)	• Concurrents 55–68 (4:00–6:05 pm, except 4:00–5:15 pm for day-cappers)			
5:00 pm						
5:30 pm				NOTE: Field trips occur throughout the day	• Plenary VI — North American Park Directors (5:30–6:30 pm)	
6:00 pm	• Poster / demo / exhibit set- up (6:00–9:00 pm)					
6:30 pm			• Poster Reception (6:30–7:30 pm)			
7:00 pm	• Meeting of GWS Student Travel Scholarship Winners & Mentors • Meeting of Native Travel Grant Winners (7:00–8:00 pm)	• Welcome to GWS2007 Reception (7:00–8:30 pm)			• GWS / NPS Awards Banquet (7:00–9:30 pm)	
7:30 pm			• Silent Auction Wrap-Up (refreshments served) (7:30–9:00 pm)			
8:00 pm				• Native Film Night & Social (8:00–9:30)		
8:30 pm						
9:00 pm						
9:30 pm						

conference overview

welcome! we're glad you've chosen gws2007

Welcome to the Twin Cities! Thank you for choosing to attend the George Wright Society biennial conference. 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. We will do our best to help you.

The GWS Board of Directors and the 2007 Conference Committee extend a warm welcome to you! Chaired by Abigail Miller, the 2007 Conference Committee members are Gillian Bowser, Rolf Diamant, David J. Parsons, William H. Walker, and Stephen Woodley. For 2007, the GWS Board of Directors includes Abigail Miller (president), Rolf Diamant (vice president), Rebecca Conard (treasurer), Gillian Bowser (secretary), Brad Barr, David Graber, Suzette Kimball, Suzanne Lewis, Stephanie Toothman, and Stephen Woodley.

the conference theme: rethinking protected areas in a changing world

The theme of the 2007 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites, "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. Here are some of the issues the GWS2007 conference will take up.

- ***Global climate change*** is the backdrop against which everything else takes place. Climate change has the potential to affect every aspect of human society, including the basic premises that nature conservation is built around. For example, what does a manager do when the species the park is supposed to protect begin dying out or migrating because of global warming?
- ***Globalization*** is an extremely complex phenomenon that holds both perils and promise for parks and cultural sites. Controls on information exchange, energy flows, and corporate behavior once were strongly associated with national boundaries. Now those controls are disappearing, challenging old concepts about how protected area systems should be organized and how individual parks and cultural sites should be managed.
- ***Shifting demographics*** are bringing new sets of visitors with different expectations. At the same time some traditional park clienteles are aging, and this is changing recreational patterns.
- The ***increasing democratization of heritage*** means that many different groups are now laying claim to the interpretation of heritage sites. Meanings and modes of interpretation are being vigorously contested, and site managers are caught in the crossfire.
- The continuing ***erosion of biodiversity*** through habitat loss and the spread of invasive species threatens to undo the fabric of nature. Protected natural areas are assumed to be a primary means of protecting biodiversity, but we don't have a long enough track record to determine whether this is true.
- The ***growing emphasis on national security in the United States*** in the wake of 9/11 has shifted budget priorities and stressed park staffs as protection personnel are detailed to security assignments. Can we make the case that systems of protected natural areas and cultural sites are crucial to national security?
- The ***alienation of people from the past***—the disconnect between average citizens and a grounded sense of history—continues to concern cultural heritage professionals. The decline in historical literacy is especially worrisome among youth.
- ***Ongoing debates over privatization of parks and heritage sites*** have brought diametrically opposed political ideologies to the doorstep of park and site managers.
- The ***emergence of civic engagement*** as an organizing principle in park outreach programs promises to deepen the intellectual engagement of parks and heritage sites with their visitors. By making parks and heritage sites a space where contentious social issues can be constructively debated, civic engagement reinforces the role of these places as an important part of an open society.

Why rethink protected areas? As the caretakers of one of modern civilization's greatest achievements—organized systems of parks and cultural sites that protect and maintain important facets of cultural and natural heritage—we as park professionals must respond to this litany of far-reaching changes. GWS2007 provides a platform where we can begin.

about the george wright society

Founded in 1980, the **George Wright Society** is an international nonprofit association of researchers, resource managers, educators, administrators, and other 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 quarterly 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 St. Paul 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 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, he also 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 www.georgewright.org.

about the GWS biennial conferences

Rethinking Protected Areas in a Changing World is the 14th 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 cultural and natural resource concerns. We are always eager to have your comments and suggestions for improvement, so please be sure to fill out the conference evaluation questionnaire and drop it off at the Registration Desk.

our thanks to the people who make these conferences 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 in the next section.

Beyond that, the GWS is grateful to the many individuals who helped make this conference happen. For secur-

ing vital funding for the conference, our thanks go to Sue Haseltine of the U.S. Geological Survey; Mike Soukup, John Dennis, Jon Jarvis, and Marcia Blaszak of the National Park Service; and Chesley Moroz of Eastern National. 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). Others who provided invaluable assistance include Dorothy Anderson, John Anfinson, Otis Halfmoon, Bonnie Halda, Melia Lane-Kamahele, Corliss Outley, Michael Schuett, Jerrilyn Thompson, and Robyn Thorson.

organizational sponsors and supporters

The National Park Service oversees more than 380 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. *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. *www.usgs.gov*

Eastern National provides quality educational products and services to the visitors to America's national parks and other public trusts. Chartered in 1948, Eastern operates in more than 130 national parks and other public trusts. All of the products, programs, and publications offered to visitors have a strong educational value and assist the educational programs of our partners. Eastern's proceeds are donated to the National Park Service and other partners to further support these programs. *www.easternnational.org*

overview of plenary sessions

GWS2007 features seven plenary sessions based on the "Rethinking Protected Areas in a Changing World" conference theme. All plenaries take place in the Minnesota East Ballroom. *For a full description of the plenary sessions, see the Daily Schedule of Events.*

- Plenary Session I, Monday, April 16, 8:00 AM: "The Impact of Climate Change on Parks, Protected Areas, and Cultural Sites." Speaker: Lisa Graumlich, Director, School of Natural Resources, University of Arizona
- Plenary Session II, Monday, April 16, 1:30 PM: "Continental-Scale Conservation in North America: Y2Y and Beyond." Speaker: Harvey Locke, conservationist, Canadian Parks & Wilderness Society and Yellowstone to Yukon Conservation Initiative.
- Plenary Session III, Tuesday, April 17, 8:00 AM: "Native Peoples, Protected Lands." Moderator: Charles Hudson, Public Information Manager, Columbia River Intertribal Fish Commission. Panelists: Roberta (Bobbie) Conner, Sisaawipam, Director, Tamástslikt Cultural Institute, Confederated Tribes of the Umatilla Indian Reservation; Tom Lee, Chief Executive Officer, Parks Canada (1998–2002)

- Plenary Session IV, Wednesday, April 18, 8:00 AM: "The National Park Service and Civic Reflection," Daniel L. Ritchie, Chancellor Emeritus, University of Denver
- Plenary Session V, Thursday, April 19, 8:00 AM: "Media Realities: The Complex Environment of News Reporting," Elizabeth Arnold, reporter, National Public Radio
- Plenary Session VI, Thursday, April 19, 5:30 PM: "Adapting to Global Change: Perspectives from North American Park Leaders." Moderator: Ernest Quintana, Regional Director, Midwest Region, U.S. National Park Service. Panelists: Mary Bomar, Director, U.S. National Park Service; Ernesto Enkerlin Hoeflich, President, Comisión Nacional de Áreas Naturales Protegidas (Mexico); Alan Latourelle, Chief Executive Officer, Parks Canada
- Plenary Session VII, Friday, April 20, 10:30 AM: "The Pristine Myth," Charles C. Mann, author of *1491: New Revelations of the Americas Before Columbus*

Recommended readings. To encourage you to delve deeper into the topics of the plenary sessions, we have compiled lists of recommended readings that relate to the topic of each session. These include books as well as journal articles (especially articles that have appeared in recent issues of *The George Wright Forum).* You'll find the reading lists next to the plenary session descriptions in your *Daily Schedule of Events* handout.

overview of concurrent sessions

Concurrent sessions (including Side Meetings and Workshops). As you will see from the *Daily Schedule of Events* in your registration packet, all sessions last 2 hours 5 minutes (except Day-cappers; see next item). The sessions denoted as "Invited Papers" or "Contributed Papers" 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 in the *Daily Schedule of Events.* Sessions marked "Panel Discussions" are participatory discussions; these also are indicated on the charts. "Side Meetings" are small-group sessions designed for a particular interest or discipline. "Workshop" sessions are designed to be interactive: their goal is to get input or other assistance from attendees on a specific product, such as a report.

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.

Day-capper sessions. "Day-cappers" are intended to give people an alternative to standard sessions during the late afternoon on Monday, Tuesday, and Thursday. They are shorter than regular sessions, lasting from 4:00–5:15 pm, and take a variety of innovative formats. Day-cappers are indicated on the concurrent session charts in the *Daily Schedule of Events.*

Note: complimentary beverages will be available to all registrants during the morning and afternoon breaks on Monday, Tuesday, Wednesday (AM only), Thursday, and Friday (AM only). All breaks are served in the Capitol Ballroom.

an important note on punctuality and last-minute changes

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 the *Daily Schedule of Events* and the *Program Guide & Abstracts* have 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 *Daily Schedule of Events.* The *Late Changes* handout captures all changes communicated to the conference organizers between the time the *Daily Schedule of Events* and *Program Guide & Abstracts* were printed and April 12. Some changes involve alterations to the printed schedule of certain sessions, so it is especially important for you to note these on the *Daily Schedule of Events.*

In the event of last-minute cancellations (i.e., those coming after April 12) 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.

overview of posters / computer demos / exhibits

Posters, Computer Demos, and Tabletop Exhibits will be displayed in the Minnesota East / Capitol Ballrooms. Floor-standing Exhibits will displayed in the foyer and hallways near the Registration Desk. We encourage all attendees to take time to view these interesting presentations.

Posters / Computer Demos / Tabletop Exhibits. Together, these comprise the Poster Session, which runs from Sunday evening through Thursday afternoon. Set-up is Sunday, April 15, 6:00–9:00 PM; take-down is Thursday, April 19, 3:00–3:30 PM. All Posters, Computer Demos, and Tabletop Exhibits must be removed by 3:30 PM so that the vendor can remove its poster boards, chairs, and tables. Posters and Tabletop 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 diagram of the Poster Session is included in the *Daily Schedule of Events.*

Floor-standing Exhibits are available for viewing in the foyer and hallways near the Registration Desk during the entire week. Exhibit set-up is Sunday, April 15, 6:00–9:00 pm; see a conference representative at the registration desk for a diagram of assigned locations. Take-down is Friday, April 20 (or earlier, at the presenter's discretion). A **Poster Session Spotlight Reception** will be held on Tuesday, April 17, from 6:30–7:30 PM in the Capitol Ballroom Presenters should plan to stand by their Poster, Demo, or Exhibit during this time. See below for more information.

special events and field trips

Special events. A variety of special events are scheduled throughout the week:

- **Welcoming Reception — Monday evening, April 16, 7:00–8:30 PM • Location: Great River Ballroom**
  We welcome you to the Twin Cities with an informal get-together in the Crowne Plaza's Great River 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.*

- **Luncheon Honoring the George Melendez Wright Student Travel Scholarship Winners — Tuesday afternoon, April 17, 12:00–1:30 PM • Location: Mississippi Garden Court Poolside**
  Each year we honor our Student Travel Scholarship winners with a luncheon. This year's event will take place in the Mississippi Garden Court Poolside at the Crowne Plaza and will feature Native American

cuisine. It's a great opportunity to meet these promising scholars from diverse backgrounds. *Advance ticket purchase required. Seating is limited, and will be reserved on a first-come, first-paid basis.*

- **Poster Spotlight Reception — Tuesday evening, April 17, 6:30–7:30 PM • Location: Minnesota West / Capitol Ballrooms**
  GWS2007 features an expanded Poster Session, starting Sunday evening, April 15, and running through Thursday mid-afternoon, April 19. On Tuesday the 17th from 6:30 to 7:30 PM, we will host a reception in the Capitol Ballroom immediately adjacent to the posters. 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, April 17, 7:30–9:00 PM • Location: Capitol Ballroom**
  Immediately following the Poster Spotlight Reception, we'll segue to the gala wrap-up of the Walkin' in the Footsteps of George Silent Auction to benefit the Travel Scholarship program (for more information, see below). Live music and an emcee will get you in the mood to 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 Film Night & Social — Wednesday evening, April 18, 8:00–9:30 PM • Location: Kellogg III**
  Three films will be shown, total time about one hour, followed by complimentary refreshments. Open to all registrants—please join us!

  Sharing Our Histories: The Keeseekoowenim Ojibway (10 minutes) tells the story of the removal of the Keeseekoowenim people to establish Riding Mountain National Park in Canada, and subsequent efforts to address and heal that situation.

  From the movie *Homeland: Four Portraits of Native Action*, one 24-minute excerpt will be shown, featuring attorney and life-long activist Gail Small of the Northern Cheyenne Reservation in Montana. Nearly all Indian lands in the U.S. face grave environmental threats, often, as in this film excerpt, related to energy extraction and contamination of water. This beautifully crafted documentary profiles the against-all-odds struggles of Native American leaders who are taking on powerful energy companies and government agencies to protect the environment.

  The Salt Song Trail (20 minutes) conveys the revitalization of the Salt Songs and their importance for memorial ceremonies and as a spiritual bond for the thirteen bands of the Southern Paiute (Nuwuvi) people. The Salt Song Trail, along which the songs are sung, traces the journeys to sacred sites and collection areas for salt and herbs.

- **The George Wright Society / National Park Service Awards Banquet — Thursday evening, April 19, 7:00–9:30 PM • Location: Science Museum of Minnesota**
  A GWS tradition, the Awards Banquet recognizes the winners of "Imagine Excellence," the GWS awards program. For GWS2007, the banquet will also feature the presentation of the National Park Service Director's Awards for Natural Resources Stewardship. In addition, former U.S. Vice President Walter Mondale will receive an Honorary Park Ranger Award. The banquet will be held at the Science Museum of Minnesota, a four-block walk from the Crowne Plaza (transportation not provided). Seating for dinner is at 7:30 pm; however, your banquet ticket gives you free admission to the museum for that day, so you'll be welcome to browse the award-winning exhibits anytime on Thursday. *Advance ticket purchase required. 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 exciting array of field trips on tap. All trips take place on Wednesday, April 18. For full descriptions of the trips, see www.georgewright.org/gws2007_fieldtrips.html. *Advance ticket purchase required.*

- St. Croix National Scenic Riverway: Hike and/or Paddle • 8:00 AM–5:15 PM
- Great River Bike Tour • 10:00 AM–4:00 PM
- Wetland Restoration and Resource Management in Minnesota State Parks • 8:00 AM – 5:00 PM
- Restoring History and the Environment at the Bruce Vento Nature Sanctuary • 1:30–4:30 PM
- Reinventing a Historic Site from the Ground Up: Historic Murphy's Landing • 1:00–5:45 PM
- The Re-birth of the Historic Minneapolis Riverfront District • 1:00–5:00 PM

conference proceedings

A conference proceedings will be published by the George Wright Society as a record of the conference. As part of their registration fee, all full-week and two-day (but not single-day) registrants will receive the proceedings on CD automatically upon publication. For an additional fee, conferees may also order the proceedings as a paperback book. 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 www.georgewright.org/gws2007_instructions.html. *Deadline for submissions is May 4, 2007.*

the george melendez wright student travel scholarship

The George Melendez Wright Student Travel Scholarship was 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 will 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. Look for the student award winners identified by special colored badges. The GWS extends a special thanks to Pamela Wright Lloyd and James Lloyd for a generous initial donation to the scholarship fund. Their donation helped encourage institutions to come forward in support of specific scholarship candidates. By leveraging the Lloyd donation and GWS-committed funds with the institutional support received, we were able to benefit 20 students. The sponsors listed below 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. The list below highlights the main sponsors, but we would also like to thank the numerous universities and organizations that matched our award with additional funds for their students.

The 2007 George Melendez Wright Student Travel Award recipients are: Brenda Asuncion, Occidental College; Mechelle Best, University of Florida; Marlene Brito, Northeastern Illinois University; Pedro Chavarria, Texas A&M University; Suzanne Davis, Wilfrid Laurier University; Michelle Dela Cruz, Northern Arizona University; Kenny Fournillier, Howard University; Stephanie Freeman, North Carolina State University; Min Kook Kim, University of Maine; Kirsten Leong, Cornell University; Paula Mancilla, Dominican University of California; Lorraine Nicholas, University of Florida; Susan Qashu, University of Arizona; Sam Roberson, Texas A&M University; Jeffrey Ross, Yale University; Jacinta Ruru, University of Victoria; Charles Stevland, Howard University; Timia Thompson, North Carolina State University; Luz M. Vazquez Garcia, York University; and Desaree Williams, Dominican University of California.

The GWS expresses its appreciation to all the organizations that are supporting the 2007 scholarship program: National Park Service Alaska Region, National Park Service Natural Resources and Science Stewardship Program, Sonoran Desert Museum, National Park Foundation, Texas A&M University, Yale University, Howard University, Southern Plains I&M Network, Student Conservation Association, and Unilever. The following units of the National CESU Network provided support: Florida Caribbean, Southern Appalachian, Desert Southwest, Colorado Plateau, Chesapeake Bay, North Atlantic, Great Basin, and Gulf Coast.

"walkin' in the footsteps of george" silent auction

Start: Sunday, April 15, 6:00 PM. Conclusion: Tuesday, April 17, 7:30–9:00 PM. Location: Capitol Ballroom.

During the conference we will be holding the third biennial silent auction to benefit the George Melendez Wright Student Travel Scholarship. "Walkin' in the Footsteps of George" recalls George Wright's pioneering efforts in the 1920s and 1930s to make a career in the park resources field. Of Hispanic descent himself (his mother was Salvadoran), Wright was fluent in Spanish and respected the value of cultural diversity. "Walkin' in the Footsteps of George" will be a fun-filled event whose entire proceeds go to the scholarship fund.

Donated park-related items from around the country will be available for viewing and bidding in the Capitol Ballroom starting on Sunday evening, April 15. The auction wraps up Tuesday evening, April 17, at a gala reception with live music, an emcee, and complimentary desserts for bidders. The gala wrap-up starts at 7:30 PM and concludes at 9:00. Join the fun and get in a final bid before each table closes!

Winning bidders can pick up and pay for their items that evening, or else pick them up at the Registration Desk later. Items not picked up by 10:00 AM Thursday, April 19, will be offered to the next-highest bidder. All items must be picked up and paid for before the end of the conference at noon on Friday.

the native participant travel grant program

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 the GWS2007 conference. 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 Aboriginals.) Applicants were screened by a committee composed of Native people, and the following individuals were selected to receive grants: Gloria Enzoe (Lutsel k'e Dene First Nation), Rae Gould (Nipmuc Nation), Cassandra Hensher (Karuk), Justine James (Quinault Indian Nation), D. Bambi Kraus (Tlingit), Kathryn Martin (Mentasta [Athabascan]), Dennis Martinez (O'odham), Lloyd Masayumptewa (Hopi), Roian Matt (Confederated Salish & Kootenai Tribes), Lucy Parker (Yosemite Miwok, Mono Lake Paiute, Kashaya Pomo), Renee Stauffer (Karuk/Yurok), Gilbert Tafoya (Santa Clara Pueblo/Tewa), Joe Williams (Sisseton Wahpeton Oyate [Dakota]), Pauline Wilson (Navajo Nation), and Ted Wright (Tlingit).

The GWS hopes to make the Native Participant Travel Grant Program a permanent feature of our biennial conferences.

the wes henry memorial fund

The late Wes Henry was a long-time leader in wilderness preservation in the National Park Service. He organized the first NPS wilderness task force and was the driving force behind establishing the NPS's national wilderness steering committee. In 2003, Henry was given a George Wright Society Special Achievement Award in recognition of his efforts to protect natural soundscapes and wilderness resources and values in America's national

parks. Following his death in December of that year, family and friends asked the GWS to establish a memorial fund in his name. Proceeds from that fund are being used to support wilderness-related activities at GWS conferences. The Fund concludes its work this year by helping to underwrite the travel of a number of wilderness managers to the GWS2007 conference. The GWS thanks all the donors to the fund for their generosity in remembering Wes Henry.

conference photography

Once again, photographer and long-time GWS member Chuck Rafkind will be documenting the conference. He will be shooting candids throughout the week, as well as photographing session speakers and special events. You will be able to view conference photos and order high-resolution prints, digital files, and merchandise by following these instructions:

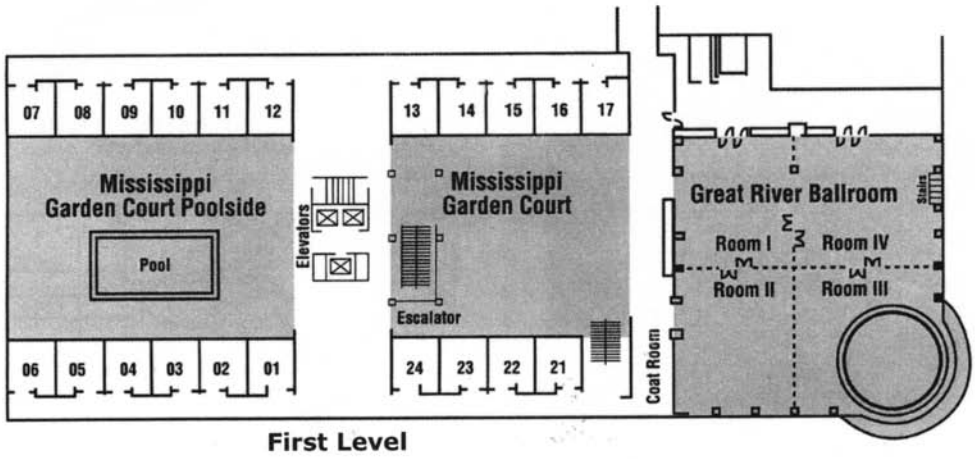
1. Go to http://rafkind.eventpictures.com.
2. Choose "GWS2007."
3. Follow on-screen instructions to view and order photos, digital downloads, CDs, or merchandise.
4. Photos are posted by day of the week, or by the name of the special event.
5. Posted photos have NOT had red-eye removed, nor have they been color- or contrast-corrected—this will be done when prints are made.
6. A special 50% discount has been instituted for all orders from this event.
7. All orders are 100% guaranteed or prints are redone or money refunded.
8. All work is done by a professional digital photo lab.
9. Photo merchandise is also available at the above site, e.g., T-shirts, mugs, mouse pads, puzzles, magnets, key chains, etc.

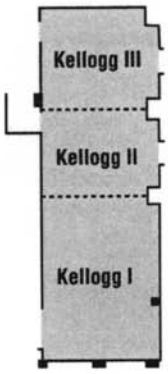
For more information, contact Chuck at Charles D. Rafkind Photography via email at photocdr@yahoo.com, by phone at 1-757-291-3553, or by toll-free fax at 1-866-842-9670. *www.geocities.com/rafkind/photography.html*

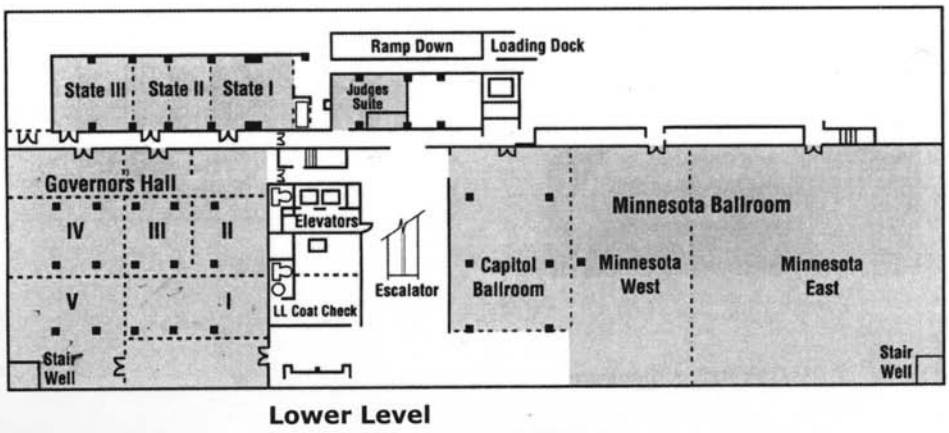
birchbark books sales table / book signings

Birchbark Books is an independent, neighborhood bookstore in Minneapolis owned by the renowned Native novelist Louise Erdrich. It is well-known for stocking a strong selection of Native and environmental titles. By special arrangement, during the conference Birchbark will be operating a sales table in the foyer near the Registration Desk, carrying a number of the Recommended Reading books related to the various plenary sessions, as well as other titles and items that will be of interest to conference attendees. Be sure to visit them at the sales table!

As we go to press, we are hoping to arrange for one or two book signings involving authors who are speaking at the conference. Details of these will be available in the *Late Changes* handout.







where is my room located?		
Room name	**Level**	**Directions**
Capitol Ballroom	Lower Level (one down from Lobby)	turn left at bottom of escalator
Governors I, V	Lower Level (one down from Lobby)	turn right at bottom of escalator
Governors II, III, IV	Lower Level (one down from Lobby)	U-turn at bottom of escalator
Great River Ballroom I/IV	First level (one up from Lobby)	turn right at top of escalator (from Lobby level)
Great River Ballroom II/III	First level (one up from Lobby)	turn right at top of escalator (from Lobby level)
Kellogg I	Lobby Level	turn right at top of escalator (from Lower level)
Kellogg II/III	Lobby Level	U-turn at top of escalator (from Lower level)
Minnesota East/West	Lower Level (one down from Lobby)	turn left at bottom of escalator
Mississippi Garden Court Poolside	First level (one up from Lobby)	turn left at top of escalator (from Lower level)
Registration Desk	Lower Level (one down from Lobby)	turn at bottom of escalator

abstracts

monday, april 16 • morning concurrent sessions • 10:00–12:05

Session 1 • Minnesota East • Invited papers

No Place to Hide: Climate and Environmental Change Impacts to Protected Areas

Chairs: Leigh Welling, Director, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT

John Gross, Ecologist, Inventory and Monitoring Program, National Park Service, Fort Collins, CO

Climate Change Science and its Role in Resource Management

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

Although the degree to which global processes are affected by human activities remains elusive, there is scientific consensus that anthropogenic activities are affecting global climate and atmospheric chemistry, pollutant amounts and distribution, and biotoxin accumulations in ecosystems. These global changes, including climate change, will have far-reaching consequences on National Park Service resource stewardship efforts. If park managers are to formulate strategies to mitigate or adapt to global change effects they must understand the relationship between these changes and resource impacts. They must also appreciate and utilize the role parks play in educating the public about these issues. As with any complex scientific issue, there are many unanswered questions. But there is enough evidence to suggest we need to manage our parks in light of the current knowledge and we need to make a concerted effort to communicate effectively on these issues to the public.

Climate Change and Coastal Ecosystems: Potential Impacts and Adaptation Strategies

Virginia Burkett, USGS Global Change Science Coordinator, National Wetlands Research Center, Stephen F. Austin University, Nacogdoches, TX

A disproportionately large percentage of the world's socially and economically important lands and natural resources occur along continental and island coastal margins. If greenhouse gas emissions and Earth's atmospheric temperature increase as projected during the 21st century, the combined effects of climate change and human development are likely to impact coastal ecosystems at scales that affect the economies, health, and culture of many nations. Sea level rise, more intense tropical cyclones, and increases in the frequency of droughts and floods are anticipated changes that will affect the sustainability of coastlands and their ecosystem services. Low-lying coastlines and deltas, for example, are very vulnerable to these combined effects. While precise outcomes for specific coastal regions are not known, steps to conserve biodiversity and other ecosystem services can be taken in a "no regrets," adaptive management approach that reflects our current understanding of how climate change is likely to impact coastal ecosystems

Adaptation Options of National Parks to Climate Change

Jill Baron, U.S. Geological Survey, Natural Resource Ecology Laboratory, Fort Collins, CO
Craig Allen, Research Ecologist, Ecosystem Dynamics, Jemez Mountain Field Station, Los Alamos, NM
Don McKenzie, Pacific Wildland Fire Sciences Lab, USDA–Forest Service, Seattle, WA
Lance Gunderson Department of Environmental Studies, Emory University, Atlanta, GA
Erica Fleishman, National Center for Ecological Analysis and Synthesis, Santa Barbara, CA
Nathan L. Stephenson, Research Ecologist, USGS Sequoia-Kings Canyon Field Station, Three Rivers, CA
Laura Meyerson, Assistant Professor, Natural Resources Science, University of Rhode Island, Kingston, RI
Jill K. Oropeza, Natural Resources Ecology Laboratory, Colorado State University, Fort Collins, CO

It may be possible to increase the resiliency of some national park ecosystems, communities, and populations to climate changes by minimizing the effects of other stressors (for example, barriers to migration, habitat loss, pollution, or competition with non-native species). In response to a call from Congress, and working in

consultation with park managers, we will present the results of a chapter for the U.S. Climate Change Science Program that addresses the sensitivity and adaptability of national parks to climate and related global changes. We hope to provide information and tools that aid in (1) understanding the combined effects on ecosystems of climate changes and non-climate stressors, and consequent implications for achieving specific management goals, (2) applying existing management options or developing new adaptation approaches that reduce the risk of negative outcomes, and (3) understanding the opportunities and barriers that affect successful implementation of management strategies to address climate change impacts.

Changing Land, Changing Lives: Impacts of Climate Change on Protected Areas and Associated Indigenous Cultures

Lois Dalle-Molle, Research Coordinator, North and West Alaska Cooperative Ecosystem Studies Unit, Fairbanks, AK

Northern protected areas may be the earliest to show noticeable impacts of climate change. Shifts in species composition, hydrologic cycles and phenology will affect not only ecosystems, but also people who have centuries-old cultural ties to those resources. As the pace of change accelerates, Indigenous people explore ways to adapt, and resource managers explore issues related to changes in their natural resources. There will also be a need for considering the interrelationships among Indigenous people, changing resource patterns, dependence on protected area resources, management responsibilities, existing policies, regulatory structures, protection, and consumption of public resources.

Climate Change Communication: Inspiring Resource Stewardship in National Parks

Leigh Welling, Director, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT

John Morris, Education Coordinator, Alaska Regional Office, Chico, CA

Karen Scott, Climate Change Division, U.S. Environmental Protection Agency, Washington, DC

What is the NPS role in communicating climate change? The complexities of climate change present challenges for interpreters and educators. First, climate change impacts are perceived to lack the immediacy of other park issues. In addition, uncertainties on rates and magnitude of change and the environmental and socioeconomic impacts further cloud discussions. Finally, the nature and language of scientific papers and climate impact assessments can make it difficult for the general public, policymakers and decision makers to respond. Yet, effective communication is essential for raising awareness, identifying management concerns, encouraging participation in resource stewardship, and promoting adaptation and mitigation. This talk will explore the role of communication on perceptions of climate change; the effectiveness of different tools in contributing to awareness and understanding of climate change; barriers that hinder effective climate change communication and subsequent motivation to action; and current climate change outreach initiatives in the NPS.

Session 2 • Great River I/IV • Invited papers

Changing Human Relationships with Wilderness and Other Wild Lands: Implications for Management and Research

Chair: He Yang, Visiting Lecturer, University of Montana, Missoula, MT

Session abstract:

The theme of this session of invited papers will be to identify (from review of literature, managers comments and research) the primary ways human relationships with wilderness and other wild lands are changing in the U.S. and important social and policy forces of change. Emphasis will be on understanding our gaps in knowledge and how managers and scientists can work together to anticipate change, address displacement, and protect public lands in the future. In the past 15 years, not only has our technology advanced in unprecedented ways to increase our efficiency in communication, but our growing expectation of convenience and access to information influences the way we manage our leisure time and experiences. Increasing controversy over efforts to restore wilderness ecosystems, increasing attention to benefits derived from eco-

nomic contributions of wild lands services, the authorization of federal agencies to experiment with user fees, applying knowledge about impacts to wilderness to apply new protectionist policies and understanding the importance of shifting demographics to public lands management are driving managers to try to understand how they can prepare better for their responsibilities in the future.

Developing a Framework for Investigating Changing Relationships with Wilderness

Robert Dvorak, Project Manager, University of Montana, College of Forestry and Conservation, Missoula, MT
William T. Borrie, Visiting Scholar, Aldo Leopold Wilderness Research Institute, Missoula, MT

A lack of conceptual and empirical clarity exists for the notion of a relationship with wilderness. A current need exists to be able to describe how visitors' uses, meanings, and experiences of wilderness changes over their lifetime. To address these needs, the development of a conceptual framework is necessary. Utilizing a meanings-based approach, this paper presents a framework for a dynamic, emergent relationship with wilderness. It suggests that a relationship consists of three components: relationship to self, relationship to agency, and relationship to place. These components are examined relative to potential external forces of change and realized outcomes that affect this relationship. Through this examination, it may be possible to develop indicators of changing aspects of wilderness relationships. These indicators may assist natural resource managers in protecting or restoring human relationships with wilderness landscapes over time.

The Displacement Dilemma: Short- and Long-term Responses to Forces of Change

Ingrid Schneider, Associate Professor & Director, University of Minnesota Tourism Research Center, St. Paul, MN

Wildland visitors respond in a variety of ways to social and policy forces of change. Understanding and anticipating these visitor responses is imminently important as wildland managers enhance visitor experiences, balance budgets, and increase public support. The majority of research focuses on hypothetical visitor responses to forces of change as opposed to actual responses. The limited research that directly addresses visitor responses to change can serve as a foundation from which to understand other responses and subsequently, develop future research efforts and immediately inform change management. The relevant research is reviewed and analyzed with direct application to wildland recreation management in the near and long term.

Intergenerational Differences: The Role of Wild Nature in the Future

Harry Zinn, Associate Professor, Pennsylvania State University, University Park, PA
Alan Graefe, Professor, Pennsylvania State University, University Park, PA

Many resource managers and outdoor enthusiasts see links among appreciating wild nature, participating in traditional outdoor activities, and supporting protection of wild areas. The mutualistic, or appreciative, value orientation toward nature that is associated with support for protecting wild nature is most prominent in regions with high levels of urbanization, formal education, and professional work. If these become more widespread, support for protecting wild nature may increase. However, younger generations' outdoor recreation exhibits striking changes—ever-shorter visits to wild areas and embrace of an "extreme" approach to traditional activities. These new ways to experience nature may signal a decline in mutualistic appreciation for wild nature, suggesting a question: How are trends in values, other beliefs, and behavior linked? Although a definitive answer is not available, we discuss what is known about trends in value orientations toward nature, trends in outdoor recreation, and possible links between them.

GPS, the Web, and Uncertainty about Future Impacts on Remote Places

Joe Van Horn, Wilderness Program Coordinator, Denali National Park & Preserve, Denali, Park, AK

This presentation discusses the possibility of rapid resource and experiential change for areas away from established trail system as a result of the recent synergy between the ability to accurately depict cross-country travel routes and camping locations through readily available GPS technology, the new communication efficiency of the Internet, and social changes that have led to new attitudes about the sharing of personal experiences such as a backcountry trip with thousands of people via that medium. The reasons why these new developments are different than the guidebooks and publications of the past is discussed along with their specific implications and significance for the management of dispersed use in cross-country areas. Thoughts

on possible actions that could be taken by managers, scientists, and others to understand and perhaps mitigate the potential impact of these new technologies and societal changes to wildlands are also presented.

Implications for Management and Education

Chad Dawson, Professor, State University of New York College of Environmental Science and Forestry, Syracuse, NY

Rick Potts, Chief, Wilderness Stewardship & Recreation Management Division, National Park Service, Washington, DC

Wilderness program managers strive to understand social and cultural forces, how they will affect public perceptions and attitudes toward wild lands, and possible implications for the long-term well-being of the national wilderness preservation system (NWPS). The goal of preserving wilderness lands for future generations will be unachievable if the present generation becomes disenfranchised or disconnected. Strong forces are likely to converge upon wilderness within the next generation: the NWPS may have begun to approach maturation in terms of size; Congress is adding more and more special provisions to new wilderness bills, indicating that the "low-hanging fruit" has already been picked; there is currently a significant downward trend in the number of overnight backcountry use which may or may not continue; the nation will become more desperate in its search for oil and gas and strategic minerals; and the "wilderness community" shows signs of fragmentation and is sending mixed messages to agency managers.

Session 3 • Great River II/III • Panel discussion

Access, Protection, and First Amendment Rights in America's National Parks

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

Session abstract:

The threat of terrorism and the assertion of free speech are testing how the National Park Service simultaneously protects its treasured sites and provides access to them. At the Statue of Liberty, intensive security measures are defining the visitor experience. Yet, at Independence National Historical Park, the metal detectors and the cordon of security barriers may be taken away to provided unimpeded access. At Antietam, Gettysburg, and other Civil War sites, the NPS must allow rallies by organizations such as the KKK and permit counter-rallies by their opponents, while providing for the safety and security of all. At Golden Gate National Recreation Area, protests and rallies are so common that they have become a routine part of the park's operation. How does the NPS protect these sites and still offer a pleasant and meaningful visitor experience? How do controversial assemblies affect the NPS image? How does the NPS fund the security necessary since 9/11 and for special events? This session will highlight recent park experiences and explore possible answers to these questions.

Panelists:

Christine Gobrial, Planner, NOS Northeast Region Office, Philadelphia, PA

John Howard, Superintendent, Antietam National Battlefield, Sharpsburg, MD

Ian Crane, Chief Ranger, Independence National Historical Park, Philadelphia, PA

Rich Weideman, Chief of Public Affairs, Golden Gate National Recreation Area, San Francisco, CA

Session 4 • Kellogg I • Invited papers

Charting a Future for National Heritage Areas: Superintendents' Perspectives, International Context, Evaluating Our Progress

Chair: Nora Mitchell, Director, National Park Service Conservation Study Institute, Woodstock, VT

Session abstract:

This session explores the current context of national heritage areas in the National Park Service and interna-

tionally and prospects for the future. Program leaders, evaluation experts, and NPS superintendents will share what the NPS and the heritage areas have learned from the last twenty years about the heritage area approach to engaging the public in conserving living landscapes, the evolving role of the National Park Service, thinking about and evaluating the impacts of national heritage areas, and how the approach compares with other landscape-scale approaches being utilized internationally.

Charting a Future for National Heritage Areas: Two Superintendents' Perspectives

Presenters TBA

National heritage areas are places where natural, historic and cultural resources form a cohesive nationally important landscape that, together with the people who live there, tell nationally important stories about our nation. In response to increased attention on national heritage areas from Congress, NPS management, OMB, and residents in communities across the country who are initiating their own heritage area projects, the National Park System Advisory Board was asked to review the approach and make recommendations on its future. The advisory board's report, *Charting a Future for National Heritage Areas*, explicitly recommends strengthening the two-way relationship between national parks and national heritage areas through resource assistance and project collaboration. In this presentation, two NPS superintendents will describe their experiences with and perspectives on working beyond park boundaries with national heritage areas, and the benefits, challenges, and opportunities of such relationships.

National Heritage Areas in an International Context: Learning from English and French Landscape-Scale Conservation Approaches

Brenda Barrett, National Coordinator for Heritage Areas, National Park Service, Washington, DC

There is growing appreciation of the value of living landscapes, particularly those that retain natural, historic, cultural and traditional economic features. There is also growing awareness of the need for recognition and special management approaches based on partnership between local communities and national or regional governments. This paper will analyze the partnership management models of three programs: English areas of outstanding natural beauty, French parcs naturels regionaux, and United States national heritage areas. The presentation will highlight the programs' similarities and differences, including objectives, legislative basis, scale, national co-ordination, management at the local level, planning requirements and funding and leverage. Evaluation models used in each of the programs and the role of non-governmental partners, including the Association of the Areas of Outstanding Natural Beauty, Federation of the Parcs Regionaux, and Alliance of National Heritage Areas, will be highlighted. Best practices and transferable ideas will be identified and recommended for consideration.

Measuring Success in National Heritage Areas: Evaluation as an Organizational Learning and Development Tool

Daniel Laven, Research Associate, National Park Service, Woodstock, VT

Suzanne Copping, Assistant Coordinator, National Heritage Areas, National Park Service, Washington, DC

As interest in National Heritage Areas (NHA) intensifies, understanding and assessing the accomplishments, strengths and challenges associated with NHAs is increasingly critical. Three national heritage areas recently undertook "sustainability studies" to evaluate their progress and financial and non-financial impacts and to inform their future direction. Findings from these studies, along with annual performance indicators and other evaluation techniques, will are currently informing the development of a methodology that enables heritage areas to regularly conduct self-assessments. In addition to advancing our understanding of how NHAs work, insights gained from the NHA evaluation process may also be relevant to partnership parks, co-managed protected areas and collaborative conservation initiatives. This paper briefly describes the history of evaluation with respect to NHAs and presents current thinking about strategies to monitor and measure the impacts of heritage area activity. An important theme associated with this work involves the engagement of different audiences as part of the evaluation process. The presentation coincides with a GWS Side Meeting that will more intensively probe heritage area evaluation.

An Assessment of Natural Resource Management Conflicts in the Working Landscapes of Turkey: Koprulu-Kanyon National Park

Nedim Kemer, Student, University of Massachusetts, Amherst, MA

Environmental conservation has become a globally mutual concern and concurrently has begun to incorporate the significant dimension of humans. Within this context national parks and protected areas, particularly in developing nations, offer outstanding case study opportunities to explore the tensions between economic development, natural protection and shifting demographics. Turkey—as a developing nation with its ambitious people, working landscapes, abundant natural resources and 37 national parks—is a country of great importance within the context of the global environment. The Koprulu-Kanyon National Park in Turkey is an exceptional example of management challenges with social conflicts since its rich and fragile bio-physical and socio-cultural resources are under tremendous pressure. The paper will explore the historical socio-cultural facts of working landscapes to build an epistemological foundation. Then it will examine the current status by focusing onto the stewardship issues to assess the resource management challenges under the influence of global economy and cultural depletion.

Session 5 • Kellogg II • Contributed papers

Management of Carnivore Populations

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

Long-term Research on the Wolves of Isle Royale: Lessons Learned

Rolf Peterson, Research Professor, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI

John A. Vucetich, Assistant Professor, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI

The wolves and moose of Isle Royale National Park, Michigan, have been the subject of uninterrupted research for almost 50 years. What are the most significant findings from this long-term effort, and why has it continued for such an unusually long period? The finding of greatest importance is the realization that this simple predator-prey system is in fact very complex, and the nature of population limitation for both wolf and moose have changed significantly over time. Also, single unpredictable events may fundamentally change the system, possibly for decades. But it is a high level of public interest that explains the duration of this study, plus the persistence of a few people. We will highlight the efforts of one person, Robert Linn (cofounder of the George Wright Society), who helped maintain its integrity in the face of serious administrative challenges that arose at many levels of the federal government.

Canada Lynx on the Border: Biological and Political Realities for Recovery Planning

Ron Moen, Biologist, Natural Resources Research Institute, University of Minnesota–Duluth, Duluth, MN

Richard J. Baker, Minnesota Endangered Species Coordinator, Minnesota Department of Natural Resources, St. Paul, MN

Steve Windels, Terrestrial Ecologist, Voyageurs National Park, International Falls MN

Wide-ranging carnivores like Canada lynx move through national parks, other protected lands, and harvested forests owned and managed by public and private entities. The background management matrix is complicated by the strong interest the public has in lynx. Lynx are a harvested furbearer in Canada, and a threatened species in the U.S. Three critical influences on lynx population recovery (movement corridors, habitat use, and mortality) have been identified in a four-year radiotelemetry study in northeastern Minnesota. At GWS2007, we will use lynx as a case study for the integration of science, management, education, and policy to benefit threatened species. Cooperative management by Canadian and U.S. agencies could enhance lynx population recovery. The case study will be further developed in a workshop and conference on lynx management along the U.S.–Canadian border, to be held in Duluth, Minnesota, in October, 2007. The topic is timely because a project on Canada lynx in Voyageurs National Park has just begun.

The Value of Data Management: A Wolf Monitoring Database

Peter Lindstrom, Cartographic Technician, Grand Teton National Park, Moose, WY
Sarah Dewey, Wildlife Biologist, Grand Teton National Park, Moose, WY

Grand Teton National Park has data on a wide variety of natural and cultural resources. However, various data management issues limit its utility—importing and exporting data is often cumbersome, some data is unnecessarily duplicated, and separate datasets make it difficult to perform many analyses. We have overcome these issues with our wolf-related data by developing a single-file database that leverages the strengths of both Microsoft Access and ESRI's ArcGIS software. Custom import procedures for GPS collars and telemetry flights shorten the time from data acquisition to analysis, and a simple user interface means that complex data structures can be used without requiring technical expertise from the park's biologists. All data remain accessible from GIS, allowing complex spatial queries and analysis. Examples encompassing the entire range of possible analyses will be shown, including pack home ranges, kill site identification, habitat use, and GPS collar performance.

Wolf Recovery in Yellowstone: Park Visitor Attitudes, Expenditures, and Regional Economic Impacts

John Duffield, Research Professor, University of Montana, Department of Mathematical Sciences, Missoula, MT
David Patterson, Professor and Chair, Department of Mathematical Sciences, University of Montana, Missoula, MT
Chris Neher, Senior Economist, Bioeconomics, Inc., Missoula, MT

Based on a 1991 park visitor survey, wolf recovery in Yellowstone was predicted to have a positive impact of $19 million annually, due to increased wolf-related visitation more than offsetting negative impacts on livestock and big game hunting (1994 EIS). To test these predictions, park visitors were sampled in 2005 at park entrances and in the Lamar Valley. A total of 2,992 surveys were distributed; 1,943 were completed for an overall response rate of 66.4%. Wolves were listed by 44% of visitors as among the top three species desired to see on their visit (second only to grizzly bears). Increased visitor spending due to wolf recovery was estimated at $35.5 million per year (confidence interval of $22.4 to $48.6 million). In 2004–2005 compensation for wolf predation on livestock averaged $63,818. The impact of wolves on big game species has been either consistent with or below EIS projections.

Determining Bear Activity Levels in the Lower Brooks River Area, an Area of High Visitor Use in Katmai National Park, Alaska

Troy Hamon, Chief of Natural Resource Management and Research, Katmai National Park & Preserve, King Salmon, AK
Sharon Kim, Katmai National Park & Preserve, King Salmon, AK
Tammy Olson, Katmai National Park & Preserve, King Salmon, AK
Tara Harrington, Katmai National Park & Preserve, King Salmon, AK

Bear activity along Brooks River varies seasonally with salmon availability. The lower Brooks River area is particularly challenging for managers because it is a focal point for feeding activity in the fall and the location of the floating bridge enabling staff and visitors access across the river. We evaluated the spatial and temporal activity pattern of bears in the lower river area to ascertain whether some areas of the lower river have less bear activity than others. We found that a more direct routing of the bridge across the river would reduce the frequency of bears fishing or resting in close proximity to the bridge. However, since we are unable to determine to what extent the current bridge affects bear movement, any changes to operations would need to be accompanied by a repeat of this project to examine changes in bear activity.

Session 6 • Kellogg III • Contributed papers

Marine and Coastal Resources

Chair: Cliff McCreedy, Marine Resource Program Leader, National Park Service (WASO), Washington, DC

Fish Assemblages and Habitat Utilization Patterns in Coastal Waters of Four National Parks in Hawaii

Eric Brown, Marine Ecologist, Kalaupapa National Historical Park, Kalaupapa, HI

Jim Beets, Associate Professor, University of Hawaii at Hilo, Hilo, HI
Alan Friedlander, Fisheries Biologist, NOAA/NOS/NCCOS/CCMA/Biogeography Team, Waimanalo, HI
Randall Watanuki, Maintenance Mechanic, Kalaupapa National Historical Park, Kalaupapa, HI
Guy Hughes, Wildlife Biologist & Natural Resource Division Chief, Kalaupapa National Historical Park, Kalaupapa, HI

Reef fish assemblages were inventoried at four national historical parks in Hawaii: Kalaupapa, Puukohola Heiau, Kaloko–Honokohau, and Puuhonua O Honaunau. Benthic habitat maps were used to evaluate fish habitat utilization patterns. Although the greatest number of marine fish species was observed at Kaloko–Honokohau, the greatest abundance and biomass of marine fishes was observed at Kalaupapa. The highest average values per sample for assemblage characteristics (species richness, numerical abundance, biomass, diversity) were observed for Kalaupapa followed by Puuhonua O Honaunau and Kaloko–Honokohau. Puukohola Heiau had the lowest assemblage characteristic values and most dissimilar species composition, correlated with a greater proportion of sand and degraded habitats. Kaloko–Honokohau and Puuhonua O Honaunau had similar species composition. Overall assemblage characteristics were higher on colonized hard bottom substrates with high topographical complexity. Results have implications for marine protected areas within park boundaries.

Coral Bleaching and Disease Combine to Cause Catastrophic Mortality on Reefs in U.S. Virgin Islands

Jeff Miller, Fisheries Biologist, National Park Service SFCN, Inventory & Monitoring Program, St. John, VI
Erinn Muller, Research Scientist, U.S. Geological Survey, St. John, VI
Rob Waara, Biological Technician, National Park Service SFCN, Inventory & Monitoring Network, Palmetto Bay, FL
Caroline Rogers, Coral Reef Ecologist, U.S. Geological Survey, St. John, VI

Historically warm water temperature during 2005 created extensive coral bleaching in Virgin Islands National Park and Buck Island Reef National Monument. Monitoring at 5 study reefs revealed >90% coral bleached. Corals regained color in October 2005 as water temperatures decreased, and minimal coral mortality was detected. Continued monitoring from November 2005 through July 2006 revealed catastrophic coral mortality from coral disease, resulting in 48.7% mean loss of coral cover at the six monitoring sites. Average coral cover at over 26 acres of study reefs has declined from 21.4 % to 11% in one year. Mortality from disease at all sites increased approximately 4–80 times that of pre-bleaching levels and is strongly suggestive of a connection between bleaching and disease mortality. While coral mortality from bleaching events has been well documented this study shows that only with frequent monitoring would the post-bleaching mortality patterns and presence of pathogenic disease be detected.

Bleaching and Mortality of *Acropora palmata* at Buck Island Reef National Monument

Ian Lundgren, Biological Science Technician, Buck Island Reef National Monument, Christiansted, VI
Zandy Hillis-Starr, National Park Service, Christiansted, VI

Corals at Buck Island Reef National Monument, located north of St. Croix, USVI, experienced elevated sea surface temperatures in 2005. Using an existing coral monitoring study and a rapid assessment, National Park Service staff quantified the bleaching extent and the subsequent mortality of *Acropora palmata.* Barrier reef sites showed almost double the mortality that sites elsewhere showed. Additionally, the backreef site experienced bleaching impact first, followed by the forereef site and sites located outside the barrier reef. The loss of approximately 60% of live *Acropora palmata* tissue on the barrier reef and approximately 30% throughout the rest of the monument is the most devastating loss of *Acropora palmata* at Buck Island Reef since Hurricane Hugo in 1989, and the white-band disease outbreak of the 1970s. Given the recent listing of this species under the Endangered Species Act, managers might find this information useful to establish critical habitat and to develop better monitoring protocols.

A Collaborative Approach to Assessing Watershed Conditions in Coastal National Parks

Kristen Keteles, National Park Service WRD/Texas A&M University, Denver, CO
Cliff McCreedy, Marine Resource Program Leader, National Park Service (WASO), Washington, DC

The National Park Service (NPS) Water Resources Division (WRD) has initiated assessments of coastal water

resources in 52 coastal and island parks through the Natural Resource Challenge Watershed Condition Assessment Program. Reports from these assessments are characterizing the relative health or status of Great Lake, estuarine, and marine resources in the national park system and are revealing ecological stressors that may cause impairment. This presentation will describe the program and explore ways to strengthen partnerships among various stakeholders to produce robust and cost-effective monitoring approaches at coastal parks. Assessing coastal water quality and habitat condition in the parks provides a platform for cooperative monitoring and watershed management partnerships. For example, dissolved oxygen concentrations were found to be unexpectedly low in estuarine waters at Cumberland Island National Seashore during the summer, which encouraged increased monitoring for hypoxia by the state of Georgia. NPS is developing the next phase of the program to investigate resource problems and fill information gaps by forming monitoring partnerships with states, federal agencies, academia, local watershed groups and programs such as the National Coastal Assessment.

Status of Kittlitz's Murrelet in Alaska: Where Have All the Murrelets Gone?

Shelley Hall, Chief, Resource Management, Kenai Fjords National Park, Seward, AK
Marc Romano, Wildlife Biologist, U.S. Fish and Wildlife Service, Portland,
Michelle Kissling, U.S. Fish and Wildlife Service, Juneau, AK
Mason Reid, Wildlife Biologist, Wrangell–St. Elias National Park and Preserve, Copper Center, AK

Kittlitz's murrelet *(Brachyramphus brevirostris)* is one of the rarest seabirds in North America. During the breeding season, it is estimated that up to 50% of the world population occurs within or adjacent to National Park Service areas in Alaska, generally associated with tidewater glaciers. Populations throughout the region have declined by as much as 85% since the 1970s. As a result, Kittlitz's murrelet was listed as a candidate species under the Endangered Species Act in May 2004. Causes of the precipitous decline are not known, but several have been hypothesized: recession of tidewater glaciers, changes in forage availability, and vessel disturbance. Little is known about the biology and habitat of this species, making effective management problematic. I will present an overview of the status of Kittlitz's murrelet and recent research efforts within Glacier Bay National Park & Preserve, Kenai Fjords National Park, and Wrangell–St. Elias National Park & Preserve.

Session 7 • Governors I • Panel discussion

La Vida Verde: Hispanic Engagement in Natural Resource Conservation and Education

Chair: Pedro Chavarria, Ph.D. Student, Texas A&M University, Bryan, TX

Hispanic populations represent one of the fastest-growing demographics in the United States and yet there is little representation apparent in the "green" jobs—or those of natural resource conservation in the United States. Participation by Hispanics in conservation may have much less to do with appreciation for nature and conservation, and much more to do with socio-economic and political mechanisms inherent in the dominant culture which may complicate, deter, or inhibit participation by other groups. Integration of this fast-growing demographic group into conservation practices is essential to successfully promote natural resource conservation and healthy sustainable ecosystems. Our panel will present points of views from community leaders, university professors, professionals from federal agencies, and university students on what factors have promoted their successes in conservation, and how one might go about in promoting changes that will more closely integrate this demographic group in the conservation arena.

Panelists:

Pedro Chavarria, Ph.D. Student, Texas A&M University, Bryan, TX
Roel Lopez, Assistant Professor, Wildlife and Fisheries Science, Texas A&M University, College Station, TX
Manuel Piña, Jr., Associate Professor, Department of Agricultural Leadership, Education, and Communications, Texas A&M University, College Station, TX

Session 8 • Governors II • Invited papers

Effects of Natural and Human-caused Sounds on National Park Visitors: A Social Science Perspective

Chair: Karen Trevino, Program Manager, National Park Service, Natural Sounds Program, Fort Collins, CO

Session abstract:

As urban areas become increasingly crowded, people are exposed to higher levels of noise in their daily lives. As a result, visitors have developed an appreciation of the acoustic environment in national parks and concern over the quality of park soundscapes. One of the most important reasons that people visit national park units is the opportunity to experience natural sounds and enjoy the peace and quiet that the parks can offer. This session presents new research on how sound is perceived by national park visitors and new approaches to helping park managers protect, preserve, and restore appropriate soundscapes and assess the potential impacts of noise on visitor experience. The papers compare visitor perceptions of soundscapes at several national parks, and illustrate how data from modeling approaches and visitor surveys can be used to develop park soundscape quality standards. The session also examines the effectiveness of various management actions related to soundscape protection.

Comparing Visitor Perceptions of Soundscapes at Muir Woods National Monument, Yosemite National Park, and Grand Teton National Park

Dave Stack, Research Associate, Department of Natural Resources Recreation and Tourism, Colorado State University, Fort Collins, CO

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Robert Manning, Rubenstein School of Environment and Natural Resources, Recreation Management Program, University of Vermont, Burlington, VT

Ericka Pilcher, Research Associate, Department of Natural Resources Recreation and Tourism, Colorado State University, Fort Collins, CO

Shan Burson, Ecologist, Grand Teton National Park, Moose, WY

Research suggests that natural soundscapes are an integral part of the visitor experience in national parks and that it is important to develop indicators of quality related to natural sounds. This paper reports on and compares the results of three data sets collected during the summers of 2005–2006. During the summers of 2005 and 2006, listening exercises were conducted in Muir Woods National Monument, Grand Teton National Park, and Yosemite National Park. These exercises asked visitors to identify sounds that they heard most frequently and to render judgments about those sounds using a "sounds checklists." These checklists allowed visitors to identify each sound and rate each sound on a scale of –4 (very annoying) to +4 (very pleasing). This research informed mangers of the sounds visitors heard most often and how acceptable those sounds were in each study setting. Results helped in the formulation of indicators of quality and provided information for the development of sound recordings used for phase II of this study. Manning et al. will report on Phase II research efforts during this session.

Understanding and Managing Soundscapes in the National Parks: Standards of Quality

Robert Manning, Rubenstein School of Environment and Natural Resources, Recreation Management Program, University of Vermont, Burlington, VT

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Ericka Pilcher, Research Associate, Department of Natural Resources Recreation and Tourism, Colorado State University, Fort Collins, CO

Michael Savidge, Golden Gate NRA, San Francisco, CA

Mia Monroe, Muir Woods NM, Mill Valley, CA

Kurt Fristrup, NPS Natural Sounds Program, Fort Collins, CO

Research has found that human-caused noise can detract from the quality of the visitor experience in national parks. But what is the threshold at which these impacts occur? What level of human-caused noise should be allowed in national parks? This study was designed to help answer these questions using the framework of

indicators and standards of quality as developed in contemporary park planning/management frameworks such as the NPS's Visitor Experience and Resource Protection. Five recordings of a mix of natural and human-caused sounds in Muir Woods National Monument, California, were prepared and incorporated into a visitor survey administered in 2006. Respondents rated the acceptability of each recording, reported the types of sounds they found pleasing and annoying, and identified the recording that best represented the soundscape conditions of the park during their visit. Resulting data provide an empirical basis to help formulate standards of quality for the soundscape of the park.

Modeling Aircraft Noise in Grand Canyon National Park

Sarah Falzarano, Geographer, Grand Canyon National Park, Flagstaff, AZ
Ken McMullen, Flagstaff, AZ

Grand Canyon National Park is a large and topographically complex park that attracts numerous air tours. A noise model allows assessment of impacts of aircraft noise on the natural soundscape and acoustic experience of park visitors. This presentation will examine model inputs, parameters, and results of the Federal Aviation Administration's Integrated Noise Model version 6.2 for the park. Model inputs include type of aircraft used, where they fly, and how they operate, topographic data, and natural ambient sound levels. Metrics computed include percent time audible, average sound levels, maximum sound levels, and percent time above a certain sound level. Modeling shows 99% of the park having greater than 25% time audible of some sort of aircraft. The model provides an estimate of impacts, but results should be viewed with caution because it represents complex relationships with simplified data.

An Adaptive Approach to Managing Soundscapes in Muir Woods National Monument: A Test of Management Actions

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Fort Collins, CO
Ericka Pilcher, Research Associate, Department of Natural Resources Recreation and Tourism, Colorado State University, Fort Collins, CO
Robert Manning, Rubenstein School of Environment and Natural Resources, Recreation Management Program, University of Vermont, Burlington, VT
Karen Trevino, Program Manager, National Park Service, Natural Sounds Program, Fort Collins, CO
Michael Savidge, Golden Gate National Recreation Area, San Francisco, CA
Mia Monroe, Muir Woods National Monument, Mill Valley, CA

Research has found that human-caused noise can detract from the quality of the visitor experience in national parks. Papers by Stack et al., Manning et al., and Lawson et al. in this session describe the formulation of indicators of quality related to soundscapes, the formulation of standards of quality related to soundscapes, and development of use simulation models that might inform the relationships between visitor flow and human induced noise, respectively. But what can managers do if and when visitor related soundscape indicators are violated? This paper reports the results of a study that used an experimental design to test the effectiveness of the use of "quiet zones" in national parks. Two surveys were implemented. On the first "treatment survey" (n=221) visitors were asked if they noticed signs in the park pointing out the "quiet zone" at Cathedral Grove and as well as a battery of attitudinal and visitor motivation questions related to soundscapes. On the second "control survey" (n=249), the same battery of questions but were asked on days when the management action was not implemented. Moreover, ambient sound recordings were captured during each of the sampling period to test the overall changes in ambient sound. Results will show the effectiveness of these management actions.

Park Visitors and the Natural Soundscape: Experience Dimensions and Access Trade-offs

Shelley Saxen, Research Associate, University of Montana, Missoula, MT
Wayne Freimund, Department of Society and Conservation, University of Montana, Missoula, MT

The natural soundscape is increasingly recognized as a threatened park resource. As national parks grapple with how to manage the newly legitimized soundscape resource, there is a need to understand the actual visitor experience of the natural soundscape itself and to contextualize visitor willingness to make trade-offs among attributes of their park experience. The proposed research will first explore and map the dimensions

of the soundscape experience through qualitative interviews. In addition, an on-site survey will be used to explore the relationships between ascribed park value and visitor support for management actions. How do visitors characterize their experience of natural sounds? How important is the natural soundscape to visitors? And can ascribed park value help us to understand visitor willingness to support management actions? This talk will outline a research framework for exploring the visitor experience of natural sounds and for contextualizing visitor willingness to make access trade-offs to ensure park soundscape quality.

Session 9 • Governors III • Contributed papers

Managing Cultural Values on a Landscape Scale and Understanding How Different Cultures Value Resources

Chair: David Glassberg, Professor, Department of History, University of Massachusetts, Amherst, MA

Evaluating the Material History of Isle Royale National Park

Philip Scarpino, Professor of History/Director of Public History, Indiana University/Purdue University–Indianapolis, Indianapolis, IN

My paper will examine the range of surviving historical resources on Isle Royale National Park; place them in the context of local, regional, and national historical trends; and analyze the historical resources and the wilderness environment in which they currently exist as a common managerial challenge. Isle Royale is one of the most geographically isolated locations in the Eastern half of the United States. About 99% of the land within the park's borders is a federal wilderness area. At the same time, the park includes a number of historic properties that are related to various human uses over time. There are surviving resources related to mining, fishing, navigation, and recreation. Several of the recreational properties are owned by life leaseholders. While isolation and climate have helped to shape the wilderness that presently exists on Isle Royale, so, too, has deliberate and careful management by the National Park Service. Together, the wilderness and the historical resources embedded therein are part of a common historical process.

Appropriate Levels of Restoration and Development at Copan Archeological Park: Setting Attributes Affecting the Visitor Experience

George N. Wallace, Director, Center for Protected Area Management and Training, Colorado State University, Fort Collins, CO

Chris Mayer, Warner College of Natural Resources, Colorado State University, Fort Collins, CO

The study looks at how differing levels of restoration and development within and increasing development next to Copan Archeological Park affect the visitor experience at this World Heritage site in Honduras. Surveys, interviews and expert observation with visitors revealed that Latin Americans, North Americans and Europeans all show a preference for a mixture of restored ruins and those being reclaimed by nature. They described how this juxtaposition adds to the visitor experience. A majority of visitors also indicated a strong preference for maintaining agricultural or forested lands between the park and the town of Copan Ruins and described how the intensification of development would affect their experience. Implications for park management and cross-boundary involvement in land use decisions at this and similar sites are discussed and recommendations given.

Listening to Neglected Voices: Hmong and Public Lands in Minnesota and Wisconsin

David Bengston, Research Social Scientist, Northern Research Station, USDA–Forest Service, St. Paul, MN

Michele Schermann, Research Fellow, University of Minnesota, St. Paul, MN

MaiKia Moua, Contractor, University of Minnesota, St. Paul, MN

Tou Tai Lee, Contractor, University of Minnesota, St. Paul, MN

Recreation managers need to understand the cultures and concerns of ethnic communities in order to serve them effectively. The Hmong are an Asian ethnic group that is heavily involved in outdoor recreation activities but has been largely overlooked by social scientists. We conducted a series of focus groups with Hmong Americans in Minnesota and Wisconsin exploring their experiences and perspectives on public lands, including: activities, positive and negative experiences, needs and concerns, special needs of new refugees,

and suggestions for improvement. Our participants revealed deep cultural and personal connections with the natural world and the importance of public lands to many Hmong. But we also heard about profound problems and concerns. Racism, discrimination, and harassment from public land managers, recreationists, and private landowners are common. Participants had many suggestions for improvement and insights regarding the special needs of new Hmong refugees.

Defining, Saving and Managing Urban Cultural Landscapes

John O. Anfinson, Historian, Mississippi National River and Recreation Area, National Park Service, St. Paul, MN

The Mississippi River Valley at St. Paul, Minnesota, faces a crisis. Currently proposed development projects are threatening to destroy the cultural landscape and St. Paul's unique sense of place. The Mississippi River Valley at St. Paul is a cultural landscape defined by the interweaving of its unique physical character and the history that has occurred within the valley. Three elements define the physical character: the high bluffs; the long, wide valley, and the world-renowned Mississippi River. Many elements contribute to valley's historic character, including ancient Hopewell Indian sites, Dakota Indian sites, bridges, buildings, parks, and basic form of the transportation system. This landscape is nationally significant. This presentation examines the character of the historic landscape and the current battles within the community over its value. The presentation will consider preservation of St. Paul's historic landscape in the context of similar efforts underway in the U.S. and in other countries.

Session 10 • Governors IV • Invited papers

Western Airborne Contaminants Assessment Project (WACAP): Final Results

Chair: Tamara Blett, Ecologist, National Park Service, Denver, CO

Session abstract:

The Western Airborne Contaminants Assessment Project was designed to determine the risk to ecosystems and food webs in western National Parks from the local, regional, and long range transport of semi-volatile organic compounds and mercury. Key parks included in the study represent a latitudinal and coastal to interior gradient: Denali, Gates of the Arctic, Glacier, Mount Rainier, Noatak, Olympic, Rocky Mountain, and Sequoia. Final results of this 6-year study (2002–2007) will be presented in this session by principal investigators responsible for each component of the study.

WACAP: How Results Might Influence Management Actions in the National Parks

Dixon Landers, Senior Research Environmental Scientist, U.S. EPA/NHEERL-Western Ecology Division, Corvallis, OR

Staci Simonich, Associate Professor, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

Sascha Usenko, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

Kimberly Hageman, Research Associate, University of Otago, Department of Chemistry, Dunedin, New Zealand

Luke Ackerman, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

Jill Schrlau, Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

Adam Schwindt, Research Associate, Center for Fish Disease Research, Oregon State University, Corvallis, OR

Michael Kent, Director of the Center for Fish Disease Research, Department of Microbiology, Oregon State University, Corvallis, OR

Carl Schreck, Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR

Donald H. Campbell, Biogeochemist, U.S. Geological Survey, Denver, CO

Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR

Daniel Jaffe, Professor, Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell, WA

Howard E. Taylor, Project Chief, Analytical and Environmental Chemistry, USGS, Boulder, CO

Marilyn Morrison Erway, Research Associate, Dynamac, c/o EPA, Corvallis, OR
Tamara Blett, Ecologist, National Park Service, Denver, CO

The Western Airborne Contaminants Assessment Project (WACAP) was initiated in 2002 by the NPS to determine if airborne contaminants were having an impact on remote western ecosystems. Multiple sample types (e.g. snow, water, sediment, fish and vegetation) were collected from 2003–2005 to evaluate flux, pathways and impacts of semi-volatile organic compounds, mercury and other metals. Atmospheric modeling was performed to determine the likely sources of contaminants. The synthesis of the WACAP results evaluates and compares current and future risk to these ecosystems based on contaminant status in snow, water, vegetation, fish and recent sediments in the context of the geographic and specific lake basin characteristics. The performance of indicators used in WACAP can be evaluated by management for their relevance to the NPS Inventory and Monitoring program. Furthermore, the spatially extensive WACAP findings can be used by management in assessing relative airborne contaminant risk in specific national parks.

Contaminants Present in WACAP Parks

Staci Simonich, Associate Professor, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Howard E. Taylor, Project Chief, Analytical and Environmental Chemistry, USGS, Boulder, CO
Kimberly Hageman, Research Associate, University of Otago, Department of Chemistry, Dunedin, New Zealand
Dixon Landers, Senior Research Environmental Scientist, U.S. EPA/NHEERL-Western Ecology Division, Corvallis, OR
Sascha Usenko, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Luke Ackerman, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Jill Schrlau, Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Donald H. Campbell, Biogeochemist, U.S. Geological Survey, Denver, CO
Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR
Adam Schwindt, Research Associate, Center for Fish Disease Research, Oregon State University, Corvallis, OR
Michael Kent, Director of the Center for Fish Disease Research, Department of Microbiology, Oregon State University, Corvallis, OR
Carl Schreck, Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR
Daniel Jaffe, Professor, Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell, WA
Marilyn Morrison Erway, Research Associate, Dynamac, c/o EPA, Corvallis, OR

Over 100 different semi-volatile organic compounds (including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and polybrominated diphenyl ethers (PBDEs)) and 51 trace elements (including mercury) were measured in WACAP snow, lake water, sediment, fish, and vegetation samples. These contaminants were chosen because of their wide range of physical chemical properties, release from a variety of different source types, and their different periods of use or release in North America. The concentration of pesticides in annual snowpack was influenced by regional current and historic agricultural practices. PBDE concentrations in fish collected from the lower states was comparable to PCB concentrations. Mercury flux to sediments was up to 10 times greater in parks in the lower states than in Alaska, yet mean Alaska fish concentrations of mercury were approximately 2 times higher than other parks. This is likely due to the influence of watershed and foodweb factors affecting bioaccumulation of mercury.

Spatial and Temporal Distribution of Contaminants in the WACAP Parks

Daniel Jaffe, Professor, Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell, WA
Will Hafner, Research Associate, University of Washington–Bothell, Bothell, WA
Donald H. Campbell, Biogeochemist, U.S. Geological Survey, Denver, CO
Dixon Landers, Senior Research Environmental Scientist, U.S. EPA/NHEERL-Western Ecology Division, Corvallis, OR
Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR

Adam Schwindt, Research Associate, Center for Fish Disease Research, Oregon State University, Corvallis, OR
Carl Schreck, Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR
Michael Kent, Director of the Center for Fish Disease Research, Department of Microbiology, Oregon State University, Corvallis, OR
Staci Simonich, Associate Professor, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Kimberly Hageman, Research Associate, University of Otago, Department of Chemistry, Dunedin, New Zealand
Luke Ackerman, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Sascha Usenko, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Jill Schrlau, Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

The Western Airborne Contaminants Assessment Project (WACAP) evaluates the exposure, accumulation and impacts from airborne contaminants reaching remote western U.S. parks. We have conducted extensive sampling of fish, snow, water, lake sediments and vegetation at a number of parks in the western U.S. and Alaska. We will describe the spatial (horizontal and vertical) and temporal distributions of the primary contaminants measured in WACAP: mercury, pesticides, PAHs, PCBs, and other persistent organic compounds. We will also present airshed maps from atmospheric transport modeling, which give an indication of contaminant sources. Significant findings include: historic and current use pesticides are significantly correlated with proximity of use and cropland intensity; significant east-west gradients exist for some contaminants across the continental divide; higher levels of Hg were found in fish in the Alaskan parks; a relationship between snowpack Hg and particulate carbon exists; and lake sediments show the long-term temporal pattern of Hg deposition.

Biological and Ecological Consequences of Contaminants in Western Parks

Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR
Carl Schreck, Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR
Adam Schwindt, Research Associate, Center for Fish Disease Research, Oregon State University, Corvallis, OR
Michael Kent, Director of the Center for Fish Disease Research, Department of Microbiology, Oregon State University, Corvallis, OR
Staci Simonich, Associate Professor, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Luke Ackerman, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Kimberly Hageman, Research Associate, University of Otago, Department of Chemistry, Dunedin, New Zealand
Sascha Usenko, Graduate Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Jill Schrlau, Student, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR
Daniel Jaffe, Professor, Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell, WA
Dixon Landers, Senior Research Environmental Scientist, U.S. EPA/NHEERL-Western Ecology Division, Corvallis, OR

An important objective of the Western Airborne Contaminants Assessment Project (WACAP) is to assess biological and ecological effects of atmospheric semi-volatile organic compounds, metals, and fixed-nitrogen contaminants. To understand the fate of these contaminants in park ecosystems, we calculated total contaminant burdens in terrestrial and aquatic ecosystem compartments from measured concentrations in vegetation, snow, lake water, sediments, fish and moose and used a mass balance approach to evaluate fluxes. To examine bioaccumulation, we assessed the accumulation, magnification, and effects of contaminants in the ecosystem components we measured. Biological responses to contaminants in fish indicate effects on the endocrine and immune systems. For example, the appearance of eggs in male fish and elevated estrogen-responsive protein seems related to estrogenic contaminants. We also identified correlations between pig-

mented inflammatory cells and whole-body mercury. Finally we discuss linkages between WACAP data and other studies of the ecological effects of contaminants.

Park-by-Park WACAP Summaries and Conclusions

Dixon Landers, Senior Research Environmental Scientist, U.S. EPA/NHEERL-Western Ecology Division, Corvallis, OR

Staci Simonich, Associate Professor, Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, OR

Adam Schwindt, Research Associate, Center for Fish Disease Research, Oregon State University, Corvallis, OR

Michael Kent, Director of the Center for Fish Disease Research, Department of Microbiology, Oregon State University, Corvallis, OR

Carl Schreck, Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR

Donald H. Campbell, Biogeochemist, U.S. Geological Survey, Denver, CO

Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR

Daniel Jaffe, Professor, Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell, WA

Howard E. Taylor, Project Chief, Analytical and Environmental Chemistry, USGS, Boulder, CO

Marilyn Morrison Erway, Research Associate, Dynamac, c/o EPA, Corvallis, OR

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

A key feature of the final WACAP document is specific park-by-park summaries that capture the breadth of the effort for each primary park by graphically summarizing the range of the diverse data types generated and interpreted by WACAP. Basic information regarding the geographic setting, lake and watershed issues and project context are provided in addition to figures showing concentration and flux information for the most prevalent contaminants. In addition, key narrative summaries of contaminant related findings, specifically tailored for each park, have been prepared and are presented along with the basic results. Finally, key specific as well as integrated conclusions resulting from WACAP, overall, will be presented and discussed.

Session 11 • Governors V • Contributed papers

Citizen Engagement and Park Management

Chair: Dorothy Anderson, H.T. Morse Distinguished Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN

Session abstract:

Park and protected area planning and management are strengthened through better cooperation, collaboration, and communication between parks and local communities. The papers in this session describe a number of different efforts to engage citizens in park decision making activities. Enzler's paper traces the evolution of litigation in the Florida Everglades as it moves from a silo-based approach to an integrative ecosystem services approach to resource management. Nunnally's paper describes how educational institutions and communities can benefit from service learning projects. Anderson, Schertz, and Thompson's paper discusses the importance of community-agency trust in park planning and management. Dhakal, Nelson, and Smith's paper evaluates citizen-initiated resettlement for wildlife conservation, human well-being, and meeting multiple park objectives in Nepal.

Protecting Ecosystems: The Case of the Florida Everglades

Sherry Enzler, Research Fellow, Department of Forest Resources, University of Minnesota, St. Paul, MN

The Florida Everglades is one of the most unique water environments in the world. Failure to protect it has profound impacts on the natural and social systems it supports. In 1994 the Environmental Protection Agency (EPA) observed that because it had concentrated on programs designed to limit pollutants little attention was given to the overall environmental health of ecosystems. EPA concluded that even with perfect compliance with federal authorities it could not assure the reversal of disturbing environmental trends in natural areas such as the Everglades. This paper explores how stakeholders in the Florida Everglades attempted to use the destabilization function of litigation to transition to an ecosystem approach to environmental pro-

tection. The destabilizing function of public litigation can, if used strategically, enable a transition to ecosystem based protection. Strategic narrative and case analysis are used to develop recommendations for future efforts to move toward policies that protect ecosystems.

Designing the Urban Mississippi River: Collaborations between University Students and Local Organizations

Patrick Nunnally, Coordinator, Mississippi River Initiative, College of Design, University of Minnesota, Minneapolis, MN

The Mississippi National River and Recreation Area (MNRRA) is a unit of the National Park Service that relies heavily on partnerships with local communities and non-profit organizations to achieve its management goals. This paper describes a service learning project undertaken by students at the University of Minnesota that developed site plans and design schemes that further specific elements of the MNRRA comprehensive management plan. Students designed three sites along the MNRRA corridor, working with partners in St. Paul at the Mississippi Design Center, Juxtaposition Arts (Minneapolis), and the University of Minnesota's Capital Projects Planning office. All of the student designs expand the system of parks, trails and open space along the river, and promote opportunities for the public to connect with the Mississippi River. The model of student service learning education and work with local community partners offers much to MNRRA with relatively little direct cost.

Community–Agency Relationships at Voyageurs National Park: Does Trust Matter?

Dorothy Anderson, H.T. Morse Distinguished Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN

Joe Schertz, Graduate Research Assistant, Department of Forest Resources, University of Minnesota, St. Paul, MN

Jerrilyn L. Thompson, National Park Service Great Lakes/Northern Forests CESU Coordinator, Department of Forest Resources, University of Minnesota, St. Paul, MN

A contentious relationship has existed between Voyageurs National Park and communities that are adjacent to or nearby the park since the park was established. In 2005 park staff, community leaders and University of Minnesota researchers met several times to develop a survey instrument to examine how the park and communities interact on issues of importance to both and ways in which the interaction could be improved. Results describing levels of trust, community attachment to the park, and community perceptions of how the park benefits nearby communities were presented to park staff and community leaders in 2006. Park staff and community leaders viewed study findings as a way to strengthen communication and collaboration with one other. As a result several workshops, built around study findings, were conducted with citizen groups from local communities. Workshops were successful and have led to a number of new initiatives between the park and local communities.

Assessment of Resident Wellbeing and Perceived Biodiversity Impacts in the Padampur Resettlement, Royal Chitwan NP, Nepal

Narayan Dhakal, Graduate Research Assistant, Conservation Biology Ph.D. Program, University of Minnesota, St. Paul, MN

Kristen C. Nelson, Associate Professor, Departments of Forest Resources and Fisheries, Wildlife, & Conservation Biology, University of Minnesota, St. Paul, MN

J.L. David Smith, Professor, Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota, St. Paul, MN

We investigate social, economic, and biodiversity impacts of a citizen-initiated resettlement program for the Royal Chitwan National Park, Nepal. Findings are based on three focus group session designed to understand the residents' critique of the resettlement planning process and household surveys (n=322) designed to investigate respondents' comparative evaluation of well-being factors in old and new Padampur. Mixed results were found regarding respondents' evaluations of their well-being. Health services, physical access and facilities, land ownership and title, and social ties after the resettlement were improved. On the other hand, there was some loss of Tharu traditional knowledge and culture, loss of farm-based jobs, water scarcity, and lower food production. Respondents believed the resettlement would provide an increase in the

park's core wildlife habitat for endangered species, contributing to conservation of endangered mega fauna (mainly rhino and tiger). Changes in well-being should be monitored in order to evaluate the long-term socio-economic impact of citizen-initiated resettlement.

Engaging Students in Parks and Protected Sites through Service Learning

Monica Siems, Service Learning Coordinator, Career & Community Learning Center, University of Minnesota, Minneapolis, MN

Each year, more than 1,500 undergraduate and graduate students at the University of Minnesota take academic courses with a service-learning component. Students in these civically engaged classes may find that their learning is enhanced and that they are more interested in social issues, and they will almost certainly gain valuable experience and contacts with professionals. This may be especially important for students interested in careers in parks and public land management. Organizations that host service-learners also benefit, not only from the students' putting in volunteer hours but also from the opportunity to educate future leaders about their work. This presentation will discuss best practices in developing service-learning programs that benefit all parties and will highlight the University of Minnesota's service-learning partnerships with city parks, a national wildlife refuge, and the NPS Midwest Region's Rivers, Trails and Conservation Assistance Program.

Session 12 • State I • Panel discussion

Expansion of Quagga (Zebra) Mussels into the Western United States: The NPS Responds (Part 1)

Chair: Linda Drees, Chief, Invasive Species Branch, National Park Service, Fort Collins, CO

Session abstract:

Quagga mussels *(Dreissena bugensis)*, an aquatic invasive species similar in characteristics and impact to the zebra mussel, were discovered in Lake Mead National Recreation Area on January 6, 2007. Subsequently, Quagga mussels have been found in Lake Mohave and Lake Havasu. This is the first discovery of this aquatic biofouling organism west of the Continental Divide. Due to critical importance of water in the West, this finding in the Colorado River basin is poised to have a major impact on western water delivery systems, water-based recreation, and aquatic habitats. This is Part l of a two-part panel/workshop. This expert panel will discuss recent expansion of quagga mussels into the western United States, implications for environmental and economic resources, and park and state responses to infestations. Part II is a workshop to develop a western park response to the invasion.

Panelists:

Sandee Dingman, Zebra Mussel Incident Response Coordinator, Lake Mead National Recreation Area, Boulder City, NV

Valerie Hickey, Student Conservation Association, Lake Mead National Recreation Area, Boulder City, NV

Mark Anderson, Aquatic Ecologist, Glen Canyon National Recreation Area, Page, AZ

Byron Karns, Biologist, Saint Croix National Scenic Riverway, St. Croix Falls, WI

Jay Rendall, Coordinator, Invasive Species Program, Minnesota Department of Natural Resources, St. Paul, MN

Part one of a two-part panel/workshop (continues in session #24)

Session 13 • State II • Contributed papers

Collaborative Conservation and Cross-boundary Initiatives

CHAIR TBA

A Multi-jurisdictional Collaborative Planning Process for Resolving Cross-boundary Issues

Donald Rodriguez, Professor, California State University–Channel Islands, Camarillo, CA

George N. Wallace, Department of Natural Resource Recreation and Tourism, Colorado State University, Ft.

Collins, CO

Intensifying development near U.S. protected area boundaries has created unique challenges for managers, local governments and land owners who share the urban-wildland interface. Negotiating compromises regarding acceptable uses on both sides of a boundary has never been more important. This paper describes a model for cross-boundary management involving elected officials and public land managers on the White River National Forest in Colorado used to address a stalemate in the forest planning process. This multi-jurisdictional collaborative process included: a unified data base; detailed boundary analysis; cataloguing and prioritization of emergent issues; creation of a joint development review process for new land uses or treatments falling within a cross-boundary overlay zone; and an MOU to work on a series of projects addressing priority issues. Direct involvement of elected local officials and local government staff members was found to be an effective strategy for breaking the stalemate and shortening the public process.

Breakfast at the Cockpit Café and Other Innovations in Protected Area Outreach

Christine Baumann-Feurt, Coordinator, Coastal Training Program, Wells National Estuarine Research Reserve, Wells, ME

Ward Feurt, Manager, Rachel Carson National Wildlife Refuge, Wells, ME

Fundamental changes in protected area outreach and education strategies are dissolving old boundaries and fostering innovative approaches to civic engagement. Roles for protected area professionals include participation as stakeholders and pioneers for collaborative processes. These approaches to community based ecosystem management link the missions of protected areas with local and regional place-based initiatives. The Rachel Carson National Wildlife Refuge and Wells National Estuarine Research Reserve share a physical land base and philosophical commitment to achieving biological diversity and habitat conservation goals through partnerships. Two case studies from southern Maine illustrate the dimensions of these collaborative approaches, define attributes of successful partnerships and describe barriers to implementing new institutional arrangements that challenge the traditional outreach paradigm for protected areas. The concept of collaborative knowledge networks captures the relationship among protected areas, local communities and organizations with shared missions for sustaining natural systems in locally valued places.

Mobilizing Partners and Volunteers for Habitat Restoration and Natural Resource Management in the Potomac Gorge

Mary Travaglini, Potomac Gorge Habitat Restoration Manager, The Nature Conservancy, Bethesda, MD

The Potomac Gorge of the Washington, D.C., metro region is exceptionally biologically rich and includes parts of two national parks: Chesapeake and Ohio Canal National Historical Park and George Washington Memorial Parkway. Since 2000, the Park Service has been collaborating with The Nature Conservancy to develop and implement a comprehensive conservation plan for the area to protect its most significant natural resources and biological diversity. To support park staff in their natural resource management goals, The Nature Conservancy has mobilized hundreds of volunteers providing thousands of hours of effort to address two priority restoration needs: invasive species control and rare groundwater invertebrate habitat restoration. This presentation describes these volunteer-based projects and their outcomes, and how both private non-profit partners and volunteers from the local community can be engaged to help parks pursue natural resource management objectives.

Restoring the Cache River Wetlands in Southern Illinois through Community-Based Conservation Partnerships

Christopher Bridges, Graduate Research Assistant, Southern Illinois University–Carbondale, Department of Forestry, Carbondale, IL

Mae A. Davenport, Assistant Professor, Southern Illinois University–Carbondale, Department of Forestry, Carbondale, IL

Jean C. Mangun, Associate Professor, Southern Illinois University–Carbondale, Department of Forestry, Carbondale, IL

Andrew D. Carver, Associate Professor, Southern Illinois University–Carbondale, Department of Forestry, Carbondale, IL

Scientists and practitioners agree that cooperation among agencies, organizations, and community stakeholders is essential to protected area conservation. Still, clear direction to agencies, organizations, and communities on how to develop effective conservation partnerships is lacking. In 1992, the Cache River Joint Venture Partnership (JVP), including the U.S. Fish and Wildlife Service, Illinois Department of Natural Resources, The Nature Conservancy, and Ducks Unlimited, was initiated to restore a Wetland of International Importance (Ramsar 1994) in southern Illinois. The JVP is now seeking to cultivate community-based partnerships to support broader conservation efforts. This research identified partnership building opportunities through an inventory and assessment, which documented over two hundred potential partner organizations. Personal interviews with stakeholders indicate great potential for partnerships that is currently constrained by a lack of awareness of the JVP and restoration efforts in the area. Recommendations were generated for community and agency leaders in a community partnership handbook.

Doing More with More: Increasing the Role of Collaborative Research Management in Yosemite

N.S. Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA
S. Thompson, Branch Chief of Wildlife Management, Yosemite National Park, Yosemite, CA
J. Meyer, Branch Chief of Physical Sciences, Yosemite National Park, Yosemite, CA
J. Weaser, Branch Chief of Vegetation and Ecological Restoration, Yosemite National Park, Yosemite, CA
C. Knipper, Resource Management Specialist, Yosemite National Park, Yosemite, CA

Flat and even decreasing budgets are prompting resource managers across the National Park Service to develop cooperating, coordinating and collaborating relationships whenever possible to achieve program goals. This talk discusses some of the lessons learned in Yosemite National Park's resource management activities that involve a much larger body of collaborators than ever before. In recent years staff have been working across the park organization with American Indian affiliated tribes, individual volunteers, other state and federal agencies, youth programs, concessionaires, climbing groups, and other park partners to implement necessary programs that could never before be initiated without the help of others. This talk illustrates some collaborative successes over the years and some of the problems and pitfalls in establishing long-term cooperative partnerships.

Session 14 • State III • Panel discussion

Creating a "Culture of Evaluation" to Inform NPS Interpretation and Education

Chair: Sheri Forbes, Chief of Interpretation, Mount Rainier National Park, Ashford, WA

Session abstract:

The National Park System Advisory Board Education Committee and the National Park Service Education Council co-hosted an Interpretation and Education Evaluation Summit, October 25–26, 2006, at the University of Denver. Modeled after the Scholars' Forum on Civic Engagement, the summit focused on "creating a culture of evaluation" within interpretation and education—infusing evaluative thinking into the design and delivery of interpretive and education programs, products, and services—to keep our national parks relevant in the 21st century and move toward decision-making based on audience analysis and outcome data. Most NPS National Leadership Council members participated, along with interpretation and education leaders from across the NPS, National Park System Advisory Board members, education partners, and representatives from the private foundation community. This session will detail highlights from the evaluation summit, provide results of a baseline study on current status of the NPS in developing an evaluation culture, and discuss ways all NPS staff and partners can get involved and make use of evaluation methods, data, and analysis.

Panelists:

Sheri Forbes, Chief of Interpretation, Mount Rainier National Park, Ashford, WA
Sam Vaughn, Interpretive Planner, NPS Harpers Ferry Center, Harpers Ferry, WV
Nora Mitchell, NPS, Conservation Study Institute, Woodstock, VT
Patti Reilly, Director, NPS Northeast Center for Education Services, Boston, MA

Session 15 • Minnesota East • Panel discussion

Concerns and Strategies for Adaptively Managing Resources in an Era of Climate Change

Chair: Kathy Jope, Natural Resources Program Chief, Pacific West Region, National Park Service, Seattle, WA

Session abstract:

Climate change is a new and unprecedented challenge confronting protected areas. While many questions remain about how climate change will impacts specific ecosystems, the weight of scientific evidence in support of global climate change is overwhelming. 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 panel discussion is designed as a response and discussion session to follow the morning plenary and concurrent session presenting the risks and impacts of climate change to protected areas. Panel members will present and discuss what they see as the biggest challenges and opportunities for using climate change research to inform management and policy decisions.

Panelists:

Dan Kimball, Superintendent, Everglades National Park, Homestead, FL

Paul DePrey, Chief of Resources, Joshua Tree National Park, Twentynine Palms, CA

Bob Krumenaker, Superintendent, Apostle Islands National Lakeshore, Bayfield, WI

Jeff Mow, Superintendent, Kenai Fjords National Park, Seward, AK

Bert Frost, Deputy Associate Director, Natural Resource Stewardship and Science, National Park Service, Washington, DC

Session 16 • Kellogg I • Invited papers

Making Good Decisions about Visitor Use and User Capacity: A Progress Report from the Field

Chair: Kerri Cahill, Planner, National Park Service, Denver, CO

Session abstract:

Addressing user capacity is a perennial issue in protected area planning and management and a subject to which considerable attention have been given since the 1930s. For decades practitioners and researchers have struggled to determine how best to address user capacity in parks and protected areas in an attempt to answer the elusive question: how much use is too much? The framing of this question has changed over the years. We have learned that user capacity not only concerns the level of use, but the type, timing and locations of use as well. Toward this end the National Park Service developed the Visitor Experience and Resource Protection (VERP) framework to address user capacity by proactively planning and managing visitor use taking into account all aspects of use and its corresponding impacts. The VERP process continues to be the NPS' preferred method for addressing user capacity and related visitor use issues in National Park units. However, precedent-setting litigation over the Revised Merced River Plan in Yosemite National Park has recently challenged the legitimacy and efficacy of using the VERP process to address user capacity.

Progress in the Planning, Policy, and Legal Arena Related to User Capacity

Linda Dahl, Chief of Planning, National Park Service, Yosemite, CA

Kerri Cahill, Planner, National Park Service, Denver Service Center, Denver, CO

The NPS has embraced condition based visitor management (in the NPS, VERP) in philosophy and policy. So, how is it working in practice? Yosemite is currently on the front lines in a legal debate on this issue. In addition, Arches, Acadia, Shenandoah and others have been testing this in practice for many years. Further, NPS is now including VERP in general management plans and other planning efforts. Planning tools have been developed to aid implementation of this approach. Now it is time to raise awareness with others about how this system protects resources and visitor experiences, and the current state of implementation in the

NPS. The purpose of this presentation is to provide an update on recent legal challenges and policy debates on this approach to user capacity and visitor use planning. Further, the presentation will cover recent advancements aimed at further integrating this framework into NPS planning.

Adaptive Visitor Use Management: A Field Report from Yosemite National Park

Jim Bacon, Outdoor Recreation Program Manager, National Park Service, Yosemite, CA
N. S. Nicholas, Chief, Resources Management and Science, Yosemite National Park
Henrietta DeGroot, Branch Chief, Integrated Resources Analysis, Yosemite National Park. Yosemite, CA
Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC
Peter Newman, Assistant Professor, Colorado State University, Fort Collins, CO

The National Park Service considers the Visitor Experience and Resource Protection (VERP) framework to be the best means to plan for and manage appropriate visitor use of parks and protected areas. Accordingly, Yosemite National Park has used the VERP process to address visitor use and user capacity for the Merced Wild and Scenic River. A revised planning effort was concluded in 2005 that outlined the desired resource and experiential conditions for the Merced, and the park is currently in its third year of implementing a visitor use and impact monitoring program to ensure that these conditions are maintained. Indicator monitoring protocols have been developed and refined; monitoring results have been compiled into reports to inform planning and management efforts; and management actions to mitigate unacceptable impacts have been initiated. This paper presents aspects of Yosemite's overall user capacity management program including the application of the VERP framework. Policy, planning, and management implications are discussed.

VERP and Visitor Use Monitoring at Acadia National Park

Charlie Jacobi, Natural Resource Specialist–Visitor Use, Acadia National Park, Bar Harbor, ME

Acadia National Park has been actively applying the VERP process in the park since 1994, starting with the park's carriage road system and continuing with the Schoodic and Isle au Haut sections of the park. Recently, we began a planning process for the Mount Desert Island section of the park, our biggest challenge so far. Most of these processes are still "in process" and do not involve active monitoring. For the carriage roads however, we have monitored visitor numbers since 1995 and visitor behaviors every three years since 1997 (4 cycles completed). In this paper we discuss our experiences with the VERP process and lessons learned from it, how we established standards, who monitors and how often, and our recent review of the behavioral standards for appropriateness based on the existing data and some new data analysis. In a second example, we discuss our application of the VERP process to the Isle au Haut section of the park, and the establishment of standards for resource conditions and the visitor experience there, where we anticipate monitoring to begin in 2008.

Applied Visitor Use and User Capacity Management in Shenandoah National Park

Steve Bair, Backcountry, Wilderness and Trails Manager, Shenandoah National Park, Luray, VA

Since 1998 the Shenandoah National Park employs a user capacity model based on the Limits of Acceptable Change (LAC) and Visitor Impact Management (VIM) planning frameworks in backcountry and wilderness planning and management. The model is similar to the Visitor Experience and Resource Protection (VERP) process and contains many of the same elements to address user capacity by proactively planning and managing visitor use taking into account all aspects of use and its corresponding impacts. LAC planning has been applied to trails management, campsite management, and to a lesser degree the distribution of backcountry and wilderness visitor use. Presently, LAC social indicators and standards are being refined in the park's backcountry and wilderness plan and a "visitor experience monitoring program" is being developed to assist evaluation and management of the visitor's backcountry and wilderness experience.

Improving Commercial Services Planning with the Visitor Experience and Resource Protection Framework

Marilyn Parris, Superintendent, National Park Service, Makawao, HI
Kerri Cahill, Planner, Denver Service Center, Denver, CO

This presentation will discuss the benefits of integrating VERP with commercial services planning. Similar to

many parks in the NPS, Haleakala National Park has experienced dramatic changes in visitor use and associated impacts to resources and visitor experiences. One of the major contributors to changing use has been the growth of commercial services in the park. To better manage visitors and associated commercial services, the park is undergoing a commercial services plan that is integrating the VERP framework. Implementing VERP along with the commercial services plan is helping the park understand the extent and severity of resource and visitor experience impacts, and identify how commercial service providers can help better manage visitor use in the park. This presentation will demonstrate that commercial services planning and the VERP framework are a good match—strategically and adaptively manage use with the aid of concessions.

Session 17 • Kellogg II • Day-capper

Experiencing Change and Resistances to Change

Chair & Presenter: John Griffin, President, Griffin Consulting, Washington, DC

Session abstract:

Experience has shown that change takes place in organizations when the "pain of what is exceeds the perceived pain (or gain) to change." In this fun and experiential exercise, participants get a chance to experience the various aspects of change that they themselves struggle with, and what they are placing on the various stakeholder groups that they are asking to be engaged with, in various collaborative efforts. Very fun and high energy.

Session 18 • Kellogg III • Contributed papers

Managing Rare and Declining Fauna Populations

Chair: David Willey, Research Assistant Professor, Department of Ecology, Montana State University, Bozeman, MT

Rapid Apparent Distributional Shift in a Montane Mammal Responding to Climate Change and Other Influences

Erik Beever, Quantitative Ecologist, NPS Great Lakes Inventory & Monitoring Network, Ashland, WI

Chris Ray, Research Associate, University of Colorado, Boulder, CO

Recent changes in climate have been shown to affect myriad taxa, and biological consequences are predicted to be most pronounced at higher elevations and latitudes. Re-surveys of 20th-century records of American pikas from the Great Basin suggest that: populations have been lost from 36% of the "sites"; the rate of losses has apparently quickened in recent years; and distance to primary roads, habitat extent, and a climatic surrogate (maximum elevation of nearby habitat) apparently influence extirpation risk. Protected areas in North America disproportionately occur at higher elevations and in rock- and ice-dominated areas—areas that happen to favor pikas—yet the role of management in pika persistence remains clouded. Research on microclimatic and other characteristics of occupied and unoccupied taluses in the hydrographic Great Basin and in lava flows of Lava Beds National Monument—using remote-temperature recorders, modeling, and population indices—are further illuminating drivers in this charismatic inhabitant of many western parks.

Development and Testing of Automated Audio Recording Systems for Monitoring in the Northern Great Plains

Marcia Wilson, NPS Northern Great Plains I&M Network, Rapid City, SD

Blake Hossack, USGS Northern Rocky Mountain Science Center, Missoula, MT

P. Stephen Corn, USGS Northern Rocky Mountain Science Center, Missoula, MT

Michael Oehler, Theodore Roosevelt National Park, Medora, ND

Concerns about amphibian declines have underscored the need for long-term monitoring of populations. Given the variable breeding by anurans (frogs and toads) and unpredictable hydroperiod of wetlands in the north-

ern Great Plains, personnel from the USGS Amphibian Research and Monitoring Initiative sought affordable, remote recording systems that would permit electronic data collection and analysis. Automated digital recording systems (ADRS) have the advantage of producing a permanent sampling record, allowing for extended sampling periods at multiple sites simultaneously, and minimizing disturbance to organisms. Additionally, automated species recognition software may soon be available, which would greatly facilitate monitoring as well as lower interpretation and analysis costs. In 2005, USGS biologists field-tested ADRS to monitor anurans in Theodore Roosevelt National Park. The NPS Northern Great Plains I&M Network is testing the feasibility of using these acoustic recordings to also monitor birds, mammals, and insects, as well as the park anthropogenic sounds.

Protecting Rare Species that Nobody Likes: Timber Rattlesnake Preservation in Minnesota State Parks

Edward Quinn, Division Resource Management Program Coordinator, Minnesota Department of Natural Resources, St. Paul, MN

Shawn Fritcher, Area Resource Specialist, Minnesota Dept. of Natural Resources, Division of Parks & Recreation, Owatonna, MN

Timber rattlesnakes are endemic to North America and historically ranged over more than 30 states and the province of Ontario. Unfortunately, habitat destruction and persecution by humans have caused it to become imperiled in over 20 of those states, primarily in the northern half of the United States. In the early 1990s a survey of timber rattlesnakes was conducted on Minnesota state park lands to assess population status. One park in particular was found to be "the best stronghold for the Timber Rattlesnake on the State Lands surveyed." Unfortunately, a decade later, poaching and vandalism had reduced the population at that site by more than 90%. In about 2002 Minnesota State Parks initiated an aggressive management program to protect remaining timber rattlesnake populations and restore habitat. This presentation reports on survey results, protection efforts and habitat improvements to aid in preservation of timber rattlesnakes in southeast Minnesota.

Migration Across Borders: Science, Management and Conservation of Threatened Fish that Leave Olympic National Park

Samuel Brenkman, Fisheries Biologist, National Park Service, Olympic National Park, Port Angeles, WA

Stephen C. Corbett, Olympic National Park, Port Angeles, WA

Scientific information on native fish from many national parks is exceptionally limited. Olympic National Park, a designated World Heritage site and biosphere reserve, protects one of the largest aquatic refuges for native freshwater fish in the Pacific Northwest. The park contains 12 major rivers, 4,000 miles of stream, 31 native freshwater fish species, and 70 populations of Pacific salmonids. Despite protection by NPS management policies, the persistence and genetic integrity of migratory fish populations is threatened by overharvest, nonnative fish invasions, and genetic homogenization associated with interbreeding between wild and hatchery fish. To illustrate the importance of implementing science to better manage park fishery resources, we present results from a study that used radio telemetry and otolith microchemistry methods to: (1) determine life history diversity in federally threatened bull trout; (2) better understand sources of direct mortality outside the park; and (3) facilitate improved management of a federally threatened species.

The Most Endangered Fish: A Report on the Effort to Save the Devils Hole Pupfish

John Wullschleger, Fishery Biologist, National Park Service, Fort Collins, CO

Michael Bower, Death Valley National Park, Death Valley, CA

Despite its small size (approx. 30 mm TL) and relative isolation, the Devils Hole pupfish *(Cyprinodon diabolis)* occupies a prominent position in the history of endangered species conservation. With a native range that is restricted to a single water-filled cavern in southern Nevada, the species was federally listed as endangered in 1967, six years before the Endangered Species Act was signed into law; it has received additional legal protection through the inclusion of Devils Hole in Death Valley National Park and a landmark Supreme Court ruling that recognizes an implicit right to sufficient water to protect the fish and its habitat. Despite these legal protections, the species appears to have been declining for the last ten years. We identify the pos-

sible causes of this decline, describe on-going efforts to prevent extinction and discuss difficulties inherent in protecting species under constraints imposed by low numbers and limited distribution.

Session 19 • Governors I • Contributed papers

Changing Views: Manifest Destiny, Romanticism, and Commercialism

Chair: Dorothy Anderson, H.T. Morse Distinguished Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN

How the Indians Lost Their Lands: Thomas Jefferson, Lewis & Clark, and Manifest Destiny

Robert Miller, Associate Professor, Lewis & Clark Law School, Portland, OR

The European countries that colonized North America utilized the Doctrine of Discovery to claim sovereign, commercial, and property rights. The doctrine was developed to control European explorations and property acquisitions in non-European lands. The United States Supreme Court adopted Discovery in 1823 in Johnson v. McIntosh. Long before 1823, however, Discovery controlled American interactions with the Indian nations. Thomas Jefferson also used Discovery to open a new phase of American expansion across the continent. He had a continental American empire in mind and he used the elements of Discovery to aim the Lewis and Clark expedition at the Pacific coast. This new phase of expansion ultimately acquired the name "Manifest Destiny." Manifest Destiny arose from the identical legal elements and principles that constituted the Doctrine of Discovery. Thus, the Eurocentric, religious, and racial ideals behind Discovery became the legal principles that justified an American Manifest Destiny to cross the continent.

Rethinking National Park Ownership and Management: An Indigenous Perspective

Jacinta Ruru, Ph.D. Student, University of Victoria, Canada Faculty of Law, Victoria, BC, Canada

In recent decades the traditional concept of the national park landscape has been challenged. There is, in part, an emerging acknowledgment in society and law that much of these places are of cultural, spiritual, historical and contemporary importance for indigenous peoples. The new legal arenas, in particular, are demanding recognition of indigenous treaty and common law rights, and many colonized societies are now attempting to reinvent their relationships with indigenous peoples, seeking respectful relations. This address considers whether the national park concept, as embodied in contemporary legislation and management policy documents, continues to reflect a Western monocultural perception of wilderness landscape. By focusing especially on the experiences in Aotearoa/New Zealand and Canada, this address provides a valuable insight into the new ownership and management philosophies emerging in the national park arena.

Selling the Land Short: Applying Lessons Learned from Game Management to Public Land Recreation

Robert Smail, Graduate Research Assistant, University of Wisconsin–Stevens Point, Stevens Point, WI

At the end of the nineteenth century, demographic and technological changes were pressuring the viability of many American wildlife populations. In response, states began implementing the use of hunting seasons and licenses while allowing landowners to post no trespassing signs on undeveloped private land. The combined effect of these changes was to limit free access to wild game—a right long enjoyed and cherished by many Americans. From the manner in which early game laws were lobbied for and implemented, managers and agencies came to view wild game as their product and sportsmen as their customers. While successful in protecting game populations, this relationship caused much ecological imbalance through stocking and predator control, failed to consider non-sporting needs and was ultimately replaced. Managers now face similar demographic and technological changes in the recreational use of public lands and risk treating outdoor recreation as a product sold to the public.

The 19th-Century Literary and Historic Roots of the Beauty vs. Utility Debate in the Adirondacks

Erica Morin, Graduate Student, Purdue University, Lafayette, IN

In February 2005, Barton Mines Corporation announced plans for the construction of the Adirondack Wind Energy Park (AWEP) in North Creek, N.Y. Supporters of the project applaud the development of clean "green" energy through wind power, while opponents assert that the wind turbines are "visual pollution"

and fear the proliferation of other energy projects throughout the Adirondacks. The current AWEP debate is but one manifestation of an older, deeper conflict over whether to preserve the natural beauty of the Adirondacks or to develop the land in an ecologically friendly and economically beneficial manner. This project reveals the nineteenth century roots of the beauty versus utility debate by contrasting the Romantic language and allegory of Adirondack authors with New York state's repeated attempts to find a use for the remote wilderness tracts of land through large-scale land surveys. Although the development of wind farms is a relatively new alternative energy solution, the contemporary conflicts of interest regarding the AWEP derive from a long-contested history of how to properly manage the Adirondack region.

The Many Faces of Great Smoky Mountains National Park: The Impacts of Differential Histories and Outreach on Local Attitudes and Actions

Marc Stern, Assistant Professor, Virginia Tech, Blacksburg, VA

The history of development of the Great Smoky Mountains National Park (GSMNP) has long been cited by many long-time residents of the region as one of conflict and social injustice. Following a series of evictions, protests, and resource conflicts, the park is still not free from controversy. However, local relations have been improving. This presentation focuses upon the role of park outreach in overcoming historical grudges. The research draws upon surveys conducted with 727 area school children, semi-structured interviews with 140 adults living in the settlements closest to the park, and 35 interviews with park officials and staff over the course of one year. Quantitative and qualitative results reveal that specific forms of outreach, including classroom and after school programs, experiential educational opportunities for adults, and cultural heritage protection, have been particularly successful at improving the park's image, diminishing conflict, and encouraging more supportive behaviors by park neighbors.

Session 20 • Governors II • Contributed papers

Hydrology and Water Quality

Chair: Charles Roman, National Park Service, North Atlantic Coast CESU, Narragansett, RI

Science and Operations: Understanding and Responding to Floods at Yosemite

Joseph Meyer, Branch Chief, Physical Science and Geographic Information Systems, Yosemite National Park, El Portal, CA

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

Jim Tucker, Yosemite Valley District Ranger (retired), Yosemite National Park, El Portal, CA

Dan Gudgel, Meteorologist, National Weather Service, Hanford, CA

Yosemite National Park has four distinct types of floods, and the seasonality of these types of floods is predictable. In winter, large floods (i.e., 100-year magnitude) can be caused by rain-on-snowpack events. In winter, small floods can be caused by powerful winter storms in the absence of significant snowpack. In spring, small floods can be caused by spring runoff of the Sierra Nevada snowpack; these floods can become medium-sized during rain-on-snowmelt events. In summer, localized flash flooding can be caused from intense thunderstorms. Each of these four types of floods has occurred within the past ten years and can be examined in detail to determine the hydrologic and climatologic settings for each type of flood. The long stream gage and meteorological data record for the park that dates to the early 1900s will be mined to determine past occurrences of each type of flood. Operational responses for recent flood events will be summarized and recommendations will be made to optimize preparedness for future flood events.

A River Runs through It: Managing Hydrologic Modifications in a National Park

Susan O'Ney, Resource Management Biologist, Grand Teton National Park, Moose, WY

Extensive water resource development had already occurred in the Jackson Hole area prior to the addition of 304,385 acres to Grand Teton National Park in 1950. This development included Jackson Lake Dam, which has altered the streamflow regime, bedload transport processes and channel dynamics of the Snake River. In addition, portions of four natural streams are chronically dewatered under present irrigation practices (Spread, Ditch, and Granite Creeks and the Gros Ventre River). The park is actively investigating the effects

that Jackson Lake Dam and other water diversion structures have had on the quality and quantity of riparian and aquatic habitats within the park. Park resource managers are developing strategies to best manage these habitats through active negotiations with the Bureau of Reclamation (to favor dam releases that mimic a more natural flow regime) and local water users (to develop voluntary agreements with local ranchers to reduce diversion during critically dry periods).

Evaluation of Watershed Imperviousness Models Using Stream Assessment Techniques in the Cuyahoga Valley

Kevin L. Skerl, Ecologist, Cuyahoga Valley National Park, Brecksville, OH
Meg B. Plona, Biologist, Cuyahoga Valley National Park, Brecksville, OH
Daniel R. Petit, Chief of Natural Resources, Cleveland Metroparks, Cleveland, OH
Andrew K. Swanson, Assistant Professor, Department of Biology, Case Western Reserve University, Cleveland, OH
Sarah R. Kyker, Department of Biology, Case Western Reserve University, Cleveland, OH

Cuyahoga Valley National Park is home to 22 miles of the Cuyahoga River and over 190 miles of tributaries. Continued residential and commercial development in park watersheds is threatening downstream resources. We assessed two GIS models of imperviousness to help characterize watershed condition based on this established indicator. Field data were used to assess the utility of the models for predicting biological impacts. To complement an existing long-term water quality monitoring dataset that includes biological, physical and chemical parameters for 19 large tributaries, we classified 287 headwater streams using Ohio EPA's Primary Headwater Habitat Stream Assessment protocols. We also examined microbial communities which dominate headwater stream habitats utilizing molecular approaches to document shifts in community structure to measured environmental variables, including development. We present the results of our analyses and discuss how this information is being used to communicate watershed protection and restoration priorities to surrounding park communities.

Assessing Impacts of Houseboat Greywater Discharge: Acquiring Decision Making Tools with a Changing User Base

Matthew Julius, Associate Professor, St. Cloud State University, St. Cloud, MN
Mark Kuusisto, St. Cloud State University, St. Cloud, MN
Chris Holbeck, Chief of Resource Management, Voyageurs National Park, International Falls, MN

Impacts from gray water discharge into freshwater systems have been extensively unstudied, while significant research has been invested in modeling wastewater dilution from marine vessels. Most of this work has been concentrated on human health. Voyageurs National Park experiences multiple moorings by recreational houseboats that discharge gray water. In the marine systems, no work to date has included fieldwork to determine the extent, if any, of impacts on biota from the actual nutrient inputs. This project addresses the impact of nutrient inputs on nutrient ratios and biota in a freshwater system. These data will allow a hypothesis development concerning potential long-term impacts of gray water discharge on Voyageurs National Park's aquatic systems and human health. The data will also serve as a basis for developing an appropriate management strategy for managing houseboat gray water discharge in an effort to minimize their effect.

Trophic Transfer of Methylmercury in Lacustrine Food Webs of Voyageurs National Park, Minnesota

Kristofer Rolfhus, Associate Professor of Chemistry, University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI
Brent C. Knights, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI
James Wiener, University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI
Mark B. Sandheinrich, University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI
Roger J. Haro, University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI
Jeffrey D. Jeremiason, Gustavus Adolphus College, Chemistry Department, St. Peter, MN

We investigated the influence of food-web structure on the mercury content of northern pike *(Esox lucius)* and 1-year-old yellow perch *(Perca flavescens)* from Voyageurs National Park, in lakes contaminated by mercury from atmospheric deposition. Predicted concentrations in 55-cm northern pike were strongly correlated

with mean concentrations in co-existing yellow perch. Variation in methylmercury concentrations in components of the lower food web (lake water, seston, zooplankton, benthic invertebrates) paralleled that in fish to varying degrees. Diet and trophic position of northern pike varied little among lakes and did not contribute notably to the inter-lake variation in mercury concentrations in this species. Bioaccumulation factors indicated bottom-up control of methylmercury concentrations in these fishes, primarily through control of abundance and entry of methylmercury into the base of the food web. We attribute the variation in contamination of fish among lakes to ecosystem factors that influence the production and abundance of methylmercury.

Session 21 • Governors III • Contributed papers

Inventory and Monitoring

Chair: Elaine Leslie, Assistant Superintendent, Canyon de Chelly National Monument, Chinle, AZ

Developing Integrated Assessments for National Capital Region Network Parks: An Example from Rock Creek Park

Lisa N. Florkowski, Graduate Student, Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge, MD

William C. Dennison, Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge, MD

Todd R. Lookingbill, Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD

Tim J.B. Carruthers, Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge, MD

Jane M. Hawkey, Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge, MD

Shawn L. Carter, National Capital Region Inventory & Monitoring Program, National Park Service, Washington, DC

Integrated ecosystem health assessments can assist in focusing management efforts as well as tracking the effectiveness of these initiatives over time. This study used National Park Service Inventory and Monitoring (I&M) Program data for the National Capital Region Network (NCRN) to assess ecological status and trends for Rock Creek Park. The data were assessed against management thresholds, which were a combination of national (e.g., USEPA) and local (Washington, D.C.) regulatory standards and ecological health standards. The percentage of time that the data passed a threshold was combined into an ecosystem health index, which was used to rank each assessment site. The rankings were summarized by metric and location as well as by region (subwatershed) to help identify key problem areas. The Rock Creek Park assessment is the first step in creating an integrated assessment of the entire NCRN.

Unrecognized Reservoirs of Pollinator Diversity? Bees in National Parks and Monuments

Terry Griswold, Research Entomologist, USDA–ARS Bee Biology & Systematics Laboratory, Logan, UT

Olivia Messinger, USDA–ARS Bee Biology & Systematics Laboratory, Logan, UT

Concerns have been raised about the status of pollinators and the services they provide. Inventories of bees (the principal pollinators in temperate landscapes) in parks and monuments have been virtually nonexistent, as are baseline data to detect declines in bee populations. Limited studies of bees in eleven parks and monuments across five ecoregions suggest that these areas are home to a rich array of bees. In the two most complete studies, Pinnacles National Monument and Grand Staircase-Escalante National Monument, we recorded 400 and 670 species respectively. These results suggest parks and monuments may conserve many of the estimated 4,000 species in the United States. Systematic inventories designed to provide baseline data for monitoring can answer such questions as: To what extent do parks conserve our diversity of bees? Are wild bee populations declining? Do bee–plant relationships vary in time and space? How does fire effect bee populations?

Community Structure of Flies in Grand Staircase-Escalante National Monument: Differences in Occurrence and Abundance at Two Sites

Tim Graham, Research Ecologist, USGS, Moab, UT
Sarah Foltz Biological Technician, USGS, Moab, UT

Insects perform many ecosystem functions, e.g., decomposition and pollination. Sustainability of natural systems depends upon the continued performance of these functions. Insects provide redundancy of functions, thus resilience to perturbations. Few ecological relationships involving insects have been described on the Colorado Plateau. Monitoring changes in insect community structure in response to changes in disturbance (e.g., grazing) regimes provide understanding of insect roles. The Diptera were consistently abundant over the course of this study. Here we examine differences in composition and abundance of flies at the family levels on alluvial bench environments in Steep Creek (closed to grazing) and The Gulch (open to grazing) Thirty-nine families are represented, with 22–27 families at a given site and time. Some fly families apparently responded to weather, others responded more to site differences. Ecological implications of these changes over time and differences in space will be discussed.

The Effectiveness of a Vegetation-Based Approach for Estimating Vertebrate Species Diversity

Kaci Myrick, Research Assistant, Texas State University, Department of Biology, San Marcos, TX
Michael Huston, Professor, Texas State University, Department of Biology, San Marcos, TX
Jeff S. Hatfield, Research Ecologist, USGS Patuxent Wildlife Research Center, Laurel, MD
Floyd W. Weckerly, Assistant Professor, Texas State University, Department of Biology, San Marcos, TX
M. Clay Green, Assistant Professor, Texas State University, Department of Biology, San Marcos, TX

Through the Natural Resource Challenge's support, the Inventory & Monitoring networks have been documenting the plant and vertebrate species that occur within NPS boundaries. We have been compiling these data, determining biodiversity metrics for parks in eastern U.S. networks, and will include a total of 13 networks as more data become available. We are testing whether vascular plants are an effective surrogate for predicting species diversity of mammals, birds, reptiles, and amphibians. Investigating the use of one taxon to estimate biodiversity may be beneficial due to easier detection and monitoring of plants than animals. There are many landscape features that may impact species diversity (e.g., park area) and we have included such variables in our analyses. To date, we have found significant relationships between plants and the species diversity of reptiles, birds and mammals; however, we expect these conclusions may change with the inclusion of more networks in our analyses.

Long-term Bioassessment of Park-scale Stream Ecological Integrity in the Rocky Mountain Inventory and Monitoring Network

E. William Schweiger, Ecologist, Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO
Dan Manier, Ecologist/Research Associate, Colorado State University, Fort Collins, CO
Mike Britten, Program Manager Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO
Brent Frakes, Data Manager, Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO
David Pillmore, Data Technician, Rocky Mountain Inventory and Monitoring Network, NPS, Rocky Mountain National Park, Estes Park, CO

The Rocky Mountain Inventory and Monitoring Network (ROMN) is implementing a long-term stream monitoring program in our six parks (Glacier, Rocky Mountain, Great Sand Dunes, Florissant Fossils Beds, Grant-Kohrs Ranch, and Little Bighorn Battlefield). Pilot work is focused on Glacier, which is potentially threatened by proposed coal mines in Canada. We are adopting a robust probability survey design and emphasizing a bioassessment approach. This will generate statistically valid, park- or basin-scale inference of integrative condition measures. Both multimetric (IBI) and multivariate (O:E) approaches will be used to summarize benthos and periphyton data. We will also collect quantitative physical habitat (hydrology, channel morphology, etc.) and select physiochemistry measures. Sites will be sampled annually within a panel structure across time allowing long term trend estimation. All survey data will be integrated using process models and found data statistical procedures with fixed-site water quality monitoring (flux and loading of nutrients, etc.) conducted by the ROMN and other partners. ROMN stream monitoring will provide a unique and missing perspective on the condition of a key resource in our parks.

Session 22 • Governors IV • Panel discussion

Western Airborne Contaminants Assessment Project (WACAP): Discussion of Results and Future Monitoring Strategies

Chair: Christine Shaver, Chief, Air Resources Division, National Park Service, Lakewood, CO

Session abstract:

The session represents the final "report out" on the results from the Western Airborne Contaminants Assessment Projects to the National Park Service by all the WACAP investigators from EPA, USGS, USFS, Oregon State University, and University of Washington. The purpose of the session is to engage the Principal Investigators in dialogue with park, regional, and national NPS staff about the significance of WACAP results to specific parks and to the NPS as a whole. Participants can ask in-depth questions about patterns of contamination, sources of contaminants, impacts to park resources, key toxic compounds, what can be done about contaminants, and which specific future toxics monitoring strategies are recommended for western national parks. Feedback from participants will be used to prepare a final report to the NPS on the WACAP project.

Panelists:

Donald Campbell, Biogeochemist, U.S. Geological Survey, Denver, CO

Staci Simonich, Associate Professor, Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR

Daniel Jaffe, Professor of Atmospheric and Environmental Chemistry, University of Washington–Bothell, Bothell WA

Adam Schwindt, Faculty Research Assistant, Center for Fish Disease Research, Oregon State University, Corvallis, OR

Linda Geiser, Ecologist, USDA–Forest Service, Corvallis, OR

Session 23 • Governors V • Day-capper

A Hundred Years of the National Park Service: What Should the Centennial Mean?

Chair: TBA

Session abstract:

The National Park Service centennial in 2016 is still nine years away, but already is drawing a great deal of attention. NPS is in the process of launching its own official Centennial Initiative, and the Bush administration's FY08 budget request included large increases for the Park Service tied to the centennial. While this proposed additional funding is still just a proposal at this stage, it is evidence that politicians are willing to take the centennial seriously as a benchmark event for the national park system. Outside organizations concerned with the national parks will also be proposing their own activities. The question is: Will the centennial be mostly about more money for the parks, or will it also be seized upon as an opportunity for critical reflection on the role of NPS in the 21st century? In this informal day-capper session, some prominent current and former NPS employees share their own thoughts on how the centennial should be celebrated.

Presenters:

Abby Miller, President, George Wright Society, Shelburne, VT

Richard West Sellars, Historian, National Park Service, Santa Fe, NM

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

Rolf Diamant, Superintendent, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT

Session 24 • State I • Workshop

Expansion of Quagga (Zebra) Mussels into the Western United States: The NPS Responds (Part 2)

Chair: Linda Drees, Chief, Invasive Species Branch, National Park Service, Fort Collins, CO

Session abstract:

This is part 2 of a two-part panel/workshop addressing the recent expansion of quagga mussels into the western United States. This workshop will develop a series of response strategies for western parks including prevention, monitoring and containment. Part 1 (session #12) is a panel discussion by experts and resource managers on quagga impacts and response efforts.

Presenters:

Sandee Dingman, Zebra Mussel Incident Response Coordinator, Lake Mead National Recreation Area, Boulder City, NV

Valerie Hickey, Student Conservation Association, Lake Mead National Recreation Area, Boulder City, NV

Mark Anderson, Aquatic Ecologist, Glen Canyon National Recreation Area, Page, AZ

Byron Karns, Biologist, Saint Croix National Scenic Riverway, St. Croix Falls, WI

Part two of a two-part panel/workshop. See additional description under session #12.

Session 25 • State II • Day-capper

Ridin' the Rails: An Exploration of America's Resources through a Partnership with Amtrak

Chair: Jim Miculka, National Coordinator for the Trails and Rails Program, National Park Service, Weimar, TX

Session abstract:

The Trails and Rails Program was first developed in 1994 to introduce the public to exploring America's national parks using the Amtrak Rail system. The program has grown to include more than 22 routes with hundred of volunteers and over a million visitor contacts each year. The key element is to bring national parks to under-represented and non traditional users by using the rails to approach these groups. Come and join a fun session on discovering the Trails and Rails Program and learning about its application to the preservation and stewardship of parks.

Presenters:

Ann McGinnis, Amtrak Marketing, St. Louis, MO

Gillian Bowser, Gulf Coast CESU Liaison, Texas A&M University, College Station, TX

Session 26 • State III • Contributed papers

Vegetation Monitoring

Chair: Kara Paintner, Fire Ecologist, National Park Service, Fire Management Program Center, Fort Collins, CO

Monitoring Vegetation Composition, Structure, and Soils in the Rocky Mountain Region

Dan Manier, Ecologist/Research Associate, Colorado State University, Fort Collins, CO

Mike Britten, Program Manager Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO

E. William Schweiger, Ecologist, Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO

Brent Frakes, Data Manager, Rocky Mountain Inventory and Monitoring Network, NPS, Fort Collins, CO

David Pillmore, Data Technician, Rocky Mountain Inventory and Monitoring Network, NPS, Rocky Mountain National Park, Estes Park, CO

The Rocky Mountain Inventory and Monitoring Network (ROMN) connects 6 NPS units in Colorado and Montana for the purpose of vital signs monitoring. These units encompass a range of ecological types from semi-arid grasslands, montane and sub-alpine forest systems, and up to the alpine. We integrated approaches and methods from several existing vegetation and soils monitoring protocols (USDA–ARS, Herrick et al.

2005; NPS HTLN, DeBacker et al. 1999; USFS FIA, Phase II National Core Field Guide 2004) to develop a response design that can be used across the region and in many vegetation types. Our integration of these protocols includes a "spoked-wheel design" combining transect and plot based sampling for vegetation and soil surface metrics; it is adaptable in that subplots of various sizes can be included, or excluded, as dictated by the target resource. In 2006, ROMN conducted prototype testing in grassland and alpine systems. Analyses of these data provide insights into the accuracy, precision, and efficiency of the methods.

Status of Whitebark Pine in Pacific Northwest National Parks

Regina Rochefort, Science Advisor, North Cascades National Park Service Complex, Sedro-Woolley, WA
Mignonne Bivin, North Cascades National Park Service Complex, Marblemount, WA
Laurie Kurth, USDA–Forest Service, RMRS Fire Sciences Lab, Missoula, MT
Steve Acker, Olympic National Park, Port Angeles, WA
Michael Murray, Crater Lake National Park, Crater Lake, OR

Whitebark pine *(Pinus albicaulis)* is a keystone species of high-elevation ecosystems in Mount Rainier, North Cascades, Olympic, and Crater Lake national parks. Today, the long-term survival of the species is uncertain due to the introduction of a Eurasian fungus (white pine blister rust, *Cronartium ribicola)* to North America in 1910. Initial surveys of whitebark pine began in Mount Rainier in 1994 and shortly thereafter in the other four parks. In 2003, Crater Lake (Klamath Network) established a monitoring program and the North Coast and Cascades Network parks initiated development of a monitoring program in 2004. Both networks have initiated gene resistance surveys and the NCCN is collaborating with the USFS in a survey of genetic diversity and support of graduate student projects on nutcrackers and regeneration success. Elements of both network programs will be presented as well as on-going research.

Mapping Invasive and Rare Wetland Plant Species to Visualize Competition and Devise a Control Strategy

Wendy Cass, Botanist, Shenandoah National Park, Luray, VA
James M. Yoder, Associate Professor, Department of Biology, Eastern Mennonite University, Harrisonburg, VA

The northern Blue Ridge mafic fen plant community is a globally rare high-elevation wetland endemic to Shenandoah National Park. This community supports 48 rare plant populations and is of very high conservation value. Three non-native plant species—garlic mustard *(Alliaria petiolata)*, Japanese stilt grass *(Microstegium vimineum)*, and oriental lady's thumb *(Polygonum caespitosum)*—are encroaching on the wetland from nearby trails, roads, and developed areas. Protection of the community and rare plant population's integrity can only be done with extremely labor intensive hand-pulling. Before control was begun, the full extent of the invasion in relation to rare plant populations was visualized by collecting rare and invasive species abundance data at 1,200 sample points placed on a 10x10-m grid. Maps displaying the areas of greatest competition between rare and invasive species were then generated and used to develop a control strategy to protect the wetland.

Determining the Disturbance Effect on Forest Development for Use in Park Management Plans

Bruce Larson, Professor and Head, Forest Resources Management Department, University of British Columbia, Vancouver, BC, Canada
Regina Rochefort, Science Advisor, North Cascades National Park Service Complex, Sedro-Woolley, WA
Mariano Amoroso, Forest Resources Management Department, University of British Columbia, Vancouver, BC, Canada

Coniferous forests are an important component of the landscape in San Juan Island National Historical Park (Washington). Although the forests were manipulated during the historic military time period (1853 to 1871), significant and widespread disturbances later occurred. Forest stands need to be assessed with respect to current composition, stand density, species composition, and fuel loads to determine how close they are to the park's desired future conditions. We studied three forest stands in detail in preparation for the initiation of a larger project to determine protocols for the management and monitoring of the forest vegetation at the park. One stand with evidence of partial cutting, one with extensive windthrow, and one with little indication of major disturbance were chosen. We reconstructed the past growth and development

of these stands through analysis of increment cores and determined some ways that the different disturbance types affect stand growth on the island.

LiDAR- and CIR-based Vegetation Monitoring for Gulf Coast Parks: Potential Multiple Yields from One Methodology

Robert Woodman, Network Quantitative Ecologist, National Park Service Inventory & Monitoring Program, Gulf Coast Network, Lafayette, LA

Amar Nayegandhi, Computer Scientist ETI (contractor), U.S. Geological Survey Center for Coastal & Watershed Studies, St. Petersburg, FL

The NPS Gulf Coast Network, in collaboration with the USGS, are developing a vegetation monitoring protocol based on using EEARL LiDAR and CIR imagery to collect detailed 3D structural data and photo image information at whole-park and landscape levels. These data will be used to evaluate status and change in park vegetation based on analysis of structural measures and species- and conditional-specific color signatures. Initially, this methodology is being developed to monitor changes in ecological status, species composition, distribution, coverage, and patch dimension in park vegetation resources. In conjunction with planned vegetation monitoring, this methodology may secondarily provide effective quantitative assessment for diverse park resource concerns, including landform change (an early focal use for LiDAR), fuel loads, animal impacts, visitor use, cultural and historic resource condition, etc. The methodology and some current findings will be discussed.

Off-site Session • Side meeting, by invitation only (others welcome to observe and participate on a limited basis)

Developing a Meaningful Evaluation Methodology for National Heritage Areas: What's Working, What's Missing?

Chair: Nora Mitchell, Director, National Park Service Conservation Study Institute, Woodstock, VT

Moderator: Jennifer Jewiss, Professor, College of Education and Social Services, University of Vermont, Burlington, VT

Session abstract:

This moderated side meeting will ask invited academics and professionals to probe an evaluation methodology currently in development for assessing the effectiveness of national heritage areas that includes performance indicators, peer review and periodic evaluation. The discussion will focus on the strengths and challenges of the methodology, what's missing, and applicable models or case studies from other fields and partnership projects. A brief presentation will summarize three years of work to measure and assess the ways in which national heritage areas currently work. Participants will be asked to provide insights and perspectives on the proposed methodology that advance thinking about where a systematic evaluation approach for heritage areas should be headed. The meeting constitutes one component of a NPS-funded project to advance national heritage areas evaluation; the proceedings will contribute to the project report. Conference-goers are welcome to observe the discussion and can participate on a limited basis. The meeting will be held from 1–5 pm in the Main Conference Room at the Mississippi National River and Recreation Area offices at 111 East Kellogg Blvd. (two blocks east of the Crowne Plaza Hotel).

tuesday, april 17 • morning concurrent sessions • 10:00–12:05

Session 27 • Minnesota East • Invited papers

Evolving Concepts: The Influence of Native Communities on Cultural Landscape Commemoration

Chairs: Ellen Lee, Director, Archaeological Services Branch, Parks Canada, Gatineau, Quebec, Canada
Dave Ruppert, Cultural Anthropologist, National Park Service, Denver, CO

Session abstract:

The session will describe the role that Aboriginal thought has played in the evolution of management concepts

regarding cultural landscapes in several contexts over the last 30 years. The first speaker will describe how working with Aboriginal communities in Canada has influenced the development and application of guidelines for national commemoration of landscapes of importance to Aboriginal people. A second presenter considers how Aboriginal cultural landscapes might foreground the relationship between culture and nature over the artifactual products thereof, thereby circumventing the problematics of heritage designation based primarily on material considerations. A third speaker will discuss the historical focus in U.S. federal contexts on discrete "sites" and the motivation behind more recent considerations given to the identification and preservation of larger landscapes. Final speaker TBA. Plenary speaker Bobbie Conner will join a discussion session following the presentations.

Aboriginal Cultural Landscapes in a Parks Canada Context

Ellen Lee, Director, Archaeological Services Branch, Parks Canada, Gatineau, Quebec, Canada

Parks Canada's approach to the commemoration of Aboriginal history has evolved considerably over the last 30 years. One of the concepts that has been the most useful in this evolution has been the concept of cultural landscapes. The concept is widely used today, as it is a convenient term for integrating the cultural and natural values of a place and conveys the wholeness of a place, rather than just the sum of its elements. However, some kinds of cultural landscapes can be difficult to define in concrete physical terms because of their intangible cultural values. If we wish to define cultural landscapes in order to evaluate and manage them we must find some culturally appropriate way to define them. In this paper, I will describe how the process of working with Aboriginal communities to determine how best to commemorate places related to their history has influenced our thinking on the use of the concept of cultural landscapes as a category for the recognition of a heritage area. The approach that we have come to attempts to integrate the intangible and the tangible and the cultural and the natural, in terms of identification, evaluation and management.

Wherein Lays the Heritage Value? Rethinking the Heritage Value of Cultural Landscapes from an Aboriginal Perspective

Lisa Prosper (Mi'kmaq), Ph.D. Candidate in Canadian Studies, Carleton University, Ottawa, ON, Canada

The commemoration of cultural landscapes is often based on an attribution of heritage value to the built structures and otherwise material forms that characterize a particular landscape. This presentation begins by discussing the implications and limitations of conceptualizing the heritage value of cultural landscapes in material terms. It then considers how aboriginal cultural landscapes might inform an alternate way of conceptualizing the heritage value of cultural landscapes more generally, one that foregrounds the relationship between culture and nature over the artifactual products thereof. It is proposed that aboriginal cultural landscapes can be used as a basis for elucidating an approach to identifying, understanding, commemorating and conserving cultural landscapes that is not only more inclusive of non-material cultures, but also circumvents the problematics of heritage designation based primarily on material considerations.

From Potsherds to Landscapes: A Cautious Glance Out of the Test Pit

Dave Ruppert, Cultural Anthropologist, National Park Service, Denver, CO

While large areas have been set aside and targeted for preservation by the U.S. government, federal law has historically focused on limiting preservation efforts to the protection of specific, discrete "sites" or "places." This short presentation provides a brief discussion of the rationale behind this somewhat limiting language of the law, and goes on to discuss the motivation behind more recent considerations given to the identification and preservation of larger landscapes.

Discussant:

Bobbie Conner, Director, Tamástslikt Cultural Institute, Confederated Tribes of the Umatilla Indian Reservation

Session 28 • Great River I/IV • Panel discussion

The Natural Resource Challenge: The Vision, How it Turned Out, Where We Go from Here

Chair: Gary Davis, Ocean Branch Chief, National Park Service Water Resources Division, Ventura, CA

Session abstract:

The Natural Resource Challenge is a major NPS effort to revitalize and expand the natural resource program within the national park system and to improve park management through greater reliance on scientific knowledge. Since 2000, the Challenge has led to significant gains in core mission capability and to efficiencies through cross-program interactions, partnerships, and accountability. Major components of the Challenge include the establish of 32 networks to conduct basic inventories and vital signs monitoring; development of the Cooperative Ecosystems Studies Units, exotic plant management teams, and Research Learning Centers; base funding increases to parks; and providing professional positions and funding for managing air, water, geological, and biological resources. The panel will reflect on the original vision and expectations of the Challenge, how it has turned out, and predictions for its future.

Panelists:

Mike Soukup, Associate Director, Natural Resources Stewardship and Science, National Park Service, Washington, DC

Abby Miller, Deputy Associate Director, NRSS, National Park Service (retired), Shelburne, VT

Cat Hawkins Hoffman, Chief of Natural Resources, Olympic National Park, Port Angeles WA

Monika Mayr, Superintendent, Vicksburg National Military Park, Vicksburg MS

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

Session 29 • Great River II/III • Panel discussion

Understanding Diverse Mechanisms for Protecting Areas from a Global Perspective

Chair: Brent Mitchell, Vice President, Stewardship, QLF Atlantic Center for the Environment, Ipswich, MA

Session abstract:

This session will discuss upcoming events and initiatives to better understand protected area (PA) management and governance worldwide. In May 2007, IUCN-The World Conservation Union will convene an international summit on PA categories. One hundred experts from around the world will finalize input to new guidelines for the international system for understanding how PAs are managed. See www.iucn.org/themes/wcpa/theme/categories/summit/summit.html for details and background papers. Governance of PAs worldwide is also a focus of IUCN study. Four governance types were formally recognized at the 2003 World Parks Congress: government managed, co-managed, privately managed, and community managed (community conserved areas). We will focus on private reserves as the least-well- studied internationally. The U.S. National Park Service and IUCN will soon convene a seminar on how to develop and sustain public-private partnerships for the management of protected areas, examining approximately 12 successful public–private partnerships worldwide, to derive elements of success to guide future relationships.

Subject areas: protected area categories, public/private partnerships, private protected areas

Panelists:

Nikita (Nik) Lopoukhine, Chair, IUCN Commission on World Protected Areas, Parks Canada, Gatineau, QC, Canada

Jonathan Putnam, Office of International Affairs, National Park Service, Washington, DC

Session 30 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 31 • Kellogg II • Contributed papers

New Technologies in Resource Management, Education, and Interpretation

Chair: Ron Moen, Biologist, Natural Resources Research Institute, University of Minnesota–Duluth, Duluth, MN

Using 3D Models of Yellowstone's Developed Areas to Visualize Different Planning Alternatives

Ann Rodman, GIS Specialist, Yellowstone National Park, WY

Steve Cater, GIS Specialist, Salt Lake City, UT

We have found that accurate and realistic 3D visualizations are an effective communication tool in the planning process. Using SiteBuilder 3D and CommunityViz software, linked to ArcGIS, we've created realistic three-dimensional models of Yellowstone National Park's developed areas. These models are directly linked to natural and cultural resource data in the park's GIS. It is possible to show the effects of tree thinning, prescribed burns, adding buildings, removing buildings, changing trails, and other modifications before the changes are made on the ground. The audience can walk or fly through the scene, viewing the changes from any perspective. Because of the complexity of the natural and built environment, creating these 3D scenes is time intensive. When does it make sense to invest in this type of a project? How much will it cost? What is involved, start to finish? What will you have to show for the effort?

Archeology, National Natural Landmarks, and State Game Sanctuaries: Combining Efforts for Science and Management

Judy Alderson, Environmental Specialist, National Park Service, Alaska Regional Office, Anchorage, AK

Jeanne Schaaf, Cultural Resources Program Manager, Lake Clark/Katmai National Parks and Preserves, Anchorage, AK

Joe Meehan, Lands and Refuge Program Coordinator, Alaska Department of Fish and Game, Anchorage, AK

Joel Cusick, GIS Specialist, National Park Service, Alaska Regional Office, Anchorage, AK

The Walrus Islands and McNeil River State Game Sanctuaries in Alaska are also designated as national natural landmarks (NNLs). An archeological survey and GPS mapping effort of developed areas and known concentrations of archeological features were completed in 2004-–05. On Round Island alone, over 100 prehistoric semi-subterranean houses and other features remaining from a series of occupations beginning 5,900 years ago were documented. With clear evidence of island-based walrus hunting nearly 6,000 years ago, over 3,500 years earlier than any island sites documented in this region, the site significantly alters understanding of the region's prehistory. Products from this work now provide managers: (1) detailed GPS mapping of existing management infrastructure, (2) the overlay of GPS archeological site information with management facilities, (3) implications of the newly documented archeological data, and (4) tools for making future management decisions that are compatible with the significant cultural resources found at these sites.

Agency-Sponsored Treasure Hunts: Providing Alternatives to Traditional Geocaching

Stuart West, Branch Chief of Remote Areas, Acadia National Park, Bar Harbor, ME

Geocaching and letterboxing have been prohibited in most national parks largely due to federal regulations prohibiting disturbance or damage of natural features, establishment of unauthorized trails, and leaving behind unattended property. National parks, including Acadia, are continually challenged by unauthorized geocache sites within their borders. The National Park Service Office of Policy supports enforcement efforts aimed at preventing resource damage and ensuring visitor safety. However, the National Park Service also recognizes that geocaching is a well-established, popular pastime that is more than just a trend, and notes that some parks perceive positive benefits in constructively managing the use. Acadia's National Park's pilot, NPS-sponsored EarthCache program is an example of how the agency's needs to preserve resources and provide for appropriate visitor enjoyment can be achieved while fulfilling some of the desires of the geocaching community.

Armchair Education and Biology—Are Webcams for You?

Joe Meehan, Lands and Refuge Program Coordinator, Alaska Department of Fish and Game, Anchorage, AK

Mary McBurney, Subsistence and Interpretation Programs Manager, Lake Clark National Park and Preserve, Homer Field Office, Homer, AK

Judy Alderson, Environmental Specialist, National Park Service, Alaska Regional Office, Anchorage, AK

For the last several years webcams have been in use at Walrus Islands and McNeil River state game sanctuaries and national natural landmarks in Alaska. These cameras provide live-feed views of walrus haulouts and fishing brown bears to Internet websites and to a viewing area at the Alaska SeaLife Center in Seward, Alaska, and the Pratt Museum in Homer, Alaska. Part of a partnership effort including Alaska Department of Fish and Game, National Park Service, the National Geographic Media, the Alaska SeaLife Center, and the Pratt Museum, these cameras provide a unique opportunity for viewing and documenting wildlife activities. This session will discuss the partnering aspects of these projects, the implications for this type of interpretation/education for the resources and the public, the possibilities of generating scientific data through these types of projects, and the pros and cons based on experience so far.

ROVs in the Great Lakes: National Parks Case Studies

Laurie Harmon, Assistant Professor, George Mason University, Manassas, VA

Mark Gleason, Michigan Technological University, Grand Rapids, MI

In 2004, 2005, and 2006 we used an underwater remotely operated vehicle (ROV) to research and involve the public in marine educational programs. We studied the impact using the ROV had on adults and youth who operated it directly, observed it while receiving interpretation, and observed it via satellite from distant locations. Study results suggested the experiential facet of using the ROV fostered a deep understanding of Great Lakes resources and strengthened the place connection visitors felt. The ROV was small, low-impact, explored up to 500 feet underwater, had two cameras, a small arm, and weighed 12 pounds. Controlled from the surface via cable, we operated it from boats and shore. We will discuss how technology assists with people understanding and becoming connected to the natural world. We assess strategies employed, successes, and challenges encountered while using the ROV with National Park Service visitors, private organizations, and students.

Session 32 • Kellogg III • Invited papers

Soundscape Management and National Park Planning: Concepts and Cases

Chair: Frank Turina, Natural Resource Planner, National Park Service, Natural Sounds Program, Fort Collins, CO

Session abstract:

In 1981, EPA estimated that over 100 million people were routinely annoyed by noise levels in their community and 12 million people lived in areas where the noise levels made them likely to experience severe annoyance and possible hearing loss. Other data suggest that these numbers have continued to grow. This increase in noise exposure may help explain why many visitors come to national parks to escape the clamor of everyday life and to enjoy the peace and quiet that the parks can offer. NPS has responded to this trend by mandating that parks protect, preserve, and restore natural soundscapes wherever possible. The papers in this session describe how soundscape protection efforts fit within the NPS planning framework and provide case studies that illustrate how soundscape planning can be developed and implemented. The papers also present methods to help managers develop an understanding of the acoustic conditions in a park and communicate soundscape issues to park visitors.

Soundscape Management Planning under the National Park Planning Framework

Vicki McCusker, Natural Resource Planner, National Park Service, Natural Sounds Program, Fort Collins, CO

Acoustic monitoring documents the "what" of a soundscape: as in, "What does a park sound like?" Planning takes the next step and decides "So what?" in terms of what should a park sound like and how to get from the existing conditions to the desired conditions. The preferable approach is to initiate this within a general management plan and tier to park program plans, strategic plans, implementation plans, etc. If this is not feasible, a separate soundscape management plan may be prepared. The Natural Sounds Program is developing guidance to provide park managers with the tools needed to assist them with these planning processes. This session will provide a brief overview of the planning process as it relates to soundscapes from

foundation statement development, describing desired conditions for soundscapes, selecting indicators and standards, and specific actions needed to achieve or maintain desired conditions.

Managing Noise Instead of Access: Natural Sound Indicators and Standards in the Denali Backcountry Management Plan

Charlie Loeb, Park Planner, Denali National Park and Preserve, Denali Park, AK
Mike Tranel, Chief of Planning, Denali National Park and Preserve, Denali Park, AK

The Denali National Park and Preserve backcountry management plan (2006) addresses increasing motorized recreation with a framework of provisional natural sound indicators and standards coupled with a commitment to adaptive management. Managing motorized access in Alaska national parks presents unusual challenges because of Alaska's exemption from the Air Tour Management Act and because the Alaska National Interest Lands Conservation Act allows motorized access that would not be permitted in other U.S. parks. Although direct management of motorized access is difficult in this legal context, the public accepted standards for motorized noise proposed in the backcountry management plan because of the relevance of natural sound to natural resource conditions, wilderness resource conditions, and visitor experience. However, adaptive management will remain a challenge because of limited public understanding of sound metrics, limited background data available during the planning process, and on-going disagreement over the applicability of NPS management tools in Alaska parks.

Soundscape Analysis and Air Tour Management Planning: Methods and Approaches Used at Mount Rushmore National Memorial

Frank Turina, Natural Resource Planner, National Park Service, Natural Sounds Program, Fort Collins, CO

In 2000, Congress passed the National Parks Air Tour Management Act to regulate air tours over units of the national park system. The act requires the Federal Aviation Administration (FAA) and the National Park Service to develop air tour management plans for all parks where air tour operators apply to conduct tours. A plan may establish controls over tours, such as routes, altitudes, time of day restrictions, and/or a maximum number of flights for a given period; or ban all air tours. As the first air tour management plans prepared, Mount Rushmore served as a model for developing methods and procedures for assessing the impacts to visitors and park resources from noise. This paper discusses how soundscape data was collected and analyzed at Mount Rushmore and describes efforts to characterize noise impacts to visitors and natural and cultural resources in the national memorial.

Collecting and Using Audibility Logging Data to Support Soundscape Management and Planning

Dave Schirokauer, National Park Service, Point Reyes National Seashore, Point Reyes Station, CA

Increasing noise levels are a reality facing managers throughout the national park system. Managers are often forced to act to address soundscape issues with little information on the acoustic environment within the parks. Monitoring programs using state of the art recording equipment can provide a detailed description of the acoustic characteristics of an area, and should be developed by parks that are experiencing noise issues. However, planning and implementing a monitoring program and analyzing data can take months. Audibility logging is a method that park managers can use to get useful acoustic data in a relatively short period of time. Audibility logging uses park staff or volunteers to identify and log sound sources that are audible in the park on handheld computers. This paper discusses the steps required to establish an audibility logging program and describes how data collected during the program can be used to inform management actions.

Interpreting Soundscape Issues: Making Sound

Sky McClain, Lead Field Interpreter, Lake Mead National Recreation Area, Boulder City, NV

The acoustic environment includes natural and human-produced sounds and since childhood those sounds have impacted our lives. Memories of the soft murmurs of a mother's voice, the twitter of a songbird in the morning, and the rumble of an incoming summer storm remain in our collective consciousness. Although sounds are integral to how we experience our environment, many visitors take park soundscapes for granted. Park managers working to protect natural and culturally appropriate sounds are often faced with visi-

tors who lack an understanding of the importance of the acoustic environment and the effects of noise on their park experience, wildlife, and other park resources. Resource managers rely on interpretive staff to help educate and develop an appreciation of soundscapes in park visitors to help ensure that management actions are effective. This paper explores the interpretive tools for characterizing how sounds and their impacts on public lands can be better communicated in today's fast-paced world.

Session 33 • Governors I • Contributed papers
Management and Ecology of Ungulates
Chair: Dan Licht, Northern Great Plains I&M Coordinator, National Park Service, Rapid City, SD

Natural Demographics of Bison in the Great Plains
Joshua Millspaugh, Associate Professor, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Sybill Amelon, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Thomas Bonnot, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
D. Todd Jones-Farrand, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Robert Gitzen, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
David Jachowski, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Barbara Keller, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Dan Licht, National Park Service, Rapid City, SD
Conor McGowan, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Shane Pruett, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Chadwick Rittenhouse, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Kimberly Suedkamp Wells, University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
Bison *(Bison bison)* exist in Badlands, Wind Cave, and Theodore Roosevelt national parks and various culling strategies have been used to remove surplus animals. Information about natural bison demographics could aid mangers in identifying culling strategies that mimic historical conditions. We reconstructed natural bison demographics (i.e., sex and age structures, population growth) in these parks before and after the introduction of the horse (pre-horse and horse periods). We developed demographic simulation models to reconstruct bison populations by incorporating reported natural herd demographic rates, literature derived predation rates, and Native American take. We found that bison numbers were relatively constant during the pre-horse period, with a slightly positive growth rate and nearly equal sex ratios. In contrast to pre-horse age structure of bison populations, the selective harvest of adult females by Native Americans skewed the age distribution of females towards younger age classes during horse period simulations. The selective nature of Native American harvests during the horse period may have appreciably impacted the structure of bison populations.

Sturgeon River Plains Bison: Wildlife Management at the Public/Private Interface
Jason Kelly, Graduate Student, Natural Resources Institute, University of Manitoba, Winnipeg, MB, Canada
Micheline Manseau, Ecosystem Scientist, Western and Northern Service Centre, Parks Canada, and University of Manitoba, Winnipeg, MB, Canada
The Sturgeon River plains bison *(Bison bison bison)* herd has been growing at a rate of 10–14% annually. Consequently, the herd's range has been expanding, with numerous incidences of bison roaming outside of the park onto private lands, causing damages to crops and infrastructure. Landowners have had little input into the management of the herd, further compounding their frustrations. In order to create a forum to better address community interests, we worked with local landowners and managers and through meetings, workshops and semi-structured interviews obtained their perspectives on the issue. The landowners agreed on being proactive, to promote the benefits and mitigate the negative impacts of the herd. They envisioned a framework which reflected the general principals of ecosystem management, where a grassroots organization could work in partnership with other agencies. These results are a step in understanding the process of promoting a collaborative approach to wildlife management at the public/private interface.

The Deer Quandary at Apostle Islands National Lakeshore: Efforts to Protect Unbrowsed Landscapes

Julie Van Stappen, Branch Chief, Natural Resources, Apostle Islands National Lakeshore, Bayfield, WI

Apostle Islands National Lakeshore's 21 islands have a diverse history of disturbance, including deer browse. A few of these islands were not impacted by browsing, even at the height of deer populations in the 1950s. These islands contain rare forest communities dominated by Canada yew *(Taxus canadensis)*, a species that has been nearly extirpated on the mainland. In recent years, two of these islands have been colonized by deer and browse sensitive species, such as yew, are being heavily impacted. In trying to address this issue, a number of factors are involved, including impacts on a regionally rare species by an overabundant, yet still native, one; legislation which allows hunting in cooperation with the state; current state regulations which restrict deer harvest; treaty related harvest rights; and extremely difficult logistics and hunting. This paper will discuss the park's approach to this difficult and complex natural resource issue.

Models and the Management of Reintroduced Elk Populations: A Case Study of Theodore Roosevelt National Park

Glen Sargeant, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, Jamestown, ND
Michael W. Oehler, Sr., Wildlife Biologist, Theodore Roosevelt National Park, Medora, ND

Reintroductions of native ungulates in national parks create significant management challenges but present unique opportunities for insight about population growth and regulation. We estimated pregnancy rates, survival rates, age ratios, and sex ratios for reintroduced elk at Theodore Roosevelt National Park, North Dakota; combined vital rates in a population model; and compared model projections with observed numbers and population ratios. Rates of survival and reproduction were essentially constant and near biological maxima for elk; however, changes in population composition caused substantial annual variation in rates of increase (range = 1.18–1.36). Our model explained 99.7% of variation in population estimates over 2 decades and also described the growth of elk populations at Tyson Park, Missouri, and the Hanford Site in Washington. Population models like ours are useful tools for improving independent estimates of demographic parameters, understanding collective consequences of population processes, and short-term management planning.

Challenges of Managing Regional Wildlife Populations: A Case Study for Rocky Mountain National Park Elk

Therese Johnson, Biologist, Rocky Mountain National Park, Estes Park, CO
John Hoesterey, Environmental Program Manager, Parsons, Denver, CO
Timberley Belish, Environmental Scientist, Parsons, Denver, CO

The migratory Rocky Mountain National Park–Estes Valley elk population is affected by human forces both inside and outside the park. Effective management demands coordinated efforts of the park and its neighboring stakeholders. Predator loss and development outside the park have resulted in overabundant and habituated elk. Hunting pressure outside the park contributes to extremely high elk densities in the park and gateway community Estes Park, as elk seek sanctuary in these safe havens. These human impacts are transforming montane habitat in the park, as willow and aspen communities that support high biodiversity are lost. The National Park Service and neighboring land and wildlife managers have explored opportunities to coordinate management actions inside and outside the park to reduce and redistribute the elk population. However, poor alignment of the missions, interests, and social, economic, and political needs of these entities and their stakeholders result in suboptimal management solutions.

Session 34 • Governors II • Invited papers

Taking Action on Exotic Species in the National Park Service

Chair: Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Division, Fort Collins, CO

Session abstract:

Increasing numbers of species are being imported and introduced to areas far from their native ranges. The increasing presence of exotic, invasive species is changing the natural landscape. Governments, scientists,

agencies and individuals are responding to this growing issue through changes in policy and increases in public awareness of, study of, and resources for invasive species. The National Park Service has been entrusted with many of the nation's most treasured natural and cultural resources. These resources are being altered and sometimes destroyed by these invading species. Decisive action must be taken to preserve these resources before they are lost forever. This session looks at national policy, NPS strategic plans, and highlights activities in the various taxa of invasive species management.

Invasive Species Management from Strategy to Action: Implications for the National Park Service

Chris Dionigi, Assistant Director for Domestic Policy, Science and Cooperation, National Invasive Species Council, Washington, DC

Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Division, Fort Collins, CO

The proliferation of non-native organisms around the world is having a profound effect on natural ecosystems. This presentation will provide an overview of the scope and threat of aquatic and terrestrial invasive species in the U.S, discuss the national policy and management responses and describes how the proposed National Park Service action plan on invasive species complements the national direction.

NPS Exotic Plant Management Teams: Five Years of Serious "Weeding"

Nancy Fraley, Exotic Plant Management Team Liaison, Southeast Team, NPS, Asheville, NC

Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Division, Fort Collins, CO

This paper looks critically at the NPS Exotic Plant Management Program. The exotic plant management team (EPMT) concept was born in the Southwest to manage tamarisk and has spread to sixteen teams stationed across the United States. This paper documents the activities of the teams over the last five years, with more than 35,000 acres and 560 species having been treated on more than 185 parks. As the program matures, the role of the teams continues to evolve, but assisting parks in managing and controlling invasive plants and creating partnerships continues to be the focus of the EPMT program. Examples of the EPMT victories can be marked with drainages free of tamarisk in the Southwest, removal of knotweed in Northwest, replacement of native grasses where only leafy spurge could be seen in the Dakotas, to acres of kudzu replaced with native forests in the Southeast.

Non-native Pests: A Growing Threat to Forests in Our National Parks

Linda Drees, Invasive Species Coordinator, NPS, Biological Resources Management Division, Fort Collins, CO

Scott Schlarbaum, Professor of Forest Genetics Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN

Forested ecosystems within National Park Service-managed lands are being destroyed by invasive insects and diseases foreign to the American landscape. Urban and historic trees are also under siege. Invasive insects and pathogens are causing widespread mortality and decline in many native tree species throughout the country, altering forest composition and ecosystem function. This paper will discuss actions, partnerships and strategies to combat forest insects and diseases and promote forest health in our national parks.

Introduced and Invasive Aquatic Species: A Problem of Increasing Magnitude Within the National Park System

James Tilmant, Fisheries Program Leader, Water Resources Division, Fort Collins, CO

The effect of introduced and invasive non-native aquatic species is pervasive throughout the national park system and is a significant issue at nearly every national park unit with aquatic resources. Yet this issue has received only minor attention compared with concerns for terrestrial exotic species. The scope of our aquatic invasive species problems include fish, invertebrates, pathogens, and vegetation and is increasing in both number of organisms and areas affected. The prevalence of the problem stems from a history of purposeful legal and illegal introductions, accidental introductions and transfers of organisms by commercial and recreational activities, discard or release of organisms from aquaria, and transfer of organisms among water bodies by wildlife. This paper provides an overview of the magnitude of the problem within the national park system and will precede a session devoted to more specific park and regional non-native aquatic species problems and threats.

Disposable Pets, Unwanted Giants: Pythons in Everglades National Park

Ray W. (Skip) Snow, Wildlife Biologist, NPS, Everglades National Park, Homestead, FL
Lori Oberhofer, NPS, Wildlife Technician, Everglades National Park, Homestead, FL

Reports of exotic snakes in Everglades National Park include regular and increasing sightings of Burmese pythons *(Python molurus bivittatus).* Pythons in the wild today are a result of being unwanted exotic pets, individuals of which are intentionally, and perhaps accidentally, released. Pythons are now established and breeding in South Florida. The Burmese python, a native to Southeast Asia, can reach a length greater than 20 feet. This python is a long lived (15–25 years) behavioral, habitat, and dietary generalist, capable of producing large clutches of eggs (8–107). The non-native python's diet in the Everglades includes a wide range of birds and mammals. In recent years more than 326 Burmese pythons have been removed from the park or adjacent lands. *Python molurus bivittatus* has the clear potential to occupy the entire footprint of the Comprehensive Everglades Restoration Project, adversely impacting valued resources across the landscape.

Session 35 • Governors III • Panel discussion

Setting the Table for Sustainability: A New Network of National Parks, Local Food Producers, and Craftspeople is Born

Chair: Nora J. Mitchell, Director, Conservation Study Institute, NPS, Woodstock, VT

Session abstract:

This panel will present examples of new thinking and practice from the pages of the recently published *Stewardship Begins with People: An Atlas of Places, People & Hand-Made Products.* The atlas, co-published by the NPS Conservation Study Institute and Eastern National, is a guide to the work of friends and neighbors of national parks, heritage areas, and national historic landmarks who are practicing a stewardship ethic and a commitment to sustainability. Their work and the food and craft products they make contribute to the preservation of authentic traditional cultures and significant cultural landscapes. These stories are gathered from nearly thirty national park areas, from Blue Ridge Mountains to the Hawaiian Islands. While conventional wisdom suggests that "parks are not islands," parks and protected areas are only beginning to appreciate the many ways they can work with neighbors and partners to both encourage stewardship of their cultural landscapes and communities.

Panelists:

Rolf Diamant, Superintendent, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT
Wendy Behrman, NPS WASO Concession Program, Environmental Management Program Team Leader, Washington, DC
John Debo, Superintendent, Cuyahoga Valley National Park, Brecksville, OH
Howard Leavitt, Chief, Interpretation and Education, Golden Gate National Recreation Area, San Francisco, CA
Laura Rotegard, Superintendent, Grant-Kohrs Ranch National Historic Site, Deer Lodge, MT

Session 36 • Governors IV • Contributed papers

Assessing Public Opinion of Parks and Protected Areas

Chair: Michael Schuett, Associate Professor, Texas A&M University, College Station, TX

The Tangible Effects of Differential Community Interface on Resource Management

Marc Stern, Assistant Professor, Virginia Tech, Blacksburg, VA

Benefits-based management has become a dominant paradigm in park management for interacting with park neighbors, as exemplified by the theme of the 2003 World Parks Congress, "Benefits Beyond Boundaries." Strategies based upon this paradigm, which focus upon communicating and/or providing tangible benefits to local populations, have often failed to garner local support for conservation. This is not because people don't think about costs and benefits. Rather, it is because these analyses are only one part of the process through which local people formulate their reactions to neighboring parks. Interviews and participant

observation with local residents living in and around three national parks—Great Smoky Mountains National Park, Virgin Islands National Park, and Podocarpus National Park (Ecuador)—reveal that other, less obvious factors, many of which can be influenced by park outreach, are commonly stronger predictors of active local responses (active support or opposition) to neighboring parks than cost-benefit analyses.

Factors that Affect Visitor Donations to Park Programs

Elizabeth Halpenny, Assistant Professor, University of Alberta, Edmonton, AB, Canada

Encouraging donations to various park programs is an important goal of many park agencies. Drawing on a survey of visitors to Point Pelee National Park (n=355) this presentation examines the impact of five variables on donation intentions. These factors are: (a) place attachment (an individual's emotional, cognitive and functional/use bond with the park); (b) previous patterns of time and money donations to environmental causes and the park in particular; (c) knowledge about the park; (d) use history/length of affiliation; and (e) frequency of use. Donation intentions were strongest for endangered species protection programs followed by education, research, and infrastructure renewal. An individual's emotional bonds rather than his/her functional or cognitive bonds with the park demonstrated the strongest relationships with the four donation categories. Interestingly, high levels of place attachment were correlated most strongly with intentions to donate to research programs, rather than the most frequently cited program that was pledged support (i.e., endangered species). Implications for protected areas management are discussed.

Public Opinion of Proposed Wilderness in the Sleeping Bear Dunes National Lakeshore Area

Gregory Wood, Student, Grand Valley State University, Jenison, MI
Carol Griffin, Associate Professor, Grand Valley State University, Allendale, MI

Conducting a wilderness study in a national park requires public participation. Sleeping Bear Dunes National Lakeshore is currently conducting a wilderness study and creating a new general management plan (GMP) that will review the boundaries included in their 1982 wilderness recommendation. Previous development on a plan was halted three years into the process largely due to public objection to wilderness policies that could affect access. In January 2006, NPS announced they would begin development of a new GMP and wilderness study at the national lakeshore. Levels of public participation are currently far below past levels. This study is a survey of local residents as a way to provide more public feedback on opinions about where and how much, if any, wilderness should be designated and the degree of support.

Social Assessment to Inform Coastal Protected Area Management

Thomas E. Fish, Human Dimensions Specialist, NOAA Coastal Services Center, Charleston, SC
Shawn E. Dalton, Environment & Sustainable Development Research Centre, University of New Brunswick, Fredericton, NB, Canada

Many challenges related to effective natural resource and protected area management stem from complex and changing social processes, public demands, and values. Managers today recognize the need for greater understanding and application of social science concepts and methods to inform their decisions. Social assessment is systematic means of data collection and analysis that employs a variety of methods to generate information about the social environment for a specific geographic area. The human ecosystem framework was used as a basis for selecting social indicators for social assessment projects conducted in national estuarine research reserves in five coastal states (MD, ME, NY, OH, TX) to inform protected area management. Projects involved working with site staff to: identify dominant issues of concern and appropriate scales of analysis; select indicators and suitable data collection methods; characterize and map the "basic facts" about the social and biophysical landscapes; and discuss options sharing information with constituents.

Perceptions of North Country National Scenic Trail Visitors on the Huron-Manistee National Forest

Carol Griffin, Associate Professor, Grand Valley State University, Allendale, MI
R. Holst, Grand Valley State University, Allendale, MI

A section of the North Country National Scenic Trail traverses the Huron-Manistee National Forest. Although the NPS manages the trail as a premiere hiking trail, the USFS allows mountain bike usage on sections of

the trail. This is a controversial decision. A visitor survey was done in 1996 and repeated again in 2004 to determine user demographics and user perceptions of the trail and its users. Results from the two surveys are almost identical. Users were evenly divided between hikers and mountain bikers. Nearly all users report their experience to have been very high quality in terms of trail maintenance, trail amenities, and encounters with other groups. In short, there is little visitor concern over mountain bike usage on the trail.

Session 37 • Governors V • Contributed papers

Beyond the Stand-alone Park: Planning and Managing Protected Area Systems

Chair: Mike Scott, Cooperative Unit Leader/Senior Scientist, Idaho Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

America's Conservation Landscape 2076: Where, What, Who?

Mike Scott, Cooperative Unit Leader/Senior Scientist, Idaho Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

Dale Goble, Professor of Law, College of Law, University of Idaho, Moscow, ID

The first calls for a protected areas system that was representative of the ecological diversity of the United States date to the second decade of the 20th century. Ninety years later we are still far short of achieving this goal. With a projected population of nearly 500 million by this country's tricentennial—a population increase likely to be accompanied by rising consumption with a concomitant increase in use of natural resources, habitat loss, and pollution loads—the country faces a fundamental loss of biological diversity: the loss of hundreds of species and entire ecosystems, while relegating many of the remaining species to functional and evolutionary extinction in isolated fragments of ecologically dysfunctional ecosystems. In this paper, we provide an assessment of the representativeness of extant nature reserves and the resiliency of their resident populations. We close by providing an alternative vision for the ecological futures of this country and a means for creating a conservation landscape that is representative of the nation's biological diversity—a vision for the re-commoning of the North American landscape.

Conserving Bird Diversity in the United States: The Role of the National Wildlife Refuge System

David Rupp, Graduate Student, Environmental Science Program, University of Idaho, Moscow, ID

Mike Scott, Coop Unit Leader/Senior Scientist, Idaho Coop Fish and Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

The U.S. Fish and Wildlife Service has developed wildlife, habitat, and biodiversity goals for the national wildlife refuge system (NWRS) in response to the NWRS Improvement Act of 1997. The NWRS is attempting to coordinate its efforts towards strategic growth, management, and maintaining biodiversity at multiple scales and with conservation partners. We used bird lists from the refuges to assess the representation and redundancy of all bird species at multiple scales across the system. Using American Bird Conservancy's Green List, we note that 28 of the 38 species considered to be of highest conservation concern occur in the NWRS. Those species not occurring in the system—mostly endangered and range-limited species—could serve as conservation targets for strategic growth of the system. When these targets are combined with an analysis of the distribution of refuges by North American Bird Conservation Initiative's bird conservation regions, priority conservation opportunities become readily apparent.

Working to Complete Canada's National Parks System: Progress and Lessons Learned

Kevin McNamee, Director, Park Establishment Branch, National Parks Directorate, Parks Canada Agency, Ottawa, ON, Canada

Parks Canada has been working since 1970 to complete its national park system, with a focus on protecting representative examples of 39 natural regions. In 2002, the federal government announced an ambitious plan to establish 10 new national parks and to expand three existing national parks by 2008. A major focus of the work to create new national parks is an emphasis on working with other governments, aboriginal people, local communities and stakeholders, and the Canadian public. In working to establish new national parks, Parks Canada has utilized a range of approaches and techniques to secure the support of Aboriginal

people, local communities, traditional users of the land, and industry. This paper will provide an update on this ambitious undertaking, with a focus on accomplishments, lessons learned, and areas that require further work. It will highlight how Parks Canada has secured three new national parks, dealt with traditional uses of the land, and secured the cooperation of aboriginal people.

The Ecological Content and Context of the National Park Service

Leona Svancara, Spatial Ecologist, Idaho Conservation Data Center and University of Idaho, Moscow, ID

Mike Scott, Coop Unit Leader/Senior Scientist, Idaho Coop Fish and Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

What will the national park system look like on its 100th and 200th birthdays? The answer depends, at least in part, on the current level of representation of natural resources within park boundaries, the spatial distribution of parks and the integrity of surrounding landscapes. While an ever-increasing human population has resulted in economic and technological advances, it has also brought numerous ecological impacts including habitat loss and fragmentation, pollution, invasions of exotic species, and species extinctions. We assessed the ecological content and context of park units with "significant natural resources" in the lower 48 states at multiple spatial scales. These 243 parks represent 1.4% of the coterminous U.S. and, generally, protect areas of higher elevation, steeper slope, and sparse vegetation. Average human population size in adjacent counties has increased faster than the national average and associated impacts play a critical role in the effectiveness of parks as conservation areas and the ability of NPS to manage for the "unimpaired" mission.

What Would We Do Differently if We were Serious about Landscape Context for Our Protected Areas?

Kevin Gergely, Gap Analysis Program Coordinator, U.S. Geological Survey, Biological Resources Discipline, Moscow, ID

Mike Scott, Coop Unit Leader/Senior Scientist, Idaho Coop Fish and Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

Using the U.S. Fish and Wildlife Service's national wildlife refuge system as a case study, we examine the policy implications of examining landscape context. Spatial analysis of the refuge system shows the system to be susceptible in a number of ways. The vast majority are small, much smaller than the ecological processes that maintain them. Refuges lands are primarily shrublands, grasslands and wetlands, but the lands surrounding refuges are largely agricultural. Revisions to the refuge system management through the Refuge Improvement Act of 1997 provides guidance for management within and outside refuges, but specific case studies show federal managers are taking a careful, if not timid, approach when it comes to entering into the fray of management issues outside refuge boundaries. We use this case study to show how land managers might use spatial analysis to rank priorities, and how their policy and regulatory policies may shift if large-area context is considered.

Session 38 • State I • Invited papers

Examining Transportation Issues in National Parks

Chair: Jeffrey Hallo, Graduate Research Assistant, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Session abstract:

Transportation is a vital component of most national parks. In fact, for most visitors, roads and public transit systems are the primary means by which national parks are experienced. However, transportation systems raise many potential issues for managers. Impacts on the environment and the visitor experience are among these issues. This session provides a forum for communicating results from some recent transportation research projects that have taken place in national parks. Papers in this session will examine the impacts of roads on wildlife, visitor use of alternative transportation systems, the experiential aspects of park roads, and simulation modeling as a tool to manage transportation.

Transportation as an Experience: Insights from Interviews with Visitors to Three National Park Service Sites

Jeffrey Hallo, Graduate Research Assistant, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

Robert Manning, Professor, Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT

In conventional terms, transportation means the conveyance of goods and people from place to place. When transportation is considered in the context of national parks it may also represent an experience or a recreational activity. To explore this issue, qualitative interviews were conducted with vehicle-based visitors to Acadia National Park, Denali National Park, and Cape Cod National Seashore. Resulting data provide insights into the experience of people who rely primarily on vehicles and roads to visit a park. Traditional transportation variables like travel efficiency and safety remain important for these visitors. However, variable like crowding, aesthetics, environmental degradation, and wildlife sightings also become important to transportation users in national parks. The significant experiential nature of transportation in parks suggests a need to manage this experience and to reregister conventional roadway management frameworks and models to include experiential measures.

Alternative Transportation Systems and Visitor Experiences in Yosemite National Park

Dave D. White, Assistant Professor, Arizona State University, School of Community Resources & Development, Phoenix, AZ

Jill A. Wodrich, Graduate Research Assistant, Arizona State University, School of Community Resources & Development, Phoenix, AZ

Jim Bacon, VERP Program Coordinator, Yosemite National Park, Yosemite, CA

The National Park Service (NPS) increasingly is promoting alternative transportation systems (ATSs) in national parks to address environmental and social impacts from the historical reliance on personal automobile access. Despite the potential advantages, ATSs may require a reorientation in the way that visitors have experienced parks since the advent of auto-tourism. It remains unclear how transportation systems affect visitors' experiences of the park landscape, what factors influence visitors' travel behavior in the parks, and what are the appropriate indicators for monitoring visitors' experience of transportation systems. This paper presents results from an on-going study of visitor perspectives toward transportation systems in the Yosemite Valley. Qualitative analysis of semi-structured interview data identified individual psychological factors as well as situational influences that affect visitors' behavior and perspectives. These findings have informed the development of survey instruments to test potential indicators of quality for visitors' experience of the transportation systems.

An Assessment of Road Impacts on Wildlife Populations in U.S. National Parks

Amanda Hardy, Research Scientist, Western Transportation Institute, Montana State University, Bozeman, MT

Tony Clevenger, Senior Research Scientist, Western Transportation Institute, Montana State University, Bozeman, MT

Meredith Evans Wagner, Research Scientist, Western Transportation Institute, Montana State University, Bozeman, MT

Olivia Lu, Research Scientist, Western Transportation Institute, Montana State University, Bozeman, MT

Part of the U.S. National Park Service's mission is two-parted: to protect wildlife and to preserve their natural habitat for future generations. Increasing visitation levels requires the Park Service to balance wildlife habitat protection with the demands of visitors and their vehicles. Main access to wildlife habitats in the parks is the road network. While papers have been published on general wildlife-transportation issues or associated wildlife-human interactions in specific national parks, a literature review of current publications found that none addressed the impact of roads on wildlife throughout the U.S. national park system. A questionnaire to park officials highlights four major areas of concern: (1) transportation logistics, (2) collection of roadkill data, (3) wildlife-transportation conflicts, and (4) mitigation practices. Results indicate that few national parks are aware of the impact of roads on their wildlife populations. This paper identifies those national parks that recognize the influences of roads on wildlife and habitat quality and those who do not.

Since all parks have wildlife, understanding the issues arising from the more highly visited national parks in the U.S. provides knowledge that can be applied to the entire U.S. national park system.

Mass Transportation and Quality National Park Experience: The Going-to-the-Sun Road Example

Melissa Baker, Graduate Research Assistant, University of Montana, Missoula, MT

Wayne A. Freimund, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

Stephen F. McCool, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

Beginning summer 2007 Glacier National Park will implement a shuttle service to mitigate effects of construction on the Going to the Sun Road. Many parks are turning to alternative transportation to mitigate issues presented by heavy traffic. While parks like Zion and Denali have imposed mandatory mass transportation, Glacier's system will be voluntary. The objective for the shuttle is to reduce road traffic by 8%, theoretically keeping waits at construction zones to less than 30 minutes. To understand visitor attitudes toward a shuttle in Glacier, 75 visitors were interviewed during summer 2006. Interviews explored visitor perceptions of trade-offs associated with riding a shuttle system, which incentives would be appealing relative to shuttle use, and how the shuttle would affect their experience. This talk will provide insight into the preliminary analysis of the interviews and discuss the implications for further research on the role of mass transportation in U.S. national parks.

Transportation Research Needs in National Parks: A Summary and Exploration of Future Trends

John Daigle, Associate Professor, Parks, Recreation & Tourism Program, School of Forest Resources, Orono, ME

This presentation will synthesize the papers presented in this session and also illustrate a spectrum of transportation-related work that's been done in parks, some potential research needs, and future trends of transportation in parks. Diverse research themes will be illustrated by examining efforts of a newly formed committee entitled Transportation Needs in National Parks and Public Lands that is part of the Transportation Research Board (TRB). TRB is a unit of the National Research Council (NRC), a private, nonprofit institution that is the principal operating agency of the National Academies and the National Academy of Engineering. Under a congressional charter granted to the National Academy of Sciences, the NRC provides expertise in science and technology to the government, the public, and the scientific and engineering communities. Opinions from audience members will be sought to get a sense of priority of needs related to transportation research in national parks.

Session 39 • State II • Panel discussion

Climate Change and Cultural Heritage: Impacts and Ideas for Protecting Our Natural and Cultural Resources

Chair: Michelle Berenfeld, World Monuments Fund, New York, NY

Session abstract:

Recognizing the urgent threats to both natural and cultural resources posed by global climate change, World Monuments Fund will host a panel discussion with professionals in the fields of historic preservation, nature conservation, and green building that will examine how these disciplines can collaborate to develop strategies for minimizing threats and sustaining both built and natural environments. The cultural heritage preservation and environmental conservation movements share a common mission to protect and sustain existing resources, but there is often limited collaboration—and occasionally conflict—between the two disciplines. Much of the time, however, preservation of the natural environment also serves cultural sites and vice versa. Nature conservation and historic preservation professionals also have much to offer the green building movement. In this session, panelists will present current strategies and challenges in their fields and discuss ways that natural and cultural heritage preservation groups could more effectively coordinate their efforts, share resources and methods, and disseminate information in their effort to address climate change threats.

Panelists:

Charles Allen III, Center for Bioenvironmental Research, U.S. Green Building Council, Holy Cross Neighborhood Association, New Orleans Historic Districts Landmark Commission, New Orleans, LA

Rebecca Beavers, Coastal Geology Coordinator, Geologic Resources Division, National Park Service, Denver, CO

Dinu Bumbaru, ICOMOS International (Scientific Advisors to UNESCO) / Heritage Montreal, Montreal, QC, Canada (invited)

Theo Spencer, National Resources Defense Council, New York, NY (invited)

Session 40 • State III • Contributed papers

Management Interventions for Restoration

Chair: Mike Wong, Executive Director, Ecological Integrity, Parks Canada, Gatineau, QC, Canada

Free of Exotic Pigs: Two Decades of Dedicated Effort

Jim Petterson, Supervisory Wildlife Biologist, Pinnacles National Monument, Paicines, CA

Rob Saulino, Biological Science Technician, Pinnacles National Monument, Paicines, CA

Denise Louie, Chief, Research and Resource Management, Pinnacles National Monument, Paicines, CA

Pinnacles National Monument recently declared 14,500 acres of park lands free of exotic pigs. Over two decades of effort made this possible through construction of 24 miles of pig fence and extensive monitoring and eradication of pigs within the exclosure. Using a variety of detection techniques, including use of dogs and radio-collared pigs, we determined that the most effective method at Pinnacles is trapping at strategic locations. Pinnacles is now in a new phase of pig management involving five critical tasks: (1) Monitor fence to identify breaches and rapidly repair breaches. (2) Remove roughly 10 feet of brush on both sides of the fence line for protection from wildfire and keeping clear to monitor for breaches. (3) Monitor for pig sign within exclosure. (4) Rapidly respond with trained staff if a pig enters the exclosure. (5) Obtain necessary funding to support a lifetime commitment to maintaining a pig-free park.

Rats and Weeds and Lizards—Oh My!

Daniel Clark, Supervisory Exotic Plant Management Specialist, National Park Service, Florida/Caribbean Exotic Plant Management Team, St. John, VI

Zandy Hillis Star, Chief, Resource Management, Buck Island Reef National Monument, Christiansted, St. Croix, VI

Chris Furqueron, Integrated Pest Management Coordinator, National Park Service, Southeast Region, Atlanta, GA

Eradication of *Rattus rattus* and control of invasive exotic plants on Buck Island, U.S. Virgin Islands. Buck Island, located north of the island of St. Croix, is managed by the National Park Service (NPS). Due to significant threats to the natural resources, visitors, and the park's long range resource management plans, the NPS has conducted a successful *R. rattus* eradication program. Snap trapping began in 1998 and diphacinone baiting was conducted in 1999 and 2000 after the creation of an eradication plan and island-wide grid with 428 bait stations. An observed recovery of listed flora and fauna, and post-project snap trapping events since 2000 yielding no rats suggests eradication of the species from Buck Island. Following *R. rattus* eradication, the NPS embarked on the control of ten invasive exotic plant species on Buck Island. Since 2003, ground field crews selectively applying herbicides have reduced the ten targeted species cover island-wide by 95%. The integration of these successful pest management programs has paved the way for the re-introduction of the federally endangered St. Croix ground lizard *(Ameiva polops)* to Buck Island in 2007.

Restoring Ungulate Winter Range In and Near Yellowstone National Park

Mary Hektner, Supervisory Vegetation Specialist, Yellowstone National Park, WY

Roy Renkin, Vegetation Management Specialist, Yellowstone National Park, WY

Jennifer Whipple, Botanist, Yellowstone National Park, WY

Lynn Burton, Rangeland Management Specialist, Gallatin National Forest, Bozeman, MT

Lands within the Yellowstone River valley immediately north of Yellowstone National Park, known as the

Gardiner Basin, were deemed essential for elk and pronghorn winter range and acquired for the Park and Gallatin National Forest in the 1920s and 1930s. Additional lands were added to the forest during the 1990s, also for wildlife habitat. Due to previous agricultural land use, altered soils and hydrologic regimes, pervasive exotic weeds, and a semi-arid climate, these acquired lands support relatively low amounts and quality of native forage for wildlife. We convened a workshop in 2005 with agency, academic, and practicing restoration and reclamation specialists to develop feasible and sustainable ecologically-based restoration and management strategies for these old agricultural lands. With the help of the restoration experts, site specific action plans were developed for restoration of disturbed lands in a multi-use, semi-desert ecosystem with high levels of use by native ungulates.

Measures to Prevent Arrival of Further Strains of Eucalyptus Rust to Safeguard Hawaii's Ohia Forest

Lloyd Loope, Research Scientist, USGS-Pacific Island Ecosystems Research Center, Makawao, HI
Robert Anderson, USGS-Pacific Island Ecosystems Research Center / Department of Plant and Environmental Protection Sciences, University of Hawaii at Manoa, Honolulu, HI
Janice Uchida, Department of Plant and Environmental Protection Sciences, University of Hawaii at Manoa, Honolulu, HI

Ohia *(Metrosideros polymorpha)*, the overwhelmingly dominant tree in 80% of Hawaii's forests, is potentially vulnerable to strains of the neotropical rust fungus *Puccinia psidii*, known internationally as the most serious pathogen of eucalyptus. *P. psidii* has a broad host range within the Myrtaceae, whereas individual strains have a narrower host range. The strain known to be present in Hawaii since April 2005 primarily affects non-native rose apple *(Syzygium jambos)* statewide, but has been found on eight other species in the Myrtaceae, including ohia. Hawaii Department of Agriculture is currently establishing emergency rules to limit pathways (e.g., live plant or foliage imports) to prevent introduction of new genetic material with increased host range, virulence, and/or climatic tolerance. Complementary work in progress aims at evaluating and monitoring distribution of *P. psidii* currently present in Hawaii and developing diagnostic molecular tools to assist in detection of new strains and prevent their establishment.

Free Prisoners! Restoring Buried Wetlands and Protecting Cultural Features at Prisoners' Harbor, Channel Islands National Park

Paula Power, Ecologist, Channel Islands National Park, Ventura, CA
Kristen Keteles, Coastal Resources Analyst, NPS Water Resources Division/Texas A&M University, Denver, CO
Kevin Noon, Wetland Scientist, NPS Water Resources Division, Denver, CO
Joel Wagner, Wetland Program Leader, NPS Water Resources Division, Denver, CO
Mike Martin, Hydrologist, NPS Water Resources Division, Denver, CO

Restoration of Prisoners' Harbor has been a complicated process requiring input from an interdisciplinary team including cultural, archeological, hydrology, wetland, natural resource, and park management personnel. This presentation discusses the concerns and data used to formulate a conceptual design plan for the wetland restoration. Historical plans and photographs provided an understanding of the evolution of the ranching influences, changes to the wetland habitat, and extent of fill in the wetland. An hydrologic analysis was conducted to model the anticipated change in hydrology and the effects on archeological resources within the active floodplain as a result of the proposed removal of fill in the wetland. Monitoring wells were used to characterize seasonal water table dynamics in filled areas and nearby undisturbed "reference wetlands." We integrated our understanding of the ecological, archeological, and hydrologic conditions to develop a model to guide the conceptual design.

tuesday, april 17 • early afternoon concurrent sessions • 1:30–3:35

Session 41 • Minnesota East • Panel discussion

Native American Treaty Rights

Chairs: Charles F. Sams III, Tribal Lands Director, Trust for Public Land, Portland, OR
Robert Miller, Associate Professor, Lewis & Clark Law School, Portland, OR

Session abstract:

Do Native Americans have "reserved" or "special" rights? This is a question many people ask. The answer is "reserved" rights, of course. Tribal people all over North America had rights to govern themselves, worship in their own way, to travel freely, and speak their truth prior to European contact. Once European contact was made, tribal people have negotiated their land rights in order to reserve certain lands and individual rights they have had since time immemorial. This workshop will engage participants to develop a stronger understanding of the treaty rights reserved to Native communities in the United States. This workshop will promote a better understanding of Native communities and their reserved rights.

Panelists:

Robert Miller, Associate Professor, Lewis & Clark Law School, Portland, OR
Charles F. Sams III, Tribal Lands Director, Trust for Public Land, Portland, OR

Session 42 • Great River I/IV • Panel discussion

The NPS Inventory and Monitoring Program: Highlights for Managers, Planners, Interpreters, and Visitors

Chair: Steven Fancy, National Monitoring Program Leader, National Park Service, Fort Collins, CO

Session abstract:

National Park managers are confronted with increasingly complex and challenging issues that require a broad-based understanding of the status and trends of each park's natural resources a basis for making decisions, working with other agencies, and communicating with the public. As part of the NPS effort to "improve park management through greater reliance on scientific knowledge," the Inventory and Monitoring Program has implemented a major effort in partnership with other programs and agencies to collect, organize, and make available natural resource data and information for management decision-making, park planning, interpretation, and collaboration with the scientific community. Panelists and representatives from the 32 networks of I&M parks will provide an overview of "What we're doing and why" and will present a series of highlights and applications that demonstrate how the I&M Program is providing timely and relevant, scientifically credible information to park managers, planners, interpreters, and the public.

Panelists:

Bert Frost, Deputy Associate Director, Natural Resource Stewardship and Science, National Park Service, Washington, DC
Steven Fancy, National Monitoring Program Leader, National Park Service, Fort Collins, CO
Beth Johnson, Regional I&M Coordinator, Northeast Region, National Park Service, Kingston, RI
Sara Wesser, Regional I&M Coordinator, Alaska Region, National Park Service, Anchorage, AK

Session 43 • Great River II/III • Panel discussion

International Connections: The U.S. National Park Service and the World

Chair: Jonathan Putnam, International Cooperation Specialist, National Park Service, Office of International Affairs, Washington, DC

Session abstract:

The national parks concept has been referred to as "America's Best Idea." Over 90 years, the U.S. National Park Service (NPS) has been looked to for leadership by countries around the world, and in that time the NPS has both inspired and provided direct assistance to nearly every other nation's park agency. At the same time, the NPS stands to gain much from international cooperation, including the protection of shared migratory species and the exchange of innovative park management practices. Although NPS international activities have faced significant challenges over the last few years, the Park Service has nonetheless

remained engaged internationally, and is currently involved in several initiatives to increase its role in international park matters. The purpose of this session is to raise awareness of GWS participants of current and proposed major NPS international activities, focusing on World Heritage, shared migratory species, transboundary and "sister parks," and international training initiatives, and to seek input on possible future activities.

Panelists:
Stephen Morris, Chief, Office of International Affairs, National Park Service, Washington, DC
Jack Potter, Chief of Natural Resources, Glacier National Park, West Glacier, MT
Bill Dolan, Chief Warden, Waterton Lakes National Park, Waterton Park, AB, Canada
Niki Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA
Gary Davis, Ocean Branch Chief, National Park Service Water Resources Division, Ventura, CA

Session 44 • Kellogg I
National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 45 • Kellogg II • Panel discussion
Bioprospecting and Benefits Sharing in the National Park Service
Chair: Lindsay McClelland, Geologist, Geologic Resources Division, National Park Service, Washington, DC

Session abstract:
Research on park specimens may generate significant scientific and economic benefits, such as the polymerase chain reaction process, built on information from an organism discovered at Yellowstone National Park. The National Park Service is evaluating the environmental impacts of three alternatives for potential implementation of benefits-sharing agreements with scientists who conduct research in National Park System units: (A) No benefits sharing/no action; (B) Implement benefits sharing (the environmentally preferred alternative); and (C) Prohibit specimen collection for any commercially related research purposes. Based on the current status of the NEPA process, panelists will discuss management of bioprospecting and benefits sharing, including permitting, controlling specimen distribution, tracking research and valuable discoveries, and negotiating with researchers and their parent organizations.

Panelists:
Michael Soukup, Associate Director, Natural Resource Stewardship and Science, National Park Service, Washington, DC
Carla Mattix, Attorney/Advisor, Office of the Solicitor, Division of Parks and Wildlife, Santa Fe, NM
Ann Hitchcock, Chief Curator, National Park Service, Washington, DC
Dale Pate, Supervisory Physical Scientist, Carlsbad Caverns National Park, Carlsbad, NM
Tom Olliff, Chief, Yellowstone Center for Resources, Yellowstone National Park, WY

Session 46 • Kellogg III • Invited papers
Post-Wildfire Burned Area Emergency Response
Chair: Richard Schwab, National Burned Area Rehabilitation Coordinator, National Park Service, National Interagency Fire Center, Boise, ID

Session abstract:
Bridging the gaps between fire management, natural resources, cultural resources, and interpretation by rethinking post-fire response in a changing world. This session will describe the Burned Area Emergency Response (BAER) program and how it needs to interact with local Park managers and specialists. The BAER

planning process will be explained from wildfire ignition to rehabilitation. Case studies of recent wildfires will be discussed by staffs that have been entrusted to manage them.

Effective Resource Advising and Suppression Rehabilitation, BAER Teams, Planning and Assessments

Sandee Dingman, Biologist, Lake Meade National Recreation Area, Boulder City, NV
Erv Gasser, National BAER Team Leader, National Park Service, Columbia Cascades Support Office, Seattle, WA

When a fire occurs in your park, as a resource manager you may be tasked with advising the incident commander of resource concerns associated with the fire management operation, such as potential impacts to protected species or their habitats, wilderness, archaeological sites, and water resources. In addition you may be asked to immediately provide information and geospatial data about your local resources. Planning and preparation are essential to successful response to a large fire incident; however, when the smoke clears and the firefighters go home the emergency isn't necessarily over. Fire effects to watersheds, vegetation, wildlife, threatened and endangered species, cultural resources, and infrastructure and potential post-fire processes may result in adverse community and/or ecological consequences. Therefore, the primary purpose for evaluating resources is to determine if the fire created emergency conditions, damaged resources during suppression, or impacted critical infrastructure.

Flick Creek Fire Case Example

Jack Oelfke, Chief of Resources, North Cascades National Park, Sedro Wooley, WA

This presentation offers case examples of the range of issues to consider that are interdisciplinary and interagency in nature. The presentation will include the interactions with fire operations and BAER teams. Funding concerns will be discussed on the limitations of emergency stabilization, burned area rehabilitation, and park base funding.

Assessment of the Water Quality and Aquatic Habitat after the French Fire

Jennifer Gibson, Ecologist, Whiskeytown National Recreation Area, Whiskeytown, CA

The aquatic resources of Whiskeytown National Recreation Area have been impacted by an extensive history of mining. Past and present activities from within and outside the park boundary have left numerous dredge tailing piles, pits, adits, tunnels, roads, and associated contaminants. A cooperative study between USGS, University of Montana, and NPS has found that heavy metals have bioaccumulated in fish, amphibians, and benthic macroinvertebrates in the Upper Clear Creek watershed and within the park. Therefore, the consequences of a large-scale and severe fire in conjunction with recent logging and a legacy of mining could have long-term impacts to the park's resident aquatic species. This study identified sources of contamination and determined the extent to which heavy metals are present in the watershed and the magnitude to which they have accumulated in biota.

Restoration Strategies in Fire-Damaged Mesic and Wet Hawaiian Forest, Hawaii Volcanoes National Park

Rhonda Loh, Botanist, Hawaii Volcanoes National Park, Hawaii National Park, HI

The 2002–2003 fire season was remarkable for the size (11,000 ac) and duration (>200 days) of wildfires at Hawaii Volcanoes National Park. They included the largest fires to date in `ohi`a rain forest and mesic forest. The impacts of fire on these two ecosystems were expected to vary according to the invasive species present and past history of disturbance in the area that resulted in several strategies to restore preburn communities. In rainforest, disruptive alien woody species, pigs and fire were excluded to allow time for natural recovery of the forest. In mesic forest overwhelmed by invasive swordfern and at high risk for future wildfires, a subset of fire-tolerant native species belonging to the preburn community was used to revegetate the area. By the third year, twenty-three native species had been established in the burn by a combination of artificial seeding and outplanting of individuals propagated in park nurseries.

Planning through Implementation: Kolob Fire Burned Area Restoration, Zion National Park

Kelly Fuhrmann, Fire Ecologist, Zion National Park, Springdale, UT
Cheryl Decker, Vegetation Management Specialist, Zion National Park, Springdale, UT
Kara Paintner, Fire Ecologist, National Park Service, Fire Management Program Center, Fort Collins, CO

The Kolob Fire was the largest in Zion National Park's recorded history. It altered the landscape on a scale that was unprecedented at over 10,000 acres. Rehabilitation efforts will be vital to restoring the burned area. A major concern from the fire's impacts was the loss of native vegetation and its replacement by non-native species, especially cheatgrass *(Bromus tectorum).* A regional Burned Area Emergency Rehabilitation (BAER) team assessed damage and made recommendations. These included replacement of burned boundary fence, use of herbicide to prevent large-scale establishment of cheatgrass (based on information from a joint fire science research project implemented in Zion Canyon), re-establish native plant species through seeding and monitoring of treatment effectiveness. This talk will take you from assessment and planning of the treatment to implementation and monitoring of the largest herbicide application in the park's history and the largest application of Plateau herbicide in NPS history.

Session 47 • Governors I • Contributed papers
Sustainable Tourism
CHAIR TBA

International Perspectives on Visitor Use and Resource Management
Michael Tollefson, Superintendent, Yosemite National Park, Yosemite, CA
N.S. Nicholas, Chief, Resources Management and Science, Yosemite National Park, Yosemite, CA
Jim Bacon, Outdoor Recreation Program Manager, Yosemite National Park, Yosemite, CA
The provision of public use opportunities in protected areas is a perennial issue throughout the world. Whether it is a national park in the United States, new protected areas in China, or a small reserve in South America, a balance between resource protection and the provision of visitor use opportunities must be achieved. Yosemite National Park has recently participated in several international collaboration efforts addressing this and other related issues. The NPS' Park Flight Migratory Bird Program sent a specialist from Yosemite to Buenos Aires Province to provide technical assistance on the integration of visitor use and sustainable development at the Punta Rasa Municipal Reserve. Additionally, several delegates from Yosemite have recently traveled to China as part of a new sister parks agreement between the Chinese government and the National Park Service. This paper presents the outcomes of these collaborative efforts and provides further insights regarding visitor use management and resource protection issues affecting these international protected areas.

Changing Coastal Agrarian Livelihood Strategies Bordering a Chilean Biosphere Reserve in the Norte Chico
Susie Qashu, Ph.D. Student, University of Arizona, Tucson, AZ
Will ecotourism be an effective response to traditional rural practices? In north-central Chile, households not only sustain themselves through agriculture, but they rely on fishing and mining to support their livelihood. Three agrarian communities will soon be encouraged to develop a livelihood change: ecotourism. Recently, the Chilean Park Service, CONAF, moved Fray Jorge National Park's (FJNP's) isolated entrance, rerouting it to one which passes through these communities. How will FJNP's management decision affect these communities' livelihood practices? From June to August 2005, in collaboration with CONAF and the University of La Serena, a University of Arizona Ph.D. student facilitated meetings with the three communities using a qualitative mixed methods approach. Researchers discovered that women's household roles are being affected by the encouraged ecotourism as they are the ones adapting to the newly introduced livelihood. How management collaborates with households will determine the pilot project's success.

Recreation Opportunity Classification and Challenges in Maintaining Recreation Diversity in Thailand's National Parks
Noppawan Tanakanjana, Assistant Professor, Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok, Thailand
Recreation Opportunity Spectrum (ROS) is a planning framework that emerged in recreation systems of North America in the late 1970s. It first appeared in Thailand's literature in 1998 when Tanakanjana et al. (1998)

used the concept to classify ecotourism sites and developed a manual for facility development for those sites. This paper presents the most recent research findings on ROS classification of nature-based recreation sites within national parks. The classification was based on the results from a nationwide survey on recreation diversity and intensive inventories of 7 groups of recreational setting indicators, including access, remoteness, naturalness, evidence of human impacts, social encounters, site management, and user management. Logistic regression analysis was employed to develop ROS equations to classify 119 recreation sites into 5 opportunity classes. The classification results were finally verified by user survey to determine a consistency between normative recreation experiences and actual experience obtained from each opportunity class.

An Integrated Study of Road Capacity at Denali National Park & Preserve

Laura Phillips, Ecologist, Denali National Park and Preserve, Denali Park, AK
Philip Hooge, Assistant Superintendent, Denali National Park and Preserve, Denali Park, AK
Thomas Meier, Wildlife Biologist, Denali National Park and Preserve, Denali Park, AK
Patricia Owen, Wildlife Biologist, Denali National Park and Preserve, Denali Park, AK

To protect park resources and maintain high-quality visitor experiences in relation to traffic along the Denali Park Road, we developed an integrated approach to determine road capacity. Components of our study include examining movements of wildlife in relation to habitat and traffic volumes, modeling patterns of vehicle movement using on-board GPS receivers, and implementing visitor surveys to identify factors affecting visitor experiences. We examined the preliminary results of these studies to determine indicators of traffic conditions along the park road likely to be important to wildlife and visitors. These conditions will then be input into a model of current and predicted park road traffic patterns to assess road capacity. Park managers will rely on models developed to assess whether the road is over capacity, at capacity, or under capacity. Our research design illustrates a cooperative approach for making informed decisions that balance park resource protection and visitor enjoyment.

Session 48 • Governors II • Invited papers

Invasive Plant Management in the National Park Service

Chair: Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Management Division, Fort Collins, CO

Session abstract:

Invasion of wildlands by exotic plant species is an increasing problem for park mangers across the country. The acres infested with exotic species and the number of invasive plants continues to increase. Against this seemingly insurmountable problem, land managers are seeing success. This session is devoted to highlighting some of the successes and challenges facing park managers in controlling exotic plants.

Status of Maui Miconia Control in Maui: Seventeen Years of Developing Partnerships and Escalating Management

Jeremy Gooding, Pacific Island Exotic Plant Management Team Liaison, NPS, Makawao, HI
Sean Birney, Pacific Cooperative Studies Unit, Haleakala National Park, Makawao, HI
Melissa Fox, Maui Invasive Species Committee, Makawao HI
Aaron Kogan, Maui Invasive Species Committee, Makawao HI

From the first discovery of miconia *(Miconia calvescens)* in a botanical garden in 1988 on Maui, awareness and resources devoted to miconia control have steadily increased. Partnership developments and increased support from federal, state, county and private entities have dramatically increased understanding and coordinated control work. Significant escalation in the effort began in 1999 with systematic reconnaissance and control by the Maui Invasive Species Committee (MISC). In 2000, the National Park Service (NPS) Exotic Plant Management Team (EPMT) began serving Hawaiian parks as a weed assessment and control force. In 2003, Haleakala National Park committed additional funding, resulting in excess of an eightfold increase in effort between 2001 and 2003. The program utilizes helicopters and ground-based crews to monitor and control infestations. An estimated 33,000 acres on Maui require at least annual aerial reconnaissance to

detect and control miconia. Infestations show promising trends following multiple years of repeated treatment.

Finding Effective Treatments for Japanese Hops: Cooperative Rapid Response to a Newly Invasive Exotic Plant

Sue Salmons, Exotic Plant Management Team Liaison, NPS, National Capital Region, Washington, DC
Anne B. Hairston-Strang, State Hydrologist, Annapolis, MD
Phil Pannill, Regional Watershed Forester, Maryland DNR Forest Service, Hagerstown, MD

Japanese hops *(Humulus japonicus)* has become more invasive in the last few years. State and federal land managers, in coordination with watershed organizations, are cooperating in a "Pulling Together Initiative" project to find and deploy effective treatments to control this invasive non-native herbaceous vine before it causes major environmental damage in riparian buffers. The National Capital Region Exotic Plant Management Team of the National Park Service conducted a pilot studies on Monocacy Battlefield Park in 2006. More extensive testing of the most promising techniques will take place in 2007 on properties within the Monocacy River Basin in Maryland. Once the data are analyzed by Phil Pannill of the Maryland DNR, we will create a new fact sheet and conduct a workshop to educate land owners on controlling this potentially harmful plant.

Shrinking Budgets Demand Getting Work Done with Volunteers

James Akerson, Exotic Plant Management Team Liaison, Shenandoah National Park, Luray, VA

Shrinking budgets have greatly eroded most organizations' ability to protect their resources from invasive, non-native species. As parks reduce staff and program activities, threats to natural and cultural resources are being neglected. Invasive, exotic plants are expanding and dominating the surrounding landscapes. The Mid-Atlantic Exotic Plant Management Team and Shenandoah National Park, with the support of the National Parks Foundation and Tauck Foundation, have formed a short-term volunteer program that provides workers and a modicum of supplies to address this critical need. The volunteer program's organization, accomplishments, and future goals are described. Other means of economy and sufficiency are also described.

Cost-Effective Mapping of Invasive Plants Using Systematic Reconnaissance Flights (SRFs)

Tony Pernas, Exotic Plant Management Team Liaison, NPS, Palmetto Bay, FL

Identifying and accurately mapping the location and distribution of invasive plant species is the first step in successfully managing invasive plant species. Systematic Reconnaissance Flights, or SRFs, is a simple, accurate, and cost-effective method for producing invasive plant distribution maps. An SRF is an aerial survey in which observers in an aircraft flying at a fixed height and spacing transverse the study area while observers detect invasive plants in a strip of land on either side, along thin quadrates. Depending on the distance between the transects, the survey can be a complete census or a sample count. Prior to 2001 the National Park Service and the South Florida Water Management District (SFWMD) conducted separate SRFs. In 2001, at the recommendation of the south Florida Ecosystem Restoration Task Force, through a memorandum of agreement, the NPS and SFWMD combined resources to implement a SRF survey program.

Minimizing the Spread of Invasive Plants on Roads and Trails

Sarah Wynn, NPS, Denver Service Center, Lakewood, CO
Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Management Division, Fort Collins, CO

The spread of invasives has been the subject of extensive research and investigation. Roads and trail ways have been well documented as a principal pathway and corridor for invasive species spread. This paper explores a partnership between maintenance and resource managers to apply simple practices and methods to reduce the introduction and spread of invasives plants. Such prevention practices as the use of weed free materials, equipment cleaning, using weed free gravel sources and road maintenance practice can minimize the introduction and spread of invasive plants.

Session 49 • Governors III • Invited papers

Putting Wheels under Science—Communicating about Science: Collaborations, Assessments, and Insights

Chair: Diane Pavek, Research Coordinator, Urban Ecology Research Learning Alliance, National Capital Region, Washington, DC

Session abstract:

The papers in this session describe the work involved in fostering communication about science among scientists, park managers, and the public. Communicating science requires collaborations. Keeping the public informed is a different mission than addressing the managers' needs for information. Each requires a different approach. The ultimate test of the usefulness of science is to ask: How are park managers using science? Does the public understand the scientific information about park resources and underpinning management decisions? The authors describe the connections made between science, NPS managers, and the public; improvements accessing park data and scientific information; challenges faced when communicating about diverse disciplines; and progress made in explaining the value of science to managers and the public.

Connecting Research, Education, and Outreach through Research Internships

Joy Marburger, Research Coordinator, Great Lakes Research and Education Center, NPS, Porter, IN

In winter of 2006, the Great Lakes Research and Education Center initiated an internship program to support research and monitoring programs in eight Great Lakes national parks. The primary objectives were to provide students with hands-on opportunities to assist with and/or develop research projects and to assist cultural and resource managers in implementing projects. The process involved (1) obtaining project needs and timelines from participating park managers; (2) developing a public announcement; (3) interviewing prospective candidates; (4) implementing the projects; (5) developing internship products for distribution; and (6) facilitating discussions among participating parks and interns to improve the program. Overall, the program was deemed successful from both the managers' and students' perspectives. Interns produced PowerPoint presentations, research reports, and master's degree theses during the program. Information resulting from the internships will be presented at conferences, workshops, and incorporated into NPS websites.

Effective Science Communication: Design Strategies Supporting Resource Management and Stewardship

Giselle Mora, Science Education Coordinator, Urban Ecology Research Learning Alliance, National Capital Region, Washington, DC

Protecting natural resources housed in national parks requires informed managers as well as increased public understanding and appreciation of the resources. The Urban Ecology Research Learning Alliance collaborates with multiple partners to achieve successful dissemination of scientific knowledge gained from studies of parks' natural resources to a wide range of audiences. We recognize that good communication tools and a clear understanding of our audience needs are essential for effective science communication. We will present thoughts and examples of strategies and tools used for communicating complex scientific results to both internal and external audiences. We will discuss the importance of providing synthesis, visualization, and context to the process of science communication and how those principles apply to the development of products that support management and resource stewardship.

Improving Natural Resource Science Communication in the Midwest Region

Jerrilyn Thompson, Research Coordinator, Great Lakes Northern Forest CESU, St. Paul, MN

Gary Willson, Research Coordinator, Great Plains CESU, University of Nebraska–Lincoln, Lincoln, NE

In 2006 the Great Lakes-Northern Forest and Great Plains CESU research coordinators led the development of a natural resource science strategy in the Midwest Region. The strategy supports efforts of the Natural Resource Challenge to enhance science capacity of parks and enable managers to obtain and use the best available scientific information to protect and manage park resources. The strategy focuses on three overarching goals: (1) communicate science information among regional natural resource staff, park staffs, and

partners; (2) identify and address priority science information needs for effective management of natural resources; and (3) develop infrastructure and procedures to support a strong science program. The communication goal focuses on ways to improve regional communication, share scientific expertise, and enhance communication of research and monitoring findings. This presentation will explore elements of the communication goal and discuss the Science Committee, established to lead the implementation of the strategy's action items.

Training Wheels, Best Practices, and Insights on Science Communication for the Public

Christie Anastasia, Education Coordinator, Point Reyes National Seashore, Point Reyes, CA

National Park Service Research Learning Centers (RLCs) have positions specifically dedicated to providing access to science, research, resource management, inventories and monitoring programs across a network of related parks. And, science communication is about so much more than the actual RLC; it's more of a strategy that can be implemented at any site. First, several organizational cultural assumptions must be acknowledged and processes must be in place before programs and projects can succeed. Secondly, questions such as "How do you provide access to science?", "Who do you provide access to?", and "How do you make the public feel welcome and invited to want to know more about the "science behind the scenes?" must be addressed. Some concrete examples and processes of science communication will also be covered including digital video, two-page research project summaries, and newsletters.

Sharing Park Science with the Public: Strategy and Tools

Marie Zhuikov, Communications Coordinator, Minnesota Sea Grant, Duluth, MN

How can you convey scientific information in a manner that the general public can understand? And how can you reach people with this information who don't visit national parks? The National Sea Grant College Program has a long history of bringing science to the public. In this presentation, a Sea Grant communicator will describe the elements of a marketing plan and how it can be used to accomplish your public relations goals. The speaker will use a scientific speaker series, "Superior Science for You!" as an example of effective planning and tool use. The series, conducted in northern Minnesota, was so well received that it led to a second series in cooperation with the U.S. Environmental Protection Agency. Attendees gave the talks high marks and found them easy to understand. Media coverage reached almost 8 million people, with an advertising equivalency of $18,300. Several speakers were invited to repeat their talks.

Learning Centers as Communication Tools for Vital Signs Monitoring: One-Stop Shop for Resource Information

Ann Rodman, GIS Specialist, Yellowstone National Park, WY
Tom Olliff, Chief, Yellowstone Center for Resources, Yellowstone National Park, WY
Tami Blackford, Writer–Editor, Yellowstone National Park, WY
Rob Bennetts, Ecologist, Greater Yellowstone Network, Bozeman, MT

From its inception, the Greater Yellowstone Science Learning Center (GYSLC) has been a collaborative effort between three National Park Service units (Yellowstone, Grand Teton, and Bighorn Canyon), our Greater Yellowstone Network staff, and our partner scientists. We have pooled our staff time, funds, and information to create a website that communicates what we know about our most important natural and cultural resources, regardless of who paid for or completed the work. Initially we have focused our efforts on new information and a suite of outreach materials for 17 topics, but we plan to cover more than 50 topics by the end of 2007. Eventually the GYSLC website will be a "one-stop shop" for status and trends, data, and in-depth understanding of all our natural resource vital signs (monitoring and inventories) and our most significant cultural resources.

Session 50 • Governors IV • Panel discussion

Offshore Wind Energy on the East Coast: Interior Agencies Discuss Management and Research Issues

Chair: David Reynolds, Natural Resources and Science Manager, Northeast Region, NPS, Philadelphia, PA

Session abstract:

Interest in offshore wind as an alternative energy source for the United States has grown tremendously in the past decade as a means to lessen energy dependence and promote cleaner air. Many large-scale offshore wind energy projects have been proposed along the Atlantic coast. Two such proposed offshore wind projects currently being considered have the potential to affect Cape Cod National Seashore (MA), Monomoy National Wildlife Refuge (MA), and Fire Island National Seashore (NY). In response, the Minerals Management Service (MMS), USFWS, USGS, and NPS formed the Department of the Interior (DOI) Northeast Alternative Energy Roundtable to identify common areas of concern and research needs related to offshore energy development. Roundtable members will attend the GWS panel session and discuss the current relationship between offshore wind energy development and trust resources managed by the DOI. The environmental review process and highlights of current on-going and completed research will be reviewed.

Panelists:

David Reynolds, Natural Resources and Science Manager, Northeast Region, NPS, Philadelphia, PA
Susan Russell-Robinson, Staff Scientist, Eastern Region Geology, U.S. Geological Survey, Reston, VA
James Kendall, Chief Scientist, U.S. Minerals Management Service, Herndon, VA
Scott Johnson, Branch Chief, Populations, Division of Migratory Birds, Region 5, U.S. Fish and Wildlife Service, Hadley, MA

Session 51 • Governors V • "Café Conversation" Workshop

Implementing the "Seamless Network" of National Parks, Wildlife Refuges, Marine Sanctuaries, and Estuarine Research Reserves I

Chairs: Brad Barr, Senior Policy Advisor, NOAA National Marine Sanctuary Program, Woods Hole, MA
Gary Davis, Ocean Branch Chief, National Park Service Water Resources Division, Ventura, CA
Cliff McCreedy, Marine Resource Program Leader, National Park Service, Washington, DC
Andrew Gude, National Wildlife Refuge Marine Program, U.S. Fish and Wildlife Service, Arlington, VA

Session abstract:

In August 2006, an agreement was signed by the leadership of key protected areas programs within the Department of the Interior and the National Oceanic and Atmospheric Administration establishing a "seamless network" of national parks, wildlife refuges, estuarine research reserves and national marine sanctuaries. This agreement highlights a framework for the seamless network, focused on support site-and regional-level partnerships. In order to effectively implement this agreement, additional input from site, regional, and program staff is needed to more clearly articulate opportunities for new, expanded, and enhanced collaborations. Conducted informally as a "Café Session," brief presentations will be made regarding the seamless network agreement and plans, and participants will be asked to work in roundtable groups to discuss key questions and offer reports of those discussions to the larger group of participants. The outputs of these discussions will be used to help guide and focus the implementation of the agreement.

Part one of a two-part workshop (continues in session #65)

Session 52 • State I • Side meeting (by invitation only)

NPS Intermountain Region Hot Topics in Resource Stewardship Meeting

Chair: Janet Wise, Deputy Associate Regional Director, Natural Resources, National Park Service, Intermountain Region, Lakewood, CO

Session abstract:

This is an interactive session on hot topics in resources stewardship in the National Park Service Intermountain Region (IMR). Issues of interest will be identified in advance by contacting IMR registrants for GWS2007 and soliciting input.

Session 53 • State II • Workshop

Developing a Framework for Evaluating Proposals for Scientific Activities in Wilderness I

Chair: Susan Boudreau, Chief of Resources and Research, Glacier Bay National Park and Preserve, Gustavus, AK

Session abstract, Part 1:

In this time of rapid global change, scientific research is increasingly essential to provide information for prudent management of designated wilderness. Yet the requirements for quality research may conflict with requirements for protecting wilderness resources and values. In response, wilderness managers and scientists from several agencies developed guidelines for evaluating the compatibility of proposed research in wilderness. The goal of this session is to facilitate a better understanding of how to evaluate research proposals and their cumulative effects in wilderness, and how to weigh or balance the impacts and benefits of proposed research. Presentations from five scientists; length of presentations: 20 minutes, including Q&A session. (For description of Part 2, see under Session #67.)

Presenters:

Peter Landres, Research Ecologist, Aldo Leopold Wilderness Research Institute
Missoula, MT
Scott Gende, Marine Ecologist, Glacier Bay National Park and Preserve, Gustavus, AK
Mark Fincher, Backcountry Wilderness Manager, Yosemite National Park, Yosemite, CA
Laurel Boyers, Wilderness Manager, Yosemite National Park, Yosemite, CA
Lewis Sharman, Research Coordinator, Glacier Bay National Park and Preserve, Gustavus, AK

Part one of a two-part workshop (continues in session #67)

Session 54 • State III • workshop

Confronting Climate Change

Chairs: Kathy Jope, Regional Program Lead, Natural Resources, NPS Pacific West Regional Office, Seattle, WA
David M. Graber, Chief Scientist Pacific West Region, National Park Service, Sequoia & Kings Canyon National Parks, Three Rivers, CA

Session abstract:

Following earlier sessions on the impacts of climate change and implications for resource management, this workshop will explore options for the NPS to take action. Following a brief summary of efforts that are already underway—research, monitoring, inventories of greenhouse gas emissions, distribution of "talking points," and development of several brochures and other communication tools—participants will discuss their thoughts on what the NPS goals should be, examine opportunities for further actions on a variety of fronts, assess their likely effectiveness, and explore strategies for implementing them. Presenters and panelists from earlier climate change sessions will be available as workshop participants and discussants.

Session 55 • Minnesota East • Panel discussion

An Interagency and Native Californian Model Collaboration: Public Lands Traditional Gathering Policy

Chair: Shannon Brawley, Executive Director, California Indian Basketweavers Association, Woodland, CA

Session abstract:

Panel members will discuss and share their perspectives on the process, content and the beginning stages of implementation of the Interagency Traditional Gathering Policy, which was signed on November 29, 2006. The gathering policy represents the results of more than a year's work by the Gathering Policy Working Group, a collective of agency personnel and representatives of the California Indian Basketweavers Association (CIBA) and the California Indian Forest and Fire Management Council (CIFFMC). This policy will ensure that traditional gatherers and basketweavers within California will have free access to gather on lands managed by the Bureau of Land Management and the Forest Service, which encompasses 35 million acres (one-third of the California's land base). The policy addresses gathering of non-timber plant species as well as mushrooms. This agreement can serve as a model for other agencies and geographic regions. The speakers will address: why this policy came about; how the policy was crafted; how the needs of non-federally recognized tribes were addressed; how traditional management techniques, including fire, were addressed; the impacts of the policy for both Native peoples and agencies; and how the implementation of the policy is proceeding.

Opening prayer:
Lucy Parker, Chair, CIBA

Panelists:
Renee Stauffer, Vice-Chair, CIBA
Merv George, Executive Director, CIFFMC
Sonia Tamez, Tribal Liaison, U.S. Forest Service
Ken Wilson, Tribal Liaison, Bureau of Land Management

Discussants:
Bernie Weingardt, Regional Forester, U.S. Forest Service Pacific Southwest Region
Mike Pool, California State Director, Bureau of Land Management

Session 56 • Great River I/IV • Invited papers

Highlights from the Chico Hot Springs Workshop on Integrating Science and Park Resource Management

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

Session abstract:

The successful integration of natural resources monitoring information into National Park planning and management is critical to the continued relevance of the NPS Inventory and Monitoring (I&M) Program. In 2006 the NPS I&M networks in the Intermountain Region hosted two workshops focused on improving the integration of research and monitoring information with natural resources management in parks. The first workshop, held in Rio Rico, Arizona, brought together park resource program managers, superintendents and I&M staff to address the needs and expectations of managers. Rio Rico resulted in the formation of a task team assigned to draft a strategy and framework for improving the integration of science and park management and planning. The second workshop, held at Chico Hot Springs, California, expanded participation and included park resource managers, superintendents, research learning centers, cooperative ecosystem studies units, regional staff, Washington staff, and other partners. A draft outline of the strategy and framework was presented at Chico that focused on five integration themes; communication, ecological thresholds, incorporating management needs into monitoring, using monitoring results in park planning

and management decisions, and the roles and responsibilities of scientists, managers and other stakeholders in integrating science and park resource management.

Integration of Science and Management: What Does It Mean?

Robert Bennetts, Inventory and Monitoring Program, Greater Yellowstone Network, National Park Service, Bozeman, MT

With the Natural Resources Challenge, NPS made a commitment to improving its stewardship of park natural resources through effective science-based decisions. Such a challenge necessitates an effective integration of the scientific and management disciplines that extends beyond just using available science for making decisions. It also includes (1) improving the communication channels between scientists and managers, (2) improving the way the information needs of management are incorporated into the planning and design of science, (3) improving the way the science information is incorporated into the decision and planning processes, and (4) understanding that decisions that affect natural resources are not made in a vacuum apart from other social values. Ideas and concepts to facilitate these needs will be discussed.

Communicating Monitoring Results to Multiple Stakeholders at Multiple Scales

Shawn Carter, Regional I&M Coordinator, National Capital Region, National Park Service, Washington, DC

For environmental monitoring to be effective, the results must inform a broad audience—from researchers to land managers to the general public. Symbols and conceptual diagrams are powerful tools for summarizing data and distilling complex ecological principles. Maps and georeferenced diagrams provide explicit spatial context for monitoring data. Graphs and tables add quantitative details to support key findings. Pictures offer eye-opening gateways into the particular ecological setting of interest. Chosen judiciously, visual elements are more than just eye-catching, they transcend scientific jargon. The combination of conceptual diagrams and symbols represent an intuitive framework for accessing different levels of monitoring data. I provide examples for national parks of the mid-Atlantic region that demonstrate effective use of visual elements to communicate monitoring results. I also demonstrate how place-based and theme-based conceptual models can be used to dynamically query hierarchical levels of ecological data using symbols.

Integrating Science and Resource Management at a Small Park: A Superintendent's Perspective

Brad Traver, Superintendent, Tonto National Monument, Roosevelt, AZ

As we face the challenges of managing our national parks in the 21st century, there is an ever-increasing need for science and management to work together effectively. In this paper, I will discuss the needs, concerns, and opportunities for successful integration of science and management from the perspective of the superintendent of a small park. From this perspective, I will consider what has previously been lacking for the successful integration of science and management, and more importantly, what is needed in the future to bridge the gap.

Integrating Science and Park Resource Management: A Large-Park Resource Manager's Perspective

Tom Oliff, Chief of Natural Resources, Yellowstone National Park, WY

As we face the challenges of managing our national parks in the 21st century, there is ever increasing need for science and management to work together effectively. In this presentation, I will discuss the needs, concerns, and opportunities for successful integration of the vital signs monitoring program with park management from the perspective of a resource manager at a large park. I will discuss ways that we are trying to improve the communication of monitoring results to park management, as well as ways that the Yellowstone Center for Resources is working with the Greater Yellowstone Inventory and Monitoring Program, the Greater Yellowstone Science Learning Center, the Rocky Mountain CESU, as well as other external partners to ensure that the science being conducted, and in particular the monitoring, meets the information needs of the park.

The "Planner's Perspective": Integrating Science and Vital Signs into the Planning Process

Kerri Cahill, Planner, Denver Service Center, National Park Service, Denver, CO

This presentation will discuss opportunities and needs in the National Park Service planning process for col-

laboration with Vital Signs monitoring and other NPS science programs. The NPS conducts planning to help managers make difficult decisions about ways to preserve significant resources for public enjoyment, priorities for funding and staff, and differing public interests of what is most important. A Logical and systematic planning process allows us to track and analyze what we know about resources and visitor experiences, interact with the public, identify goals, and provide management accountability. In order to support the best possible decision making for the agency and the public it serves, the process must be infused with the best science and technical expertise available. This presentation will outline key needs from the science community to aid the planning process, and also identify some key steps in the process that would most benefit from collaboration.

Session 57 • Great River II/III • Contributed papers

Adapting to Climate Change

Chair: Joseph Meyer, Branch Chief, Physical Science and Geographic Information Systems, Yosemite National Park, El Portal, CA

Opportunities in a Changing Climate: Biodiversity and Protected Areas in British Columbia

Victoria Stevens, Protected Areas Ecologist, BC Parks, Ministry of Environment, Victoria, BC, Canada

British Columbia has a protected areas system that includes more than 14% of its land base and represents the ecosystem structure of a large and topographically complex province. This complexity is matched by the most diverse flora and fauna in Canada. As the cornerstone of the province's biodiversity strategy, the managers of this protected areas system have begun to assess the possible outcomes of climate change to biodiversity and to mitigate effects where possible. This presentation explores the ways the BC Ministry of Environment is currently approaching an investigation of potential adaptations to climate change. These include an analysis of: (1) the remaining roadless areas in BC and their relationship to protected areas; (2) the protected area lands that meet or exceed a minimum reserve size of 270,000 ha; (3) protected areas with a wide breadth of latitude or elevation; (4) hotspots and global responsibility; (5) glacially influenced watersheds; and (6) recent climate changes.

Climate Change and Protected Areas Adaptation in Canada

Christopher J. Lemieux, Ph.D. Candidate, Department of Geography, University of Waterloo, Waterloo, ON, Canada

Daniel J. Scott, Canada Research Chair in Global Change and Tourism, Department of Geography, University of Waterloo, Waterloo, ON, Canada

Tom J. Beechey, Associate Director, Canadian Council on Ecological Areas (CCEA), Cambridge, ON, Canada

Recent suggestions by the Intergovernmental Panel on Climate Change (IPCC) that Earth is committed to climate change regardless of greenhouse gas mitigation efforts and the World Commission on Protected Areas (WCPA) that "conservation actions are likely to fail unless they are adjusted to take account of climate change," emphasizes the need for protected areas agencies to begin integrating climate change into policy, planning, management and research. This presentation summarizes the results of a collaborate survey conducted by the University of Waterloo and the Canadian Council on Ecological Areas (CCEA) on Protected Areas and Climate Change (PACC). The survey collected information from federal and provincial jurisdictions as well as non-governmental conservation organizations on three key issues: (1) climate change impacts currently being experienced, or anticipated to be experienced, in protected areas across Canada; (2) where the issue of climate change ranks in relation to other protected areas management issues within Canadian jurisdictions; and, (3) what policy and management, operations and development, monitoring and research, education and outreach, and other climate change responses (adaptation) efforts have occurred, or are being considered, by protected areas agencies across Canada. The presentation provides an overview of the survey results and the state of the climate change response by protected areas organizations in Canada.

Enhancing Management of Protected Areas in a Changing Climate

Kelly Levin, Doctoral Student, Yale University, Boston, MA

Climate change is severely impacting protected areas with long-term implications for conservation and management. Trends of climate impacts are already becoming visible, including modification of migration patterns, length of growing seasons, species distributions, and invasive species outbreaks. Even if mitigation strategies were effective in stabilizing emissions, the lag of climate impacts will result in significant effects, imposing the need to implement adaptation strategies. Adaptation activities in protected areas include rigorous monitoring, establishment of corridors and buffer areas, core zone expansion, control of invasive species, reduction of non-climate stressors, and acquisition of new reserves. While conservation biologists have performed extensive research on climate change effects in protected areas, a coordinated management and policy response has yet to emerge. This research will propose a methodology for evaluating the response thus far, as well as identify some promising management and institutional innovations for enhancing protected areas effectiveness in a changing climate.

Paleontological Parks and Global Change

James Hammett, Superintendent, John Day Fossil Beds National Monument, Kimberly, OR
Ted Fremd, Science Advisor, Pacific West Region, NPS, Kimberly, OR
Regan Dunn, Paleobotanist, John Day Fossil Beds National Monument, Kimberly, OR

Deep time perspectives on planetary-scale processes, such as global climate change, can be appreciated at many units of the National Park Service, especially in areas established to preserve the fossil record. In some of these areas, such as in the John Day Basin, remarkably long-term records of climatic events and the species tracking these through time have been preserved in the geologic strata. These data document ecosystems continuously evolving as species adapt to environmental changes. Conversely, several mass extinction episodes, involving multiple phyla, have occurred when populations have not had sufficient time to adapt. Activities of a single species have never been observed to alter the environmental balance of the planet. The extent and rate of planetary transformation resulting from shifts in human behavioral ecology is unprecedented. Natural national parks documenting ancient examples of coevolution are now threatened by the activities of the very species that established them.

Establishment of the USA-National Phenological Network: Opportunities for Monitoring, Interpretation, and Management

John Gross, Ecologist, National Park Service, Fort Collins, CO
Julio L. Betancourt, U.S. Geological Survey Desert Laboratory, Tucson, AZ
Mark D. Schwartz, University of Wisconsin–Milwaukee, Milwaukee, WI

Phenology is the study of periodic plant and animal life cycle events influenced by environmental changes, especially seasonal variations in temperature and precipitation. Important phenophases include timing of leafing, flowering, and fruiting in plants, agricultural crop stages, insect emergence, and animal migration. Phenology profoundly affects virtually every aspect of life, including ecological processes, human health, commerce, and recreation. The NPS is uniquely poised to benefit from information provided by the USA-National Phenological Network (USA-NPN) and to contribute to information. Phenological events have been routinely recorded by many parks (e.g., fish spawning, flowering, leaf color, arrival of birds). Phenological changes are expressions of climate change that are easily measured and understood by citizens, managers, and scientists. We describe the emerging USA-NPN and its relevance to park monitoring, interpretation, and management. The USA-NPN will be launched in 2007 and there are many opportunities for involvement by individuals, agencies, and groups.

Session 58 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 59 • Kellogg II • Workshop

Biosphere Reserves in the United States

Chair: Vernon C. (Tom) Gilbert, President, U.S. Biosphere Reserves Association, Knoxville, TN

Session abstract:

The U.S. Biosphere Reserves Association has been working to renew the U.S. Biosphere Reserve Program and encourage the U.S. to participate once again in the World Network of Biosphere Reserves, which now includes 500 sites in 103 countries. In 2006, at the suggestion of representatives on the House Resources Committee, leaders of the Biosphere Reserves Association met with leaders of Sovereignty International and other organizations that oppose biosphere reserves and World Heritage sites. Now committees representing both sides are working to develop new criteria and authorizing legislation for U.S. biosphere reserves. Proposed legislation will be submitted to the new House Committee on Natural Resources by mid-summer 2007. The legislation would authorize a U.S. Biosphere Reserve program that focuses on conservation of ecosystems, species and genetic diversity; research and education, and voluntary participation of private property owners. The panel will discuss the draft criteria and legislation for biosphere reserves, and strategies for implementation.

Panelists:

Kenton R. Miller, Chair, IUCN World Commission on Protected Areas (retired), Mathias, WV

John Dennis, Deputy Chief Scientist, National Park Service, Washington, DC

Christine Alssen-Norodom, United Nations Educational, Scientific, and Cultural Organization (UNESCO), New York Office, New York, NY

Session 60 • Kellogg III • Day-capper

Assessing Storm Hazards in Vulnerable Areas of the National Park Service

Chair: Mark Borrelli, Storm Hazard Analyst, Texas A&M University, College Station, TX

Session abstract:

Hurricanes and large-scale natural disasters, tsunami, and large-scale events impact many units of the National Park Service. This session will discuss ways to prepare for storm events as well as respond to impacts. Current efforts underway include efforts under a fee-demonstration-funded project with the NPS Geologic Resources Division, Gulf Coast CESU, and Texas A&M University. This project, called "Storm Hazard Analysis," is designed to help parks prepare for storm events, assess impacts from storms including impacts on natural and cultural resources as well as local communities. This project will also design a recovery plan for park managers and will work with the incident command System to ensure parks get assistance during events. This day-capper will be a lively conversation about examples of park resource assessments pre and post storm, and new ways to prepare for storm impacts.

Presenters:

Jung Eun Hung, Graduate Student, College of Architecture, Texas A&M University, College Station, TX

Mark Borrelli, Storm Hazard Analyst, Texas A&M University, College Station, TX

Rebecca Beavers, Coastal Geology Coordinator, Geologic Resources Division, National Park Service, Denver, CO

Gillian Bowser, Gulf Coast CESU Liaison, Texas A&M University, College Station, TX

Session 61 • Governors I • Panel discussion

Cultural Resource Management in Wilderness

Chair: Paul Gleeson, Chief, Cultural Resource Division, Olympic National Park, Port Angeles, WA

Session abstract:

National parks are the home to 44 million acres of designated wilderness. Within these roadless areas are many

structures and sites significant in the local, regional or national history and prehistory. These properties evoke prehistoric cultures, early exploration, settlement, and attempts of development in settings that closely resemble their historic setting. Proposals for preserving these resources, as mandated by the NPS Organic Act, the National Historic Preservation Act, and related policies and guidelines, are being challenged in the courts by wilderness advocates as violations of the Wilderness Act. Recent court decisions appear to support the concept of an inherent conflict between the Wilderness Act and NHPA in which the mandates of the Wilderness Act supercede those of NHPA, thus prohibiting preservation maintenance of historic properties in designated wilderness. The participants will discuss the resources at risk, the court cases, legal interpretations of the Wilderness Act and NHPA, the challenges facing federal managers, and possibilities for resolving this "conflict."

Panelists:
Jon Jarvis, Director, Pacific West Region, National Park Service, Oakland, CA
William Laitner, Superintendent, Olympic National Park, Port Angeles, WA
Rick Potts, National Wilderness Coordinator, National Park Service, Washington, DC

Session 62 • Governors II • Invited papers
Wildlife Disease Management in National Parks
Chair: Todd Shury, Wildlife Health Specialist, Parks Canada, Saskatoon, SK, Canada

Session abstract:
Emerging wildlife diseases pose threats to biodiversity and conservation in protected areas. New threats, such as highly pathogenic avian influenza, as well as established diseases, such as bovine tuberculosis and brucellosis, are becoming increasingly complex to manage in the context of protected areas management. Wildlife health is becoming an increasingly important aspect of ecosystem monitoring and management due to global travel, trade, and animal movement. We will discuss various disease management regimes that have been attempted in the past and will be attempted in the future in several different national park settings throughout North America, and their consequences for park managers.

Maintaining Ecological Integrity in Canada's National Parks: To Manage or Not to Manage?
Todd Shury, Wildlife Health Specialist, Parks Canada, Saskatoon, SK, Canada
Stephen Woodley, Chief Scientist, Ecological Integrity Branch, Parks Canada, Gatineau, QC, Canada
Maintenance of ecological integrity is one of the primary mandates of Parks Canada in the management of national parks. In some Canadian parks, wildlife diseases such as bovine tuberculosis, brucellosis, and Johne's disease have the potential to threaten ecological integrity as well as domestic animal and human health. Integrating this mandate with numerous outside agency and stakeholder interests has been challenging. Disease management history in Wood Buffalo and Riding Mountain national parks will be used as two case examples to illustrate the complexities in achieving this balance.

Back to Basics Management: Could Wolves Control Chronic Wasting Disease?
Margaret Wild, Wildlife Veterinarian, National Park Service, Fort Collins, CO
Michael Miller, Wildlife Veterinarian, Colorado Division of Wildlife Resources Center, Fort Collins, CO
N. Thompson Hobbs, Colorado State University, Department of Forest, Rangeland and Watershed Stewardship, Warner College of Natural Resources Fort Collins, CO
Mark Graham, Wildlife Biologist, National Park Service, Fort Collins, CO
Recent theoretical studies have suggested that alterations to predator abundance influence disease prevalence. We suggest that restoring top predator–prey–scavenger food webs may be a promising management alternative for chronic wasting disease (CWD). Wolves could influence CWD prevalence through several mechanisms, including: increasing mortality rates, particularly selective removal of CWD-positive deer and elk, redistributing deer and elk from areas of high concentration, and removing infected carcasses from the environment. We used a simple mathematical model to forecast that predation by wolves could have potent

effects on CWD prevalence in elk. Results from preliminary simulations suggest that predation by wolves has the potential to eliminate CWD from a population in the absence of re-infection from outside sources. These results, coupled with potential effects on disease prevalence from changes in transmission rates associated with alterations in elk concentrations and removal of prion-infected carcasses, suggest that wolves could serve to control CWD.

Roles for National Parks in Canada's National Wildlife Disease Strategy

Ted Leighton, Executive Director, Canadian Cooperative Wildlife Health Centre, Saskatoon, SK, Canada
Todd Shury, Wildlife Health Specialist, Parks Canada, Saskatoon, SK, Canada

No single federal, provincial, or territorial government agency in Canada is responsible for managing diseases that occur in wild animals. Legislated authority in this area is fragmented and incomplete, leaving large gaps in perceived responsibilities and scenarios for disasters or in times of urgent disease crises. In 2003, Canada undertook to develop a comprehensive national wildlife disease strategy that comprises six major goals: prevention, early detection, rapid response, effective disease management, education, and communication. Implementation is now being pursued by a consortium of government agencies and Canada's veterinary colleges. National parks must engage with wild animal diseases on many levels: preserving ecological integrity, invasive species, zoonotic hazards to staff and visitors, and societal needs outside of park boundaries. National parks include significant areas of land and populations of wild animals representative of most ecological zones in Canada. In any national plan to manage diseases of ecological or socioeconomic importance, it is imperative that national parks participate comprehensively.

Wildlife Disease in U.S. National Parks: What is Out There?

Jenny Powers, Wildlife Veterinarian, National Park Service, Fort Collins, CO
Margaret Wild, Wildlife Veterinarian, National Park Service, Fort Collins, CO

Increasing awareness of wildlife disease amongst wildlife managers has led to augmented disease surveillance and discovery in many NPS units. This curiosity and vigilance has revealed a variety of diseases which can influence both wildlife population health and potentially domestic animal and human health. Often, these disease processes are influenced either directly or indirectly by anthropogenic affects such as the introduction of invasive species. For example, die-offs of native birds along the Great Lakes have been attributed to botulism type E toxin which is amplified by the exotic zebra mussel and round goby. Similarly, habitat-sharing by domestic cattle and elk has allowed Johne's disease spillover and likely spillback between livestock and wildlife. By identifying a baseline of disease presence and prevalence, managers can gain greater insights into the wildlife populations they seek to manage and preserve.

Planning for Highly Pathogenic Avian Influenza in Wildlife in the U.S. National Parks

Mark Graham, Wildlife Biologist, National Park Service, Fort Collins, CO
Margaret Wild, Wildlife Veterinarian, National Park Service, Fort Collins, CO
Robert Winfree, Science Advisor, National Park Service, Anchorage, AK

As highly pathogenic avian influenza (HPAI) H5N1 spreads across the world, early detection of its presence is vital to limiting the impact on human health, commerce, and natural resources. While human pandemic planning is receiving considerable attention, we also strongly encourage planning to address prevention and management of the disease in wildlife. Before the disease arrives in North America, U.S. National Park Service (NPS) units should already be planning so as to expedite awareness, communication, preparation, and action regarding the presence of this disease. Two wildlife related plans have been issued by the NPS: the highly pathogenic avian influenza in wildlife preparedness and communication plan and the highly pathogenic avian influenza in wildlife response plan. An overview of these wildlife plans will be presented in relation to what parks should be doing now, including surveillance in wildlife. Examples from the Alaska Region will be highlighted.

Session 63 • Governors III • Invited papers

Technologies and Applications for Environmental Acoustic Monitoring

Chair: Kurt Fristrup, Senior Acoustic Specialist, National Park Service, WASO Natural Sounds Program Center, Fort Collins, CO

Session abstract:

Units of the national park system are increasingly affected by noise, and acoustic monitoring is emerging as a potent tool to manage noise and survey natural resources. This session will discuss technical tools to gather and analyze acoustic data, exploring the current state of the art and the breadth of potential applications. Several examples of current usage will be presented. Methods for monitoring and analyzing ambient sound levels will be discussed in relation to modeling the potential impact of noise sources. Techniques for automatically processing large volumes of environmental recordings will be discussed in relation to ambient sound characterization and wildlife monitoring. The session will close with questions from the audience to the panel of presenters.

Reducing the Cost and Complexity of Sound Level Monitoring: Less Can Deliver More

Damon Joyce, Information Technology Specialist, NPS, WASO Natural Sounds Program Center, Fort Collins, CO

NPS acoustic monitoring has historically relied on acoustical instrumentation developed for transportation and workplace noise-monitoring applications. Adapting this equipment for field deployments in backcountry areas and unattended operations lasting weeks or months proved both expensive and complicated. The NPS Natural Sounds Program Center is working to simplify the process of sound level monitoring and reduce the expense of the equipment and its field maintenance. This presentation will demonstrate the operation of a revised system that reduces power consumption by factor of six (eliminating the need for solar panels), comprises a more compact package, and improves the continuity of the data. The potential use of consumer digital recording devices will also be assessed, which can provide further reductions in cost, weight, and power consumption. Reduced data collection costs can expand the scope of acoustic monitoring, and software tools for more efficient data analyses will be presented and evaluated.

Denali National Park and Preserve Sound Monitoring Program

Jared Withers, Physical Scientist, Denali National Park & Preserve, Center for Resources, Science, and Learning, Denali Park, AK

Chad Hults, USGS Alaska Science Center, Anchorage, AK

The National Park Service is inventorying the sound environment of the whole of Denali National Park and Preserve to better understand, manage, and preserve the natural soundscape of the park. The inventory uses the sampling grid of the park's other long-term ecological monitoring surveys, and 59 locations are slated to be occupied over the next 10 years. Five automated sound stations collect data during the summer visitor season, with fewer locations sampled during the winter. Each sound station records sound levels and collects five-second digital recordings every five minutes. With this information we can identify the sound sources present at each sampling location, the sound levels of each sound source, and calculate the number of times per day each sound is audible. These data are used to compare the natural ambient sound levels to the sound levels of non-natural sounds.

Acoustic Data Collection in Grand Canyon National Park

Laura Levy, Physical Science Technician, Grand Canyon National Park, Flagstaff, AZ

Sarah Falzarano, Geographer, Grand Canyon National Park, Flagstaff, AZ

Ken McMullen, National Park Service, Flagstaff, AZ

Natural ambient sounds are important to wildlife survival and the visitor experience, and as a resource itself in our national parks. These sounds are increasingly masked or altered by human-generated noise. Grand Canyon National Park has numerous air-tour flights over backcountry areas and has been mandated by the 1987 National Parks Overflights Act to restore natural quiet in the Park. Natural sounds vary by vegetation type, time of day, season, weather, and other factors. This presentation will discuss natural ambient sound collection results. Natural ambient sound levels were collected in 2005 and 2006 in four major vegetation

types in Grand Canyon National Park as a baseline for the integrated noise model (INM). Sound levels were very low, often near the noise floor of the instruments (about 15 dBA). Winter ambient levels were not significantly different from summer levels, except in the ponderosa pine environment. Despite collecting data in backcountry areas, human-generated sounds were still audible 34% of the time during the day; most of these sounds were aircraft.

Understanding and Managing Soundscapes in the National Parks: Visitor Use and Soundscape Modeling

Steve Lawson, Assistant Professor, Virginia Tech, Blacksburg, VA
Brett Kiser, Virginia Tech, Blacksburg, VA
Karen Hockett, Virginia Tech, Blacksburg, VA
Kenneth J. Plotkin, Wyle Laboratories, Arlington, VA
Bob Itami, Geodimensions Pty Ltd, Sorrento, Victoria, Australia
Kurt Fristrup, National Park Service, WASO Natural Sounds Program Center, Fort Collins, CO
Damon Joyce, Information Technology Specialist, NPS, WASO Natural Sounds Program Center, Fort Collins, CO
Karen Trevino, Program Manager, National Park Service, Natural Sounds Program, Fort Collins, CO

Recent studies of national park visitors have found that enjoyment of quiet, solitude, and natural sounds adds to the quality of the visitor experience, while human-caused noise can interfere with visitors' enjoyment. Furthermore, recent research has used social science to help formulate potential sound-related indicators and standards of quality. This study integrates visitor use and noise simulation modeling approaches to monitor the condition of sound-related indicators of quality in Great Smoky Mountains National Park. Visitor use and acoustical data were collected during the 2006 visitor use season and used to model visitors' "soundscape experience." Results of the study illustrate how visitor use and noise modeling approaches can be used to monitor sound-related indicators of quality.

Automated Processing of Animal Sounds from Long-term Recordings

Russell Charif, Senior Research Specialist, Cornell Laboratory of Ornithology, Bioacoustics Research Program, Ithaca, NY
Kathryn Cortopassi, Cornell Laboratory of Ornithology, Bioacoustics Research Program, Ithaca, NY
Kurt Fristrup, National Park Service, WASO Natural Sounds Program Center, Fort Collins, CO
Harold Figueroa, Cornell Laboratory of Ornithology, Bioacoustics Research Program, Ithaca, NY
Ildar Urazghildiiev, Cornell Laboratory of Ornithology, Bioacoustics Research Program, Ithaca, NY

Environmental sound recordings can be used to gather many kinds of important biological information: presence/absence of species; spatial distributions; population estimates; diurnal and seasonal activity patterns; vocal repertoire and behavioral patterns. In order to efficiently extract this information from large volumes of sound recordings, researchers need the capability to automatically detect, measure, classify, and spatially localize acoustic events, and to interactively review and annotate the results of these automated procedures. Several factors pose significant challenges to realizing these capabilities, including: the natural variation in most sound sources, natural variation in ambient acoustic background, clutter and overlap from multiple sound sources, and the sheer enormity of the potential numbers of events. We will discuss these challenges, and present examples of successes and current limitations of software tools for answering various biological questions. Finally, we will explore promising directions for future development.

Session 64 • Governors IV • Contributed papers

Managing Landscapes for Social and Cultural Sustainability

Chair: Dorothy Anderson, H.T. Morse Distinguished Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN

Gigidowin: Dialogue with the Elders

William Allen, Cultural Heritage Researcher, Heritage One, Burk's Falls, ON, Canada

The wisdom of Aboriginal elders needs to be incorporated into cultural heritage research objectives and cultural landscape interpretation. Gigidowin—dialogue with elders in an atmosphere of mutual trust—taps

ancient understandings embedded in wampum, story, dance, and the nuances of Aboriginal language. This presentation outlines gigidowin examples from Ontario's Algonquin Dome, the region between the Ottawa River and Georgian Bay of Lake Huron. At Asinabka on the Ottawa River, people from as far away as the centre of the continent have gathered for centuries. The crest of the dome crosses Algonquin Park, where forestry, recreation, and cultural landscapes are managed simultaneously. Further west on the dome is part of the Trans-Canada transportation corridor and a section of the Great Lakes Heritage Coast. Aboriginal elders and the presenter have documented ancient sacred and archaeological sites across the Algonquin Dome through commitment to gigidowin.

The Impacts of Population and Landscape Change on National Parks

Michael Schuett, Associate Professor, Texas A&M University, College Station, TX
Gillian Bowser, National Park Service Coordinator, Gulf Coast Cooperative Ecosystems Studies Unit, Texas A&M University, College Station, TX
Darrell Fannin, Department of Recreation, Park, and Tourism Sciences, Texas A&M University, College Station, TX
Jiaying Lu, Department of Recreation, Park, and Tourism Sciences, Texas A&M University, College Station, TX

A wildland–urban interface (WUI) is an area where houses meet or intermingle with wildland vegetation, creating challenges for park managers and policy-makers. Over the last decade, population and landscape change in the surrounding areas of national parks has become a serious management concern. Increased housing density may have negative impacts on wildlife, vegetation or recreation opportunities. Population shifts around the WUI have introduced visitors to parks and protected areas, with potentially new preferences and needs. The purpose of this study was to document population change and profile residents in the WUI of eastern Texas and western Louisiana. Presentation objectives (1) to show population change and housing density using spatial data; (2) to report on residents' recreation behavior; and, (3) to discuss the value of these data for understanding future population changes, visitor needs, policy formation, and long-term implications for national park management nationwide.

Racial and Ethnic Minority Under-Representation in Pittsburgh's City Parks: An Empirical Study

Rebecca McCown, Graduate Assistant, University of Vermont, NPS Conservation Study Institute, Burlington, VT
Robert Manning, Professor, University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT
Megha Budruk, Assistant Professor, Department of Community Resources and Development, Arizona State University, Tempe, AZ
Myron Floyd, Professor, North Carolina State University, Department of Parks, Recreation, and Tourism Management, Raleigh, NC

Research has found that racial/ethnic minorities are substantially under-represented in outdoor recreation, and in particular in the national parks. Three hypotheses to explain under-representation are: marginality, subcultural, and discrimination. This study explores the discrimination hypothesis by measuring (1) how visitor perceptions of crowding and other issues in national parks are affected by the racial composition of other visitors encountered, and (2) visitor attitudes toward management actions designed to address under-representation of minorities in national parks. The study consisted of a survey of visitors to the Pittsburgh city parks. Visual research techniques borrowed from the crowding literature were used to test for evidence of racial discrimination. The questionnaire also included respondent attitudes toward management actions designed to address under-representation of minorities in national parks and differences between national park users and non-users regarding knowledge of minority under-representation and attitudes toward associated management actions.

Environmental Justice and Sustainable Tourism: The Missing Cultural Link

Tazim Jamal, Associate Professor, Texas A&M University, College Station, TX
Blanca Camargo, Graduate Student, Texas A&M University, Department of Recreation, Park and Tourism Sciences, College Station, TX

Katy Lane, Graduate Student, Texas A&M University, Department of Recreation, Park and Tourism Sciences, College Station, TX

An environmental justice framework is useful to examine the effects of tourism development among diverse social groups, races, and communities. It is particularly important in addressing the needs of those that are disenfranchised or too disempowered to prevent injustices related to access, distribution, and use of environmental resources. Environmental justice studies have addressed environmental and socio-economic problems well. But there is a "missing link" between culture and environment in the environmental justice framework. We argue that it is crucial to bridge these in order to ensure equity among those who visit, those who inhabit the natural area and those whose cultural heritage is embedded in landscapes and cultural sites (though they may no longer be present). The paper proposes a framework to bridge environmental justice and cultural dimensions for sustainable tourism development. Examples are provided to illustrate dimensions of the framework and offer insights for ecotourism, historic preservation, and heritage tourism.

Session 65 • Governors V • Workshop

Implementing the "Seamless Network" of National Parks, Wildlife Refuges, Marine Sanctuaries, and Estuarine Research Reserves II

Part two of a two-part workshop. See description under session #51.

Session 66 • State I

CANCELED

Session 67 • State II • Workshop

Developing a Framework for Evaluating Proposals for Scientific Activities in Wilderness II

Chair: Peter Landres, Research Ecologist, Aldo Leopold Wilderness Research Institute, Missoula, MT

Session abstract, Part 2:

The goal of the second part of the workshop is to discuss and reach a consensus on key issues raised during the presentations in part one of the workshop (Session #53). These key issues include how to weigh or balance the impacts and benefits from proposed scientific activities, and how to assess cumulative impacts. The results of this discussion will be presented to the National Park Service's National Wilderness Steering Committee as part of an integrated set of tools to help managers evaluate the proposals for scientific activities in wilderness.

Part two of a two-part workshop. See description of part one under session #53.

Session 68 • State III • Invited papers

Challenges and Rewards of Citizen Science Programs

Chairs: Sallie Hejl, Resource Education Specialist, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT

Joy Marburger, Research Coordinator, Great Lakes Research and Education Center, Indiana Dunes National Lakeshore, Porter, IN

Session abstract:

Citizen science programs educate volunteers about resource issues, help managers and scientists obtain valuable data, and allow volunteers to contribute to the stewardship of those resources. The National Park Service has a network of Research Learning Centers—places where parks and partners create citizen science opportunities. The talks in this session will describe how to create a citizen science program and the chal-

lenges and rewards of running citizen science programs through highlights of programs occurring at five Research Learning Centers.

Citizen Science: A Best Practices Manual and How it Can be Applied

Paul Super, Science Coordinator, Appalachian Highlands Science Learning Center, NPS, Lake Junaluska, NC
Susan Sachs, Education Coordinator, Appalachian Highlands Science Learning Center, NPS, Lake Junaluska, NC
Michelle Prysby, Virginia Master Naturalist Program Coordinator, Virginia Cooperative Extension, Charlottesville VA

The authors recently compiled the proceedings of a 2003 conference on citizen science best practices into a manual to assist organizations considering using citizen scientists to collect biological data or currently doing so. The manual includes a discussion of the definition of "citizen science," methods for ensuring the scientific validity of data collected by the citizen scientist, a flow-chart to assist with selecting the appropriate level of citizen involvement to meet your needs, and chapters on evaluation, partnerships, and avoiding common pitfalls. The authors will use three research projects coordinated by the Appalachian Highlands Science Learning Center that include the use of citizen scientists for data collection as case studies that illustrate how the manual can be applied.

Ivory-billed Woodpecker Searches with Citizen Scientists: Lessons Learned at Congaree National Park

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

Field surveys for the ivory-billed woodpecker in South Carolina began at Congaree National Park in February and continued through April 2006. The Old-Growth Bottomland Forest Research and Education Center hosted and coordinated all field activities associated with this effort. At least 45 citizen scientists contributed more than 1,950 volunteer hours to survey significant wilderness acreage across the park. The facilities of the Old-Growth Bottomland Forest Research and Education Center were transformed into an "operations center" for all aspects of this work, which included weekly volunteer training sessions, daily logistics coordination, overnight accommodations for field crews, and data download and management. This project was funded through the U.S. Fish and Wildlife Service and supports a regional survey effort in the historic range of the ivory-billed woodpecker. An overview of this research will be presented, including steps taken to ensure high quality data collection during this large-scale intensive research effort.

Volunteers in the Backcountry: Case Studies of Projects from Rocky Mountain National Park

Cheri Yost, Park Ranger, Rocky Mountain National Park, Estes Park, CO
Judy Visty, Research Administrator, Rocky Mountain National Park, Estes Park, CO

In an effort to improve safety for park staff and volunteers, Rocky Mountain National Park implemented new rules for work in the backcountry, which is defined as any area more than one mile from a developed area or road. The park safety protocol requires all employees and volunteers to file a "flight plan" that outlines their planned locations, place of departure and return, and anticipated time of entry and exit. The resource management and research division further established a backcountry experience screening process for staff and volunteers and an essential equipment list. This session will discuss safety concerns for research volunteers and provide lessons that the Continental Divide Research Learning Center learned from using research volunteers in several backcountry projects.

Using Citizen Science to Determine the Population Status of Common Loons at Glacier National Park

Sallie Hejl, Resource Education Specialist, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT
Jami Belt, Biological Technician, Crown of the Continent Research Learning Center; Glacier National Park, West Glacier, MT

The Crown of the Continent Research Learning Center created a citizen science program about common loons in Glacier National Park in 2005. Before 2005, park staff and a few volunteers monitored loons only on Loon Day each year. With citizen scientists, we increased the quantity and quality of data collected. In 2006,

77 volunteers conducted 395 surveys on 72 lakes. We successfully monitored loons at 45 priority lakes at least three times during the breeding season. Season-long results (45 adults, 16 pairs, 5 chicks) differed substantially from Loon Day results (36 adults, 9 pairs, 4 chicks). In addition to improving knowledge of loon populations, we educated citizen scientists about loon biology, management issues, and sensitivity to human disturbance and gave the citizen scientists a way to contribute to the stewardship of the park. Our current greatest challenge is to devise the best way to sustain this program into the future.

Global Citizen, Local Volunteer

Beth Middleton, Research Ecologist, USGS National Wetlands Research Center, Lafayette, LA

Volunteer programs can extend the ability of researchers to answer questions regarding widespread ecosystems and ecotypes. At the USGS National Wetlands Research Center, volunteers are engaged in a variety of research activities, including collecting data on the ecotypes of *Lythrum salicaria* (purple loosestrife). This well-known invasive has infested wetlands in northern North America and may be altering their function. Volunteers collect data on seed production, height, and environment around the world to determine how latitude and environmental factors limit this species. This program is run via a website, where volunteers are provided with information about the program. Many USGS volunteers have been trained in partnership workshops with the Great Lakes Research and Education Center of the National Park Service. The volunteer research is valuable to USGS and similar agencies because it helps researchers to inexpensively answer important questions that would otherwise be impossible for a single researcher to address.

wednesday, april 18 • concurrent sessions • 10:00–5:00

Session 69 • Minnesota East • Side meeting (open to all)

National Park Service Inventory and Monitoring Program Business Meeting I

Chair: Steven Fancy, National Monitoring Program Leader, National Park Service, Fort Collins, CO

Session abstract:

The NPS Inventory and Monitoring Program is holding its annual meeting in conjunction with the GWS conference. More than 180 people attended last year's meeting. This meeting, scheduled to run 7 hours from 10 am to 5 pm and open to all GWS participants, will provide the latest I&M Program guidance, strategies, best practices, and accountability procedures for natural resource inventories, vital signs monitoring, information management, and reporting measures. Program requirements and core responsibilities for staff working with the 32 I&M networks and prototype monitoring parks will be reviewed. The meeting will include breakout sessions by job type and subject matter area to promote collaboration and communication among I&M Program participants.

Part one of a two-part side meeting (continues in sessions #81, 84, 85, 86 & 87)

Session 70 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 71 • Kellogg II • Contributed papers

Fire in Cultural and Natural Landscapes

Chair: Victoria Stevens, Protected Areas Ecologist, BC Parks, Ministry of Environment, Victoria, BC, Canada

Place Meanings of a Changing Cultural Landscape: Implications for Fuel Treatment, Flathead Indian Reservation, Montana

Roian Matt, Educational Outreach Coordinator, The Confederated Salish & Kootenai Tribes, Forest Management

Department, Ronan, MT

Alan Watson, Research Social Scientist, USDA–Forest Service, Aldo Leopold Wilderness Research Institute, Missoula, MT

The interface between wilderness and non-wilderness lands is a crucial zone for planning and implementing fire and fuels management. On the Flathead Indian Reservation in Montana, this interface area exists as a formally designated Tribal Buffer Zone between the Mission Mountains Tribal Wilderness and the non-wilderness valley floor. Due to an unnatural, hazardous accumulation of forest fuels in the Tribal Buffer Zone, the Tribal Forestry Department is currently assessing the potential for fuel treatment there. As input to this assessment, a cooperative research project was initiated in the fall of 2006 to identify the range, types, intensity and spatial distribution of individual and community meanings associated with the Tribal Buffer Zone and to describe how fuel treatment may affect them. Presentation of contrasting place meanings in the Tribal Buffer Zone provides a basis for understanding differing attitudes about alternative treatment techniques and effects.

Agents of Depredation, Agents of Renewal: Intersections between Fire Management and Aboriginal Policy in Banff National Park

Shauna McGarvey, Ph.D. Candidate, McMaster University, Turner Valley, AB, Canada

This paper will explore how the exclusion, control, and "reintroduction" of fire parallels, or helps us to understand, the changing relationship of Aboriginal people to Canada's mountain national parks. Like fire, First Nations people were excluded from the parks as agents of "destruction" and "depredation," however, evidence for pre-settler "Aboriginal burning" is now evoked by Parks Canada to argue for controlled burning. In its view, prescribed burning in anthropogenically adapted ecosystems replaces "Aboriginal fire," meaning the current conservation project can now be argued to be a part of a continuation of human management. The reformation of fire as a means of renewal in the various discourses and practices of conservation also corresponds to an emerging interest to engage First Nations in the management aspects of the parks. While it appears that Parks Canada is interested in engaging First Nations in order to apply indigenous ecological knowledge to fire management practices, the willingness of the agency to actively consult with Aboriginal communities and the degree to which this intersects with Aboriginal interests will also be explored.

Untrammeling Fire: Wilderness Restoration, Fire, Advocacy Coalitions and the Future

David Ostergren, Associate Professor, Northern Arizona University, Flagstaff, AZ

Many ponderosa pine-dominated wilderness ecosystems are out of their natural range of variability and need restoration of composition, structure, and function. In particular they need fire. This policy analysis focuses on the decision-making process. For many public lands the answer is to thin and/or prescribe burn. However, wilderness has deeper theoretical implications. Over three decades the debate has engaged agency personnel, researchers, and non-government organizations. Management is supposed to maximize both natural and untrammeled conditions. The advocacy coalition framework identifies historical trends. I conclude a radical step needs to be made—a leap of faith by all stakeholders. Options include; (1) letting wildfire burn regardless of the outcome, (2) single-entry prescriptions with hand tools or chainsaws shifting to WFU, (3) light thinning and regular-interval prescribed burns planned for the foreseeable future. Any option in wilderness is bound to require extensive documentation, collaboration, and strong, creative leadership.

Quantifying Benefits of Low-intensity Fire under a Changing Regulatory and Climate Regime in Yosemite National Park

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

Projected warming in the West and associated increases in fire frequency and intensity could pose an unprecedented challenge to land managers in the coming decades. Forest management options, especially for the NPS, are constrained by stringent air quality regulations to protect human health and visual resources on one hand, and Wilderness Act- and Organic Act-related mandates to protect and preserve forest ecosystems on the other hand. Low-intensity fire, whether it occurs as "wildland fire use" or as "prescribed burning," is the most powerful landscape-level tool parks have to balance these apparently conflicting constraints.

This preliminary case study quantifies the long-term benefits of low-intensity fire in terms of photochemical precursor, fine-particle, and greenhouse-gas emissions, comparing those longer-term benefits (i.e., prevented emissions) with shorter-term costs (e.g., air quality), in the context of projected climate change and lower fine-particle health standards.

Influence of Forest Fires on Ozone and Particulate Matter Concentrations in the Western United States

Dan Jaffe, Professor, University of Washington–Bothell, Bothell, WA
Duli Chand, University of Washington–Bothell, Bothell, WA
Will Hafner, University of Washington–Bothell, Bothell, WA
Anthony Westerling, Scripps Institute of Oceanography, University of California–San Diego, San Diego, CA

Fires play a key role in summertime air quality in the western U.S. and fires may be increasing in frequency and size due to climate change. In this study we examined variations in O^3 and $PM^{2.5}$ at numerous sites in the western U.S. (including many NPS sites) and used a fire database that was developed from state and federal fire reports. Overall, we found good correlations between area burned and $PM^{2.5}$ and O^3 concentrations at most sites. In some cases, we also found a correlation between air quality in one region and area burned another region, indicating transport of smoke and other emissions from the fires. During large fire years, summertime mean $PM^{2.5}$ and O^3 are enhanced by 4-5 μg/cu^3 and 6–7 ppbv, respectively, over large portions of the western U.S. Thus fires can have a significant influence on our ability to meet air quality objectives.

Session 72 • Kellogg III • Contributed papers
Diverse Aspects of the Visitor Experience
CHAIR TBA

Bridging the Gap: Managers' Perspectives of Visitor Experiences at Canyon de Chelly National Monument

Carena Van Riper, Undergraduate Research Assistant, Arizona State University, Phoenix, AZ
Dave D. White, Assistant Professor, Arizona State University, School of Community Resources & Development, Phoenix, AZ

Canyon de Chelly National Monument, Arizona, is composed entirely of Navajo Tribal Trust Land. A Navajo community still inhabits the canyon, and most visitor activities require an authorized Navajo guide. Given the unique characteristics of this site, it is vital for Canyon de Chelly managers to understand visitors' experiences. It is also important to understand managers' perceptions of visitors' experiences in order to effectively manage the park. In this paper, we explore the question of whether Canyon de Chelly managers' perceptions of visitors' experiences are similar or different to visitors' self-reports. We assessed visitors' perspectives through an NPS-sponsored on-site questionnaire. Canyon de Chelly managers completed the same questionnaire with instructions "to predict the answers that visitors would give." We conducted follow-up interviews with managers and held a group discussion with the staff to discuss how they perceive the visitors' park experience. These findings are discussed for informed management planning of parks and protected areas.

Providing Resource Management Directives to Visitors through Commercial Operators at a Fly-in-Only Alaska Park

Troy Hamon, Chief of Natural Resource Management and Research, Katmai National Park & Preserve, King Salmon, AK

Katmai National Park and Preserve is partnering with commercial operators to transfer important resource management directives to park visitors. Unlike most parks, Katmai is inaccessible by road. Nearly all visitors access the park through authorized commercial services using airplanes (or boats) for such diverse guided activities as bear-viewing, sport fishing, photography, hiking, camping and river trips. The park unit extends over 4.7 million acres, and while few backcountry visitors interact with park rangers, nearly all visitors interact with commercial operators. Katmai supports one of the largest protected brown bear populations in the world. Bears have been documented to approach within 10 yards of bear-viewing and sport-fish-

ing groups. As popular "extreme wildlife" television shows typically emphasize close proximity to wildlife, commercial operators may feel pressured by clients to provide similar experiences. The park will continue working with commercial operators to provide them with tools necessary to discourage unsafe visitor behavior around bears.

Connecting Visitors to Land, People, and Place: Place Attachment and Perceptions of Cultural Authenticity at Canyon de Chelly, New Mexico

Megha Budruk, Assistant Professor, Arizona State University, Phoenix, AZ
Jill A. Wodrich, Graduate Research Assistant, Arizona State University, School of Community Resources & Development, Phoenix, AZ
Dave D. White, Assistant Professor, Arizona State University, School of Community Resources & Development, Phoenix, AZ

Place attachment has emerged in recent years as a central theme in visitor experience research. Concurrently, place-based management has received increasing attention. Also, authenticity is increasingly proposed as a guiding management principle, especially for cultural heritage parks. To date, however, there has been little research examining the relationships between these concepts. This paper examines the relationships between place attachment and visitors' perceptions of authenticity at Canyon de Chelly National Monument, Arizona. The park is unique in that it is located entirely on Navajo Tribal Trust Land, is home to a living community of Navajo, and most visitor activities require services of a Navajo guide. Examining place attachment and authenticity may provide insights into management strategies that promote meaningful visitor experiences while simultaneously preserving the natural and cultural heritage of the park. The analysis is based on data collected in 2006 through an NPS-sponsored onsite questionnaire.

Effective Communication about Natural Resources: Combining Science and Art at Denali National Park and Preserve

Lucy Tyrrell, Research Administrator, Denali National Park and Preserve, Denali Park, AK

The Murie Science and Learning Center combines science and art to help visitors make meaningful connections with natural resources at Denali—through art design and wilderness writing workshops, digital storytelling, and the display of a special quilt. Denali Quilters' quilt, *Denali Landcover–Pixel and Prospect*, invites viewers to learn from the fabric and from Denali's wild landscapes. The quilt engages visitors/viewers at several layers of learning about Denali's natural resources: GIS technology contributes to the *science* of the quilt (e.g., pixel size, mapped topographic lines for quilting). The quilt's *educational* themes include patterns of elevation and geography, and ecological properties of the park. Themes for *interpretation* include community (teamwork to make quilt, to protect a park), sense of place, contrast (close and far scale, tradition and innovation), change, travel (where do visitors versus caribou travel?), discovery (what species can you detect?), and home (for animals and plants, quilts as symbols of homes).

Session 73 • Governors I • Side meeting (by invitation only)

Research Learning Centers Strategic Planning Session I

Chair: Leigh Welling, National Coordinator, Research Learning Centers, National Park Service, West Glacier, MT

Session abstract:

This meeting is for those who are directly involved in an active or proposed RLC. The purpose is to discuss collective issues and initiatives that are currently underway that affect the structure and function of RLC operations and to identify concerns and opportunities for future direction.

Part one of a two-part side meeting (continues in session #83)

Session 74 • Governors II • Invited papers

Good Up High, Bad Nearby: Ozone Pollution in National Parks

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

Session abstract:

Ozone in the upper atmosphere protects life on earth from the sun's harmful ultraviolet radiation. At ground-level, ozone is an air pollutant that is harmful to breathe and damages crops, trees, and other vegetation. Ozone is formed when emissions from vehicles, industry, power plants, and other sources react in the atmosphere. Many parks occasionally experience high ozone concentrations and about 50 parks are in counties that do not meet the ozone standard. Health advisories are issued in some parks to warn visitors about possible high ozone concentrations on certain days. Vegetation in many parks is at high risk from ozone, which can cause foliar injury and reduce reproduction and growth. Ozone injury to plants has been documented in a number of parks. Practical recommendations are given for monitoring ozone and assessing the effects of ozone. Also, ways to integrate ozone effects surveys into student outreach programs will be explored.

Development and Field Testing of a Handbook for Assessing Foliar Ozone Injury on Plants

Robert Kohut, Research Scientist / Plant Pathologist (retired), Boyce Thompson Institute, Cornell University, Ithaca, NY

Ozone is the most widely distributed phytotoxic air pollutant in the United States, and its potential impacts on vegetation in the national parks are largely unknown. A handbook was written for the U.S. National Park Service to provide the broad background and specific information necessary to design and implement field programs to assess the presence and extent of foliar ozone injury on plants. Three assessment approaches are described: scouting, surveying, and monitoring. The handbook describes the different objectives of each approach, how candidate field sites are located, how assessment plots are established, and how assessments of foliar injury are conducted. Guidance is provided on compiling injury data, implementing a quality assurance program, and conducting fieldwork safely and efficiently. In the summer of 2006, the handbook was field-tested and injury surveys conducted at these national park system units: Allegheny Portage Railroad, Mammoth Cave, Cumberland Gap, Cowpens, and Rocky Mountain.

Outside Influences Control the Air Quality in Parks: Trends and New Measurement Tools

John Ray, Atmospheric Chemist, NPS Air Resources Division, Denver, CO

Ozone is one of several air pollutants that present health risks to visitors and threaten plant injury to sensitive vegetation. Historically, only a few parks have had direct measurements of the air pollution within the parks to guide resource decisions. Two developments have broadened the available of information: (1) Geographic Information Systems (GIS) have allowed spatial presentation of data and interactions and (2) new monitoring techniques allow cheaper measurements in more places. Trends in ozone concentrations within the parks often follow the trends of local, regional, and even hemispheric emissions. This presentation will provide the latest GIS maps (Air Atlas) and trends for air quality parameters in the parks and show how portable monitors can be used to extend and validate pollutant estimations. Eastern parks with improving air quality will be contrasted with some intermountain western parks where ozone is increasing.

Ozone Effects in California National Parks and Forests: Science Meets Resource Management and Policy

Judy Rocchio, Physical Scientist, NPS Pacific West Regional Office, Oakland, CA

Research has shown certain plant species are more sensitive to ozone than humans, so air quality standards set to protect human health do not protect sensitive plants. Ozone injury in California national parks and forests has been best documented on ponderosa and Jeffrey pine trees because of their sensitivity to ozone, their abundance statewide and their economic importance. Working closely with California state and federal air regulators, California national park and forest scientists and managers are developing an ozone injury critical threshold below which foliar ozone injury will not occur. Several ozone summary statistics will be examined in assessing the relationship between ozone exposure and foliar injury symptoms. The ambient indices most strongly related to injury will be used to develop a critical threshold. This is an important meas-

ure used by managers and regulators to assess impacts of air pollution sources and to support stricter emission control measures for ozone precursor pollutant.

Foliar Ozone Injury Survey at Mammoth Cave National Park, Kentucky

Bob Carson, Natural Resource Management Specialist, Mammoth Cave National Park, Mammoth Cave, KY

Cumberland Piedmont Network and Mammoth Cave National Park personnel jointly participated in a test of the draft National Park Service handbook for assessment of foliar ozone injury on vegetation in the national parks in August 2006. The handbook was developed to provide both the broad background and the specific information necessary to design and implement a field program necessary to assess the presence and extent of foliar injury on plants. *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tulip popular), and *Asclepias syriaca* (common milkweed) were selected for evaluation at two plots in Mammoth Cave National Park, Kentucky.

Using Students to Monitor Ground-Level Ozone Effects on Plants

Susan Sachs, Education Coordinator, Research Learning Center, Great Smoky Mountains National Park, Lake Junaluska, NC

During field trips to the park, students and teachers monitor ground-level ozone effects on three sensitive plant species at the Appalachian Highlands Science Learning Center in Great Smoky Mountains National Park. Teachers can also create their own bio-monitoring gardens in their schoolyard using root cuttings from these plants. Data from each site is shared using a common internet database, allowing for plant tracking and comparisons based on elevation, geography, urban/rural areas, and more. To date, over 100 schools have set up ozone bio-monitoring gardens and over 300 teachers have been training in the protocols. This study was set up as the educational component to a NPS Natural Resources Protection Program grant from 2002–2005.

Session 75 • Governors III • Contributed papers

Landscapes and Policy

Chair: Steve Cinnamon, Chief, Natural Resource Stewardship & Science, National Park Service Midwest Region, Omaha, NE

Glacier National Park and its Neighbors: A Twenty-Year Study in Regional Resource Management

Robert Keiter, Wallace Stegner Professor of Law, University of Utah S.J. Quinney College of Law, Salt Lake City, UT

Joseph Sax, Professor Emeritus of Law, University of California–Berkeley, San Francisco, CA

Twenty years ago Glacier National Park was considered the park most at risk from external threats, such as mining and timber harvesting on adjacent lands. This finding led us to undertake a study during the mid 1980s to examine whether Glacier officials were effectively defending the park from these external threats. We concluded that the park's non-confrontational strategies were tenuous at best, but that some protection had been achieved by strong laws enforced by environmental advocates. We also noted the park's early efforts to promote a regional management vision. Since then, the concept of a regional ecosystem that must be protected across formal borders has progressed significantly, though still imperfectly. This presentation, based on recent interviews and documents, is a twenty-year reassessment of resource management in the Glacier region, revisiting controversies from our earlier study and examining several new ones too. It also evaluates the actual forces that drive—and that impede—efforts to manage land in accord with habitat and watershed realities, rather than boundary lines drawn on a map.

Extending Habitat Protection Beyond Park Boundaries: A Case Study From Costa Rica

Barry Allen, Associate Professor of Environmental Studies, Rollins College, Winter Park, FL

Lee Lines, Associate Professor of Environmental Studies, Rollins College, Winter Park, FL

Costa Rica is well known as one of the world's most important centers of biological diversity. The economy of Monteverde, in the Tilaran Mountains of Costa Rica, is highly dependent on the Monteverde Cloud Forest

Preserve to which over 50,000 people each year are drawn to see the resplendent quetzal and three-wattled bellbird. While the reserve provides excellent habitat for these species during part of the year, their altitudinal migration requires habitat outside the protected area along the largely deforested Pacific slope. In response, conservationists are striving to create a biological corridor to protect both the migratory species and the local economy. A key aspect of this endeavor is convincing local landowners of the economic benefit of providing additional habitat for these birds. Survey data collected in 2005 predicts devastating economic impacts if these species are allowed to become extinct.

A Comparison of Park Management in South Africa and in the United States

Daniel Licht, Program Manager, Northern Great Plains Monitoring Network, National Park Service, Rapid City, SD

Rob Slotow, School of Biological and Conservation Sciences, University of KwaZulu-Natal, Durban, South Africa

Josh Millspaugh, School of Natural Resources, Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO

In many parts of the developed world, national parks are the last remaining wild areas and the best hope for conserving natural ecosystems. This is true in the United States and South Africa. However, grassland parks in these countries face similar issues. For example, many native ungulates historically traveled great distances in response to environmental conditions. Landscape fragmentation and societal concerns now prevent these movements. Hence, parks in both countries use fences to manage ungulates. Although there are similarities, there are also differences. For example, mid-size South African parks are more likely to intervene to conserve small populations of large predators, whereas U.S. parks only restore predators where they can be self-sustaining. Park management in the two countries can benefit from an understanding of what each other are doing. Furthermore, consistencies in management may lead to a better understanding of ecological principles and of anthropogenic effects such as climate change.

Stopover Ecology and Habitat Utilization of Migrating Land Birds in Colorado River Riparian Forests of Mexico and the Southwestern U.S.

Charles Van Riper III, Leader, USGS Sonoran Desert Research Station, Tucson, AZ

Kristina Ecton, Northern Arizona University, Flagstaff, AZ

Chris O'Brien, University of Arizona, Tucson, AZ

Susan K. Skagen, USGS, Fort Collins Science Center, Fort Collins, CO

In western North America, migration patterns of neotropical land birds evolved within a landscape of a heterogeneous and patchy environments. Western migrant land birds appear to assess migrant routes and stop over habitats at four major scales: (1) genetically influenced corridor selection; (2) large-scale landscape features; (3) vegetation patches; and (4) microhabitat selection within the vegetation patch. Along the lower Colorado River, these four scales are variously influenced by weather, vegetative species, structure, plant phenology patterns, and insect prey base. In migrating neotropical migrant warblers that we have examined in protected natural areas of Sonora, Mexico, and Arizona, USA, species arrival dates and numbers were variable among years, being largely influenced by large-scale weather patterns and plant phenology cycles. It appears that large-scale landscape features within protected areas, along with vegetation species, structure, phenology, abundance, and insect prey base all play a role in structuring spring warbler migration patterns along the lower Colorado River corridor.

Using Decision Support Tools to Assist in Open Space Land Acquisition in an Urbanizing Landscape

Stephanie Snyder, Operations Research Analyst, USDA–Forest Service, Northern Research Station, St. Paul, MN

James R. Miller, Assistant Professor, Iowa State University, Departments of Landscape Architecture and Natural Resource Ecology and Management, Ames, IA

Adam M. Skibbe, Graduate Student, Iowa State University, Department of Landscape Architecture, Ames, IA

Robert G. Haight, Research Forester, USDA–Forest Service, Northern Research Station, St. Paul, MN

Habitat protection for grassland birds is an important component of open space land acquisition in suburban Chicago. We use optimization decision models to develop recommendations for land protection and analyze tradeoffs between alternative goals. One goal is to acquire (and restore if necessary) as much grassland habi-

tat as possible for a given budget. Because a viable habitat for grassland birds consists of a relatively large core area with additional parcels of grassland habitat nearby, the second goal is to minimize total pairwise distance between newly protected parcels and large existing reserves. We also use the concept of an effective grassland habitat area, which considers influences that neighboring land covers have on grassland habitat suitability. We analyze how the parcels selected for protection change as total protected effective area is traded off against total distance.

Session 76 • Governors IV • Panel discussion

Tribal Parks, Native Tourism, and Living Cultures

Chair: Destry Jarvis, President, Outdoor Recreation & Park Services, LLC, Hamilton, VA

Session abstract:

A growing number of Native American tribes have established, or are in the process of establishing, tribal parks on their reservations most often for the purposes of creating jobs, generating tourism revenue, and sharing their culture and respect for natural landscapes. Tribes especially want to make known that they are living cultures today, not just a collection of archeological sites. This panel will be composed of selected individuals actively engaged in managing or establishing tribal parks and tourism activities.

Panelists:

Thomas Gates, Director, Office of Self Governance and Tribal Historic Preservation Officer, Yurok Tribe, Klamath, CA

Bambi Kraus, Executive Director, National Association of Tribal Historic Preservation Officers, Washington, DC

Alvin Warren, Tribal Council Member, Santa Clara Pueblo, Espanola, NM

Denelle High Elk, Tribal Parks & Tourism Director, Cheyenne River Sioux Tribe, Eagle Butte, SD

Session 77 • Governors V • Panel discussion

The City that Reclaimed the Waterfall that Built It: Minneapolis Riverfront Revival

Chair: David Wiggins, Supervisory Park Ranger, National Park Service, Mississippi National River and Recreation Area, St. Paul, MN

Session abstract:

Cooperation between agencies on the Minneapolis Riverfront has resulted in the successful redevelopment of a blighted (yet historically significant) district. This was done in a way that accomplished the potentially conflicting missions of economic redevelopment, historic preservation, and park development. A national, state, local government, and private partnership has resulted in a billion dollar-plus transformation, the preservation and adaptive reuse of very challenging historic properties, and a restored sense of place for the city. While conflicts and challenges remain, this is a special story of success. There are lessons in what was done and how this was done that can be applied to other cities and places facing similar challenges.

Panelists:

John Crippen, Director, Mill City Museum, Minnesota Historical Society, Minneapolis, MN

Ann Calvert, Riverfront District Coordinator, Minneapolis Community Planning & Economic Development Dept, Minneapolis, MN

Jon Oyanagi, Riverfront District Manager, Minneapolis Park and Recreation Board, Minneapolis, MN

David Wiggins, Supervisory Park Ranger, Mississippi National River and Recreation Area, St. Paul, MN

Session 78 • State I • Workshop
Transcending Boundaries: Facilitating and Managing Complex Systems Change
Chair and Presenter: John Griffin, President, Griffin Consulting, Washington, DC

Session abstract:
Those who are working to support protected areas are in need of innovative approaches for accelerating complex large systems change. Increasingly we find ourselves needing to facilitate collaboration amongst diverse stakeholders and the transcending of various organizational boundaries. The purpose of this workshop session is to increase the understanding of participants in the dynamics of change management that will allow them to work more effectively in situations of organizational and relationship complexity—transcending traditional boundaries. In so doing they will develop ways to understand and manage conflict, collaborate and find common ground. Recommended for individuals that deal with collaborative management, partnerships, multi-stakeholder initiatives and complex large systems change (including co-management, landscape/ecosystem planning, conflict management and transboundary initiatives). Those who attend the workshop will learn to explore power relationships and how groups differentiate and integrate. Develop ways to understand and manage conflict, collaborate and find common ground.

Session 79 • State II
CANCELED

Session 80 • State III • Side meeting (by invitation only)
NPS Regional Wilderness Coordinators Meeting I
Chair: Tim Devine, Carhart Wilderness Training Center, National Park Service, Missoula, MT

Session abstract:
This is a meeting for the NPS regional wilderness coordinators, NPS wilderness training program manager, and NPS national wilderness and recreation program manager to discuss and collaborate on the NPS Wilderness Stewardship Program.

Part one of a two-part workshop (continues in session #90)

Wednesday, April 18 • afternoon concurrent sessions • 1:00–5:00

Session 81 • Minnesota East • Side meeting (by invitation only)
National Park Service Inventory and Monitoring Program Business Meeting II

Part two of a two-part side meeting. See description under session #69. The business meeting also includes the breakout sessions listed below. Business meeting concludes at 5:00.

Session 82 • Kellogg I
National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 83 • Governors I • Side meeting (by invitation only)
Research Learning Centers Strategic Planning Session II

Part two of a two-part side meeting. See description under session #73. Session concludes at 5:00.

Session 84 • Governors II • Side meeting (by invitation only)
National Park Service Inventory and Monitoring Program Business Meeting (breakout session).
See description under session #69.

Session 85 • Governors III • Side meeting (by invitation only)
National Park Service Inventory and Monitoring Program Business Meeting (breakout session).
See description under session #69.

Session 86 • Governors IV • Side meeting (by invitation only)
National Park Service Inventory and Monitoring Program Business Meeting (breakout session).
See description under session #69.

Session 87 • Governors V • Side meeting (by invitation only)
National Park Service Inventory and Monitoring Program Business Meeting (breakout session).
See description under session #69.

Session 88 • State I
CANCELED

Session 89 • State II
CANCELED

Session 90 • State III • Side meeting (by invitation only)
NPS Regional Wilderness Coordinators Meeting II

Part two of a two-part side meeting. See description under session #80. Side meeting concludes at 5:00.

thursday, april 19 • late morning concurrent sessions • 10:00–12:05

Session 91 • Minnesota East • Workshop
Delivering Your Message to the Public: Breaking News and Blogs
Chairs: Mike Whatley, Chief, Office of Education & Outreach, NPS Natural Resource Program Center, Fort Collins, CO
Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, NPS, Fort Collins, CO
Jackleen de La Harpe, Workshop Coordinator, Portland, OR

Session abstract:
This workshop will match different media representatives (television and a new media representative, e.g., blogger) with a non-journalist (scientist) to discuss how to manage breaking stories to the public and how scientists can help in corroborating information. In addition to a television journalist and the new media representative, this session may include USGS scientist David Mech who has been involved in wolf biology and recovery in Minnesota and national parks around the country. *Presenters TBA.*

Session 92 • Great River I/IV • Invited papers

Innovative Tools for Collecting, Managing, and Delivering Inventory and Monitoring Data

Chair: Peter Budde, Natural Resource GIS Program Manager, National Park Service, Fort Collins, CO

Session abstract:

The Inventory and Monitoring Program networks are developing innovative and effective methods of collecting field data, managing these data, and delivering the resulting products to parks. This session comprises presentations that highlight particular tools or techniques that are now being used. The presentations will provide an overview of these tools, emphasizing their practical application, lessons learned, and long-term benefits to parks.

Rugged Tablet Computers in the Wilds of Alaska: Bringing Data Quality Control to the Field

Doug Wilder, NPS Midwest Region, Madison, WI

One of the aims of the Inventory and Monitoring Program is to provide sound data as quickly as possible to support park management decisions. The Central Alaska Network uses tablet computers for data collection and processing—saving time and controlling errors. Data input forms that utilize pick lists and other programmed constraints contribute to error reduction and data standardization. Data are essentially quality-checked when collected. Database replication routines allow for concurrent data collection on multiple tablets. Tablets are kept powered with solar panels and other power sources. Valuable reference materials too bulky and heavy to take to the field go as digital files on the tablet. Ancillary databases and field forms can easily be incorporated into data collection. Digital photos can immediately be viewed on the 10-in. tablet screen and annotated by hand, and handwriting may still be used to capture critical notes and sketches on the computer.

A Database Template for Managing Natural Resource Inventory and Monitoring Data

Margaret Beer, Inventory & Monitoring Program Data Manager, National Park Service, Fort Collins, CO

The NPS Inventory and Monitoring Program developed the Natural Resource Database Template (NRDT) as a model for building natural resource inventory and monitoring project databases. NRDT provides a common design starting point that can be extended to accommodate almost any inventory or monitoring field sampling protocol. NRDT is peer-supported: its direction is determined by a user board, and individual applications and tools are widely shared among users.

The NPS Metadata Tools and Editor

Chris Dietrich, Information Management Specialist (Partner), Colorado State University, Fort Collins, CO

Natural resource research and management in the National Park Service requires and generates data and metadata. The Natural Resource GIS Program has developed the NPS Metadata Tools & Editor (MTE), a software tool for data and metadata management. The MTE runs either within ESRI's ArcCatalog or as a standalone application and integrates with the NPS Data Store to provide a single system for creating, managing, and sharing metadata and data.

The NPS Data Store: "Open" for Data Discovery and Delivery

Peter Budde, Natural Resource GIS Program Manager, National Park Service, Fort Collins, CO

The National Park Service (NPS) Data Store is a publicly accessible (i.e., "open") source for a wide variety of information and products relevant to agency planning, operations, research, and management activities. Data and their accompanying metadata are innately tied to a specific park, network, or program office and are discoverable through flexible search criteria (based either on location, thematic content, or data type). Data Store records are transformed/displayed in a variety of formats depending on their respective type or content, and can be downloaded if desired. A renewed goal of the Data Store is to truly provide a one-stop "shop" for NPS data discovery and delivery.

Development of an Internet Mapping Service to Visualize and Distribute Environmental Monitoring Data
Mark Hart, Great Lakes Inventory & Monitoring Network, National Park Service, Ashland, WI
The Great Lakes Inventory and Monitoring Network (GLKN) has just begun long-term environmental monitoring. To be successful, GLKN must make appropriate information available to prospective users: managers, administrators, researchers, etc. While the network will provide reports, synthesis, and static data sets via conventional websites, it has also initiated the development of an internet mapping service, which provides on-demand, dynamic access to data from GLKN's monitoring work, relevant partner data, and high-resolution imagery and maps. Using this online map portal, users can view, query and download customized data sets. The portal implements protections for both data quality and sensitivity, based on account-level permissions. Areas of interest, personalized data sets, and custom queries can be created by users, and saved as private or shared resources. This tool gives data users rapid access to custom data delivery.

Session 93 • Great River II/III • Invited papers
When Preservation isn't Enough: The Case for Active Management in the NPS (Part 1)
Chair: Karl Brown, Vegetation Mapping Program Manager, NPS NRPC/BRMD, Fort Collins, CO

Managing for Wild Nature: A National Parks Management Strategy for the 21st Century
Jerry Freilich, Research & Monitoring Coordinator, Olympic National Park, Port Angeles, WA
Philip Cafaro, Associate Professor of Philosophy, Department of Philosophy, Colorado State University, Fort Collins, CO
A paradox lies at the heart of national park management. We seek to preserve the parks unimpaired for future generations and one way that wild nature can be impaired is by taming it: by outlawing unruly organisms (big predators, unsightly diseases) or controlling dangerous processes (fire, floods) rather than allowing them to create the landscape. On the other hand, preserving all the organisms and processes in a park (the full complement of wild nature) often demands hands-on management, particularly as parks become more crowded and surrounding lands more degraded. No magic cure will dissolve this paradox. Managing for wild nature will be most successful if we take two steps. First, make the full range of management goals explicit and frankly acknowledge conflicts between them. Second, work to better manage people and limit their impacts on the parks. The better we manage ourselves, the wilder we can let nature remain.

The Changing Definition of Native Species: All Natives are Not Created Equal
Nancy Brian, Endangered Species Specialist (Plants), Biological Resource Management Division, NPS, Fort Collins, CO
Rita Beard, Invasive Plant Program Manager, Biological Resource Management Division, NPS, Fort Collins, CO
A burned sagebrush site (at 7,200 ft) at Navajo National Monument needs to be restored and you have two choices: use seed collected from the monument which had been grown out at a local nursery; or purchase seed which had been collected from Idaho (at 5,000 ft). They are both native species. The Arizona seed is from wild plants that grew a few miles of the project site and had not been introduced by direct or indirect human action. The Idaho seed is also native, but from a different geographic area; in this case, a different state and ecoregion. Which do you choose? The Arizona native is the best choice. The non-local Idaho native is genetically distinct and unexpected consequences will likely occur if it is used. There are three main reasons to choose appropriate local natives: species viability, the broader ecological community, and management interests.

Making the Difficult Decision to Use Herbicides
Rita Beard, Invasive Plant Program Manager, Biological Resource Management Division, NPS, Fort Collins, CO
Carol DiSalvo, IPM Coordinator, Biological Resource Management Division, Washington, DC
The environmental impact of invasive plants has been well documented, and include changes to plant diversity, loss of rare species, loss of forage and habitat for wildlife, and changes in soil chemistry, to name a few. In an ideal world, good natural resource management would result in a native flora that could compete or guard against exotic plant invasions. Unfortunately, even the most carefully managed sites, with diverse high

seral plant communities, are not a defense against exotic plant invasions. Hand-pulling and other manual methods are not always effective and herbicides may be the only effective and practical alternative. In this paper we will explore factors that will help managers weigh the benefits and consequences of using herbicides, minimize the impact of herbicides, and reduce consequences for non-target species.

Managing Wildlife Health and Disease in an Ever-shrinking World

Jenny Powers, Wildlife Veterinarian, Biological Resource Management Division, NPS, Fort Collins, CO
Dan Sealy, Deputy Chief, Natural Resources and Science, National Capital Regional Office, Washington, DC
Mary Kay Watry, Biologist, Rocky Mountain National Park, Estes Park CO
Dan Roddy, Biologist, Wind Cave National Park, Hot Springs SD
Jim Atkinson, Wildlife/Fisheries Biologist, Shenandoah National Park, Luray, VA

Emerging wildlife disease issues have gone from being obscure topics to matters of regular dinner conversation and keen political interest. Along with this familiarity has come pressure to address these diseases for the health of the host as well as the health of the human environment. The NPS has historically assumed that most wildlife diseases are a natural part of ecosystems and therefore do not usually require active management. Only recently have we begun to recognize that many pathogens are exotic and even those pathogens that are native to a particular environment operate in ecosystems highly affected by anthropogenic influences. For example, the geographic range where chronic wasting disease of cervids is found has been drastically altered by human assisted movement across North America. When faced with incomplete and altered ecosystems, NPS units need a wide array of tools to effectively manage non-native disease processes to protect native resources.

Integrating the Human and Ecological Dimensions of Biological Resource Management to Improve Decision-making

Kirsten Leong, SCEP Biologist/Graduate Student, Biological Resource Management Division, NPS/Cornell University, Fort Collins, CO
Dan Decker, Director, Office of Land Grant Affairs, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY
Jim McKenna, Coordinator, Schoodic Education and Research Center, Acadia National Park, Bar Harbor, ME

National Park Service biological resource management must be: (1) faithful to the values for which the agency and its specific units were created, (2) based on sound ecological science, and (3) carried out for the benefit of current and future generations. Within these sideboards, many possible ends and means can be considered for any complex management issue. The diversity of stakeholders affected by and desiring input in management has grown dramatically in the last few decades, and managers of public trust resources are increasingly expected to consider the interdependence of human and ecological dimensions in biological resource management. To illustrate this interdependence, we examine: the scales of management influence (local to national), the types of stakeholders activated at different stages of planning, and implications for effectively addressing expectations for public participation. We conclude with an example of an integrated approach that enhanced decisions about deer management at Acadia National Park.

Session 94 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 95 • Kellogg II • Panel discussion

Healthy Parks, Healthy People: An Examination of the Paradigm of Parks and Today's Health Issues

Chair: Alex McIntosh, Rural Sociology and Community Studies, Department of Recreation, Park, and Tourism Sciences, Texas A&M University, College Station, TX

Session abstract:

This panel will explore the issue of healthy and obesity in the visiting public and the role of parks and public spaces in promoting societal health. Panelists from around the world will examine the issues from several angles starting from the health issues themselves to international programs that specifically address improving health through park experiences.

Healthy Children and Physical Activity

Alex McIntosh, Rural Sociology and Community Studies, Department of Recreation, Park, and Tourism Sciences, Texas A&M University, College Station, TX

Physical activity undertaken by children is related to lower risks of chronic illnesses in later life. Research indicates, however, that over the past decade, children have engaged in less exercise. This decline is related to fewer facilities at which exercise can take place as well as neighborhood safety issues. This paper reviews current research on the extent of physical activity engaged in by children and suggests factors that may contribute to increasing physical activity in this population.

Additional presenters TBA

Session 96 • Kellogg III • Contributed papers

Local Knowledge, Living Traditions

Chair: Elaine Leslie, Assistant Superintendent, Canyon de Chelly National Monument, Chinle, AZ

Protecting Resources, Protecting Livelihoods: Contributions of Traditional Ecological Knowledge to the Development of Scientific Policy

Elizabeth Barron, Graduate Research Assistant, Rutgers University, New Brunswick, NJ

National parks are dynamic areas in which efforts to protect and understand natural resources must take into account past, present and future land use. Nationwide, the sustainable collection of fungi from public lands is of increasing concern to park managers. In Maryland there is an on-going tradition of morel mushroom collecting, however, with recent reported declines in two national parks, research is under way to determine potential impacts of harvesting activities. Using both qualitative and quantitative methods this study seeks to utilize the traditional ecological knowledge of local harvesters, in combination with the science-based ecological knowledge of managers and mycologists, to develop a further understanding of morel habitat and ecology in the mid-Atlantic region. Additionally, practical suggestions are provided for morel mushroom management that incorporate input from all stakeholders groups. This research has practical implications for the conservation of non-timber-forest-products and for co-management of park resources.

Commercial Grizzly Bear Viewing Management in the Fishing Branch (Ni'iinlii Njik) Protected Area (Yukon, Canada)

Erik Val, Director, Yukon Parks Branch, Yukon Department of Environment, Whitehorse, YT, Canada

Over the last two decades the settlement of Aboriginal land claims in Canada's Yukon Territory has led to the creation of parks and protected areas. The Fishing Branch (Ni'iinlii Njik) is a 6,500-sq-km protected area in northern Yukon which was conserved through the 1995 Vuntut Gwitchin Land Claim Agreement. The area protects cultural and natural resources, most notably the unusually high concentrations of salmon and grizzly bear. Unique in Canada, the protected area consists of both public and Aboriginal lands and is managed in partnership as an ecological unit by the Yukon and Gwitchin Governments. A jointly developed management plan approved in 2000 identified the conditions to allow for commercial bear viewing. After fulfilling these conditions, viewing started in September 2006. This paper explores the benefits and oppor-

tunities to cooperatively preparing for and managing such an activity. Comparisons will be made to similar operations in other northern regions in Canada and Alaska.

Bears, Fish, Prehistory, and Deferred Maintenance at Brooks Camp, Katmai National Park and Preserve

Dale Vinson, Section 106 Coordinator, Katmai National Park and Preserve, Anchorage, AK

Brooks Camp is popular with fishermen and bear viewers but also has a 4500-year archeological record. Original construction of Brooks Lodge and NPS facilities and subsequent operation caused major cumulative impacts to archeological sites with little mitigation. The 1995 Brooks DCP decision to move Brooks Camp never occurred. Now critical infrastructure maintenance is needed which will further impact archeological resources. Alaska Natives continued traditional salmon harvest in Brooks River into the 1950s and consider Brooks River to be a traditional cultural property. Natives successfully claimed land and established conservation easements to maintain their interests. Until Brooks camp relocates. Katmai must balance cultural resources protection with critical infrastructure maintenance. The discovery of a burial during 2006 compliance investigations demonstrated that maintaining Brooks Camp infrastructure will require expensive data recovery projects done in cooperation with local native groups who prefer that Brooks Camp was not on top of their ancestors' graves.

Collaborative Archaeology at Hassanamesit Woods

Rae Gould, Nipmuc Nation, South Grafton, MA

A collaborative archaeological project at the Hassanamesit Woods site between the University of Massachusetts (Boston), Town of Grafton, and Nipmuc Nation provides a model for projects that involve multiple interests, including those of Native American tribes. Through documentary research, oral history, and archaeology, the lives of the inhabitants of one Indian household discovered in the project area are being recreated through novel perspectives. As Native culture became intertwined with the Euro-American settlers of the town, notions of middle class may have held some meaning for the members of this household. Yet long-term connections to Hassanamesit as a Nipmuc place within the broader network of a Nipmuc homeland also existed. This paper will present the most recent interpretations of the documentary and archaeological research from this site, as well as the perspectives of the Nipmuc Nation concerning the role of collaborative archaeological research projects such as that undertaken at Hassanamesit Woods.

One Landscape, Multiple Histories: The Partnership to Preserve Hassanamesit Woods

Joanna Doherty, Community Planner, National Park Service, Blackstone River Valley National Heritage Corridor, Woonsocket, RI

Edmund Hazzard, Clerk, Hassanamesit Woods Management Committee / President, Grafton Land Trust, Grafton, MA

This paper will explore the multifaceted partnership that has developed to preserve and interpret Hassanamesit Woods, an approximately 200-acre site in Grafton, Massachusetts. Associated with a 17th-century "praying Indian village," the site has a complex history and remarkable cultural and natural resources, attracting support from the municipality, the National Park Service, state agencies, non-profits and the Nipmuc Nation. The findings and recommendations of the Hassanamesit Woods preservation master plan, including interpretive themes and strategies, will be discussed. The paper will also address the planning process, which, through its inclusive and rigorous approach, has strengthened the existing partnership, enhanced the final product and contributed to the thoughtful preservation and interpretation of the site. Though this paper presents the story of a particular approach to a particular place, it speaks to issues that are pertinent to many sites and parks, including the presentation of multiple histories, creative interpretive techniques and the benefits of innovative civic engagement.

Session 97 • Governors I • Invited papers

Factors Affecting Mercury Accumulation and Biomagnification in National Parks in the Great Lakes Region

Chairs: Larry Kallemeyn, USGS-CERC-IFBS, International Falls, MN
Steve Windels, Terrestrial Ecologist, Voyageurs National Park, International Falls, MN

Session abstract:

National parks are widely considered as pristine environments by the public, yet they are susceptible to the airborne mercury (Hg) contamination that affects thousands of water bodies in the Great Lakes states. The environmental threat posed by Hg, particularly to human health, has prompted many studies of atmospheric mercury pollution and Hg bioaccumulation in sport fishes consumed by humans in national parks and other protected areas in the Great Lakes region. Presentations in this session will summarize the results of more recent research that has assessed the importance of geologic and atmospheric sources of Hg to park waters, identified factors contributing to variation in ecosystem sensitivity and methylmercury concentrations in aquatic food webs, and examined the threat posed to park wildlife by Hg contamination. Knowledge about the effects of Hg on biological systems and associated human interactions is essential for management of protected areas.

Human and Natural Controls on Methylmercury in Aquatic Food Webs of Voyageurs National Park and Apostle Islands National Lakeshore

James Wiener, Professor, University of Wisconsin–La Crosse, La Crosse, WI
Larry Kallemeyn, USGS-CERC-IFBS, International Falls, MN
Kristofer Rolfhus, University of Wisconsin–La Crosse, La Crosse, WI
Mark Sandheinrich, University of Wisconsin–La Crosse, La Crosse, WI
Brent Knights, USGS-UMESC, La Crosse, WI
Jeffrey Jeremiason, Gustavus Adolphus College, St. Peter, MN
John Sorensen, University of Minnesota-Duluth, Duluth, MN
Julie Van Stappen, Apostle Islands National Lakeshore, Bayfield, WI

Fish in lakes of Voyageurs National Park and lagoons of Apostle Islands National Lakeshore contain high concentrations of methylmercury, a bioaccumulative toxic compound that biomagnifies in aquatic food webs. The spatiotemporally variable and elevated concentrations of methylmercury in these seemingly pristine environments result from a combination of human disturbances and natural factors that increase the net production and abundance of methylmercury and its concentrations in aquatic biota. Human disturbances that increase the abundance of methylmercury include fluctuating water levels in impounded waters and anthropogenic loadings of mercury and sulfate in atmospheric deposition. Natural factors that increase the net production and abundance of methylmercury in these waters include presence of adjoining wetlands, moderately low pH, dense submersed vegetation, and high water temperature in summer. The parks are mercury-sensitive landscapes, in which seemingly small loadings of mercury can cause toxicologically significant exposures of piscivorous fish and wildlife to methylmercury.

Synergistic Effects of Water-table Fluctuation and Atmospheric Sulfate on Methylmercury Production in Boreal Wetlands

Jill Coleman-Wasik, Ph.D. Student, St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN
Daniel R. Engstrom, St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN
James E. Almendinger, St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN
Edward B. Swain, Minnesota Pollution Control Agency, St. Paul, MN
Bruce A. Monson, Minnesota Pollution Control Agency, St. Paul, MN
Jeff D. Jeremiason, Gustavus Adolphus College, St. Peter, MN
Randy K. Kolka, USDA–Forest Service, Grand Rapids, MN

Carl P. J. Mitchell, University of Toronto at Mississauga, Mississauga, ON, Canada
Brian A. Branfireun, University of Toronto at Mississauga, Mississauga, ON, Canada

Boreal wetlands are important sites for production of methylmercury by sulfate-reducing bacteria and are thought to be widely sulfate-limited based on laboratory and field-mesocosm experiments. These observations have been reinforced by an ecosystem-scale study in which we sprayed sulfate onto half of a 2-ha bog at the Marcell Experimental Forest in northeastern Minnesota. The additions—now in their fifth year—significantly increased MeHg concentrations in porewaters and the wetland's outflow, although the response differed markedly depending on the season of application and may not be additive over the years. Here we report on the 2006 introduction of a "recovery" treatment (where sulfate addition has ceased) and examine the effects of seasonal, water-table fluctuation on mercury methylation. We address in particular the question of possible chronic effects of sulfur enrichment in the surface peat and the larger issue of recovery of wetlands previously impacted by elevated sulfate from acid rain.

Impact of Wildfire on Mercury in Forest Soils, Voyageurs National Park, Minnesota

Laurel G. Woodruff, Research Geologist, U.S. Geological Survey, Mounds View, MN
William F. Cannon, U. S. Geological Survey, Reston, VA

Atmospheric deposition has created a legacy of enriched mercury (Hg) in forest soils in the Lake Superior region. In Voyageurs National Park forest floor layers contain approximately 0.22 mg/m^2 and organic mineral soils contain approximately 1.20 mg/m^2 Hg. Mercury in forest soils is strongly influenced by forest disturbance, especially fire. A 2004 wildfire in Voyageurs resulted in an immediate release of Hg by combustion and mobilization from near-surface soils. The amount of Hg released was highly dependent on fire severity and varied from insignificant at low/moderate areas to near total Hg loss from severely burned areas. A large area in Voyageurs burned in severe wildfires in 1936. Mercury contents of soils within the 1936 burned areas are still significantly lower than in adjacent areas that did not burn. We suggest that an initial Hg loss by fire may be augmented by changes in long-term Hg cycling in forest ecosystems.

Decline in Mercury Levels in Fish in Inland Lakes of Isle Royale National Park

Paul Devnick, Ph.D. Student, Miami University, Oxford, OH
Patrick Gorski, University of Wisconsin, Madison, WI
Daniel Engstrom, St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN
Donald Canfield, University of Southern Denmark, Odense, Denmark
Gerald Smith, University of Michigan, Ann Arbor, MI
James Oris, Miami University, Oxford, OH
Lisa Cleckner, University of Wisconsin, Madison, WI
James Hurley, University of Wisconsin, Madison, WI

Previous research at Isle Royale National Park documented mercury levels in fish from several lakes high enough to elicit fish consumption advisories for humans and to raise concerns about toxicity to piscivorous wildlife and to the fish themselves. The initial focus of our study was to examine the toxicity of mercury in fish. For this purpose, we collected fish from nine lakes in 2004–2005. Rather than observing toxicity, our results indicate a recent decline in mercury levels in fish. Our efforts are now focused on determining the factors responsible for this decline. Mercury deposition has not recently declined and, therefore, is not the driving factor for this trend. We are thus examining other factors that affect mercury bioaccumulation in fish. From this research, current mercury levels in fish, and hence, mercury exposure to piscivorous wildlife and humans will be better understood. Further, understanding the factors responsible for this decline will be important for predicting trends in mercury levels in fish in other ecosystems.

Monitoring Mercury in Wildlife

David Evers, Executive Director, Biodiversity Research Institute, Gorham, ME

Recent findings show that the availability of methylmercury to wildlife is more pervasive than once thought. In addition to elevated mercury levels in fish, avian, and mammalian piscivores, other high trophic level species in foodweb pathways such as ones based on wetland invertebrates are also potentially at risk. Identification of biological mercury hotspots through field sampling and modeling is needed to support

local and regional landscape management and policy decisions. To monitor spatiotemporal changes of mercury deposition and availability to wildlife a standardized national program has been developed and parts of this program are in place in the northeastern United States. National parks can greatly facilitate and gain from participating in such a network.

Session 98 • Governors II • Contributed papers

The Evolving Wilderness: New Perceptions, New Management Challenges

Chair: Alan Watson, Research Social Scientist, Aldo Leopold Wilderness Research Scientist, Missoula, MT

Rethinking Wilderness Concepts in a Changing World: A Canadian Perspective

Kevin McNamee, Director, Park Establishment Branch, National Parks Directorate, Parks Canada Agency, Ottawa, ON, Canada

The preservation of wilderness areas was a dominant theme in the design and management of many of Canada's national parks and protected areas in the latter half of the 20th century. However, with the emergence of themes such as biodiversity, sustainable development, and ecological integrity, wilderness as a central concept has been pushed to the sideline. And with the continuation of traditional uses of resources within national parks, the concept is further challenged in proposed national parks such as the Mealy Mountains in Labrador. Yet, wilderness continues to have strong appeal within the interests of park visitors. And the Canadian Parliament has amended the Canada National Parks Act to compel the designation of wilderness areas within national parks. This presentation will highlight how the wilderness concept has been challenged and evolved in Canada with a focus on the last 40 years, and on Canada's national parks.

Keeping the Wild in Wilderness: Minimizing Nonconforming Uses in the National Wilderness Preservation System

Kevin Proescholdt, Director, Wilderness and Public Lands, Izaak Walton League of America, St. Paul, MN

Nonconforming uses in units of the national wilderness preservation system often make it difficult or impossible to protect wilderness values. These uses (which include such things as airplane access, jetboats, motorboats, motor vehicles, roads, buildings and structures, and more) have been allowed with greater frequency in the wilderness system since about 1980, and are often replicated in subsequent wilderness legislation. In order to keep wilderness truly wild, we must reverse this trend and minimize nonconforming uses in wilderness. This paper will examine the background of nonconforming uses, the problems they raise, and suggestions for minimizing them in the future.

NPS Managers' Perceptions of Wilderness Day Use: Use Patterns, Impacts and Management Practices

James D. Abbe, Wilderness Specialist, Bureau of Land Management, Mohave Valley, AZ

Robert Manning, Professor of Natural Resources and Chair of the Recreation Management Program, University of Vermont, Burlington, VT

Day use of wilderness areas is emerging as a growing and important use, and one that will require increasing management attention. It is an important topic to wilderness management because of its growing share of visitor use, user impacts on wilderness resources, and impacts on the quality of the visitor experience. In order to better understand wilderness day use issues, a survey of National Park Service (NPS) wilderness managers was conducted. Managers from 87 NPS units with wilderness responsibilities were asked to participate in a web-based survey endorsed by the NPS National Wilderness Steering Committee. The survey provided service-wide information regarding managers' perceptions of wilderness day use and actions they take to manage this growing use. Results from the survey showed that managers see wilderness day use as a significant issue, identify day users as a distinct user group, attribute many impacts to day users, rarely take management action to specifically address only day use impacts, and perceive that day users have differing concepts/values of wilderness when compared to more traditional overnight wilderness users.

The Adaptable Human: Implications for Recreation Management in Wilderness

David Cole, Research Geographer, Aldo Leopold Wilderness Research Institute, Missoula, MT
Troy Hall, Associate Professor, Department of Conservation Social Science, University of Idaho, Moscow, ID

Managers are charged with protecting high quality experiences in wilderness. How best to do this is often unclear, particularly in wildernesses close to large metropolitan areas. To assist managers, we conducted a series of related studies in wildernesses in the states of Washington and Oregon. Results suggest most wilderness visitors adapt to increasing wilderness use by rationalizing the appropriateness of suboptimal conditions. They recognize conditions are crowded, avoid visiting on holidays and weekends, if possible, and if not, alter expectations so experience evaluations remain highly positive. Most prefer to be allowed to decide for themselves whether to visit a crowded wilderness, rather than have that decision made for them (through use limits). The seemingly infinite ability of visitors to adapt to changing conditions raises questions about appropriate management of visitor experiences in such places, as well as the relevance of visitor survey data in making decisions about appropriate management.

Evaluating Research Proposals in Wilderness: Policy Guidance, the NEPA Connection, and Minimum Requirements Analysis

Richard L. Anderson, Environmental Protection Specialist, NPS, Alaska Regional Office, Anchorage, AK

Several parks have worked out their own systems to process outside research permits in wilderness. Dozens of steps are required for evaluation, approval or denial, revision, record keeping, data entry, notification and communication. RPRS, the research permit and review system, has greatly improved this process. Since cultural and environmental impact analysis is required for any review, NEPA compliance comes into play, with its own dozens of steps and its four potential pathways. PEPC, the planning, environment, and public comment website, has greatly improved this process, although it is not coordinated with RPRS. For research proposals in wilderness areas, additional impact analysis is prescribed via the MRDG, the minimum requirements decision guide. This paper addresses the review process, with emphasis on NEPA and the wilderness minimum requirements analysis. It recommends process improvements for both the ranger evaluating proposals and the researcher seeking a permit.

Session 99 • Governors III • Panel discussion

State Agency Responses to the Challenges of Climate Change Impacts for Fish and Wildlife Resources

Chair: Amber Pairis, Science and Research Liaison, Association of Fish and Wildlife Agencies, Washington, DC

Session abstract:

State fish and wildlife agencies are responsible for the management of most of the fish and resident wildlife in our nation and have a critical interest in the potential impacts associated with climate change. Since climate change will either impact or have the potential to impact the wildlife resources for which they are responsible, state resource management agencies, tribes, and the federal agencies will all be challenged to manage populations and ecosystems in the face of these changes and uncertainties about how ecological systems will adapt. This panel discussion will highlight approaches and strategies that state agencies are taking to address potential impacts and issues associated with climate change on a variety of fish and wildlife resource issues. This session will include presentations from state resource agency representatives and opportunities for increased communication and collaboration through a question/answer and discussion session between the panelists and the audience.

Panelists:

Jim DeVos, Assistant Director (Retired), Arizona Game and Fish, Phoenix, AZ
Randy Kreil, Game Chief, North Dakota Game and Fish, Bismarck, ND
Greg Wathen, Chief of Wildlife Management, Tennessee Wildlife Resources Agency, Nashville, TN
Fred Harris, Chief Deputy Director, North Carolina Wildlife Resource Commission, Raleigh, NC
Priya Nanjappa-Mitchell, State Coordinator, Partners in Amphibian and Reptile Conservation, Washington, DC
Dave Schad, Director, Division of Fish and Wildlife, Minnesota Department of Natural Resources, St. Paul, MN

Session 100 • Governors IV • Invited papers

The NASA/NPS Connection: Parks for Science, Science for Parks (Part 1)

Chair: Woody Turner, Program Scientist, Biological Diversity Program Manager, Ecological Forecasting, NASA Headquarters, Washington, DC

Mike Story, Physical Scientist, National Park Service NRPC, Denver, CO

Session abstract:

The National Aeronautics and Space Administration (NASA) funds a variety of projects that use National Park Service (NPS) units as their focus. In addition, many more projects are funded that study issues directly related to NPS concerns. Two invited-paper sessions describe some of these projects. The projects range from the development of visualization and interpretation products using NASA imagery and programs, to natural resource issues focused on invasive species, wildland fire, and biodiversity. The purpose of the two sessions is to report on the results of these studies so that managers of natural areas can benefit from the findings and possibly initiate their own projects with NASA funded researchers.

Assessment of Mangrove Height, Biomass, Productivity, and Hurricane Impact in Everglades National Park

Marc Simard, Research Scientist, NASA Jet Propulsion Laboratory, Pasadena, CA

Keqi Zhang, Radar Science and Engineering Section, Jet Propulsion Laboratory, Pasadena, CA

Victor H. Rivera-Monroy, Radar Science and Engineering Section, Jet Propulsion Laboratory, Pasadena, CA

Mike Ross, Radar Science and Engineering Section, Jet Propulsion Laboratory, Jet Propulsion Laboratory, Pasadena, CA

We present results from an on-going interdisciplinary science project on mapping tree height, biomass, and productivity at landscape scale. In particular, we focus on the mangrove forests of the Everglades National Park. We used several datasets to calibrate Shuttle Radar Topography Mission (SRTM) elevation data including: airborne LIDAR system (no waveform), ICEsat/GLAS waveforms and field data. The airborne LIDAR data was collected specifically for this project in Everglades National Park using an Optech ALTM 1233 system on April 15–16 and May 14–16, 2004. We produced the first landscape-scale 3D maps of mangrove canopy height and biomass distribution in Everglades National Park. The map was then used to estimate biomass and productivity of the ecosystems at the landscape scale. We used field data to derive a relationship between stand height and biomass. Hurricane impact was quantified using the airborne LIDAR data collected before and after hurricane Wilma.

Utilizing Remote Sensing to Analyze Aerosols over Glacier National Park, Montana

Amanda D. Smith, NASA Langley Research Center, Coeburn, VA

Rodney Steve, NASA Langley Research Center, Coeburn, VA

Sasha Congiu, NASA Langley Research Center, Coeburn, VA

Samantha Banker, NASA Langley Research Center, Coeburn, VA

Each year wildfires within forested areas contribute to the presence of aerosols, or particulate matter, in the atmosphere. In 2003, Glacier National Park was subjected to a major fire season during which fires destroyed 10% of park property. This study addressed the transport, frequency, and magnitude of aerosols and Particulate Matter 2.5 ($PM^{2.5}$) migrating from Montana's Glacier National Park as a result of these fires. The effects of aerosols and $PM^{2.5}$ crossing into Canada were a major consideration during this project. NASA Earth Observation data from Terra (MODIS) and Aqua (MODIS) satellite missions, along with Geographical Information Systems data, were used to track the transport of aerosols out of the park's boundaries. Using NOAA's HYSPLIT model, trajectories were created for each fire that occurred during 2003. Although the overall effects of aerosol transport are still unknown, the methodology created during this study may be a useful tool when analyzing aerosols in the Western U.S.

Evaluation of integrating NASA's Invasive Species Forecasting System to Support National Park Service Decisions

Jeffrey T. Morisette, Research Scientist, NASA Goddard Space Flight Center, Greenbelt, MD

Nate Benson, National Park Service
Kara Paintner, National Park Service
Neal Most, NASA GSFC/Innovim
Pete Ma, NASA GSFC/Innovim
Asad Ullah, NASA GSFC/SSAI
Weijie Cai, George Mason University
Monique Rocca, Colorado State University
Joel Silverman, Colorado State University
Jeff Pedelty, NASA GSFC
Tom Stohlgren, U.S. Geological Survey
John Schnase, NASA GSFC

NASA Goddard Space Flight Center has worked in conjunction with the U.S. Geological Survey to develop invasive plant habitat models through the invasive species forecasting system (ISFS). NASA is now working with the National Park Service to explore the use and usefulness of ISFS and the predictive maps produced for three major park systems: Yellowstone/Tetons, Sequoia/Kings Canyon, and throughout Alaska. The presentation will describe our work to date. A series of interviews were conducted with Park Service personnel and volunteers to develop baseline "expert opinion" maps on areas likely to support the selected invasives. We will present both the expert opinion and ISFS maps as well as the procedure used to generate both; with some specifics on the inclusion of fire disturbance in the ISFS modeling. Areas where the two maps differ will help direct future field samples (stratified between areas where the two agree and areas of disagreement). This field work will allow us to check both maps and allow us to either adjust the ISFS prediction or update the park's opinion of habitat suitability.

Monitoring Resources in the Fremont-Winema National Forest and Yosemite National Park Using Satellite Imagery

Cyrus Hiatt, ARC DEVELOP Student Manager, Earth Science Division, Biospheric Branch, NASA Ames Research Center, Moffett Field, CA
Cindy Schmidt, ARC DEVELOP Coordinator, Earth Science Division, Biospheric Branch, NASA Ames Research Center, Moffett Field, CA
J. W. Skiles, Research Scientist, Earth Science Division, Biospheric Branch, NASA Ames Research Center, Moffett Field, CA

During the last three summers, students with the Human Capital Development Internship Program, called DEVELOP, at NASA Ames Research Center have used remotely sensed data and geographic information systems (GIS) in conducting projects within Fremont-Winema National Forest in Oregon and Yosemite National Park in California. The goal of the projects was to provide resource managers with information to support their decision making tools. In 2004 DEVELOP students applied the FlamMap model to identify regions susceptible to forest fire in the Winema National Forest. The following year students demonstrated the utility of the normalized difference vegetation index (NDVI) and the normalized difference moisture index (NDMI) in conducting change detection in post-fire regions within Yosemite National Park. Most recently in 2006, students correlated negative anomalies in the MODIS-derived leaf area index (LAI) in Yosemite National Park to help identify the location and causes of areas affected by phenomena such as fire and insect infestations. This information will be useful in early identification of future events responsible for diminished forest health.

Using Satellite-based Tree Cover and Impervious Cover Data to Monitor National Parks in the Upper Delaware River Basin

Eric Brown de Colstoun, Senior Scientist, Science Systems and Applications, Inc., Greenbelt, MD
Jessica Robin, Science Systems and Applications, Inc., NASA Goddard Space Flight Center, Greenbelt, MD
Leslie Morlock, GIS Specialist, Delaware Water Gap National Recreation Area, Research and Resource Planning Division, Milford, PA
David Forney, Superintendent, Upper Delaware Scenic and Recreational River, National Park Service, Beach Lake, PA

James Irons, Biospheric Sciences Branch, NASA Goddard Space Flight Center, Greenbelt, MD

We have developed and tested a satellite-based regional land cover/use monitoring protocol. The approach is based on well-established algorithms used with coarse resolution satellite data and uses state-of-the-art processing techniques. Sub-pixel fractions of tree, and bare or impervious cover are derived at the 28.5-m spatial resolution of the Landsat satellite data using air photography and used to detect and monitor land cover changes in and around the Upper Delaware Scenic and Recreational River and Delaware Water Gap National Recreation Area park units, in the tri-state area of Pennsylvania, New York, and New Jersey. A pilot project that examines land cover/use changes at these two parks in the Upper Delaware River Basin from 1984 to 2005 is presented as a demonstration of the protocols. The protocols are aimed at providing the critical tools needed by park managers for effective decision-making on the management and stewardship of the resources they are charged with protecting. The protocols also can help to address some of the immediate needs of the NPS' Inventory and Monitoring Program.

Session 101 • Governors V • Panel discussion

The BLM's National Landscape Conservation System: Opportunities for and Challenges to Conserving Public Lands in the 21st Century

Chair: Mala Malhotra, Project Manager, Outreach/Strategic Planning, National Landscape Conservation System, Bureau of Land Management, Washington, DC

Session abstract:

This panel is an introduction to the BLM's national landscape conservation system (NLCS). This system is responsible for the management of 27 million acres of public lands in 12 western states. Each of its 850-plus conservation areas have been specially designated by congressional act or by presidential proclamation for the protection and conservation of cultural, ecological and/or scientific resources. The NLCS is responsible for the management of BLM's national monuments, national conservation areas, wilderness areas, wilderness study areas, wild and scenic rivers, and national scenic and historic trails, to name a few. Representatives from the American Hiking Society, the Sonoran Institute, and The Wilderness Society will present challenges and opportunities within the NLCS from their varying perspectives. Panelists include: Elena Daly, director of the NLCS; Gregory Miller, president of American Hiking Society; Nina Chambers, director of socioeconomics of the Sonoran Institute; and Wendy Vanasselt, director of the Wilderness Society's campaign for the protection of the NLCS.

Panelists:

Elena Daly, Director, National Landscape Conservation System, Bureau of Land Management, Washington, DC
Wendy Vanasselt, Director of the NLCS Campaign, the Wilderness Society, Washington, DC
Nina Chambers, Socioeconomics Program Manager, Sonoran Institute, Bozeman, MT
Gregory A. Miller, President, American Hiking Society, Washington, DC

Session 102 • State I • Side meeting (open to all)

Ocean Park Stewardship Action Plan

Chairs: Cliff McCreedy, Marine Resource Program Leader, National Park Service, Washington, DC
Gary E. Davis, Visiting Chief Scientist for Ocean Programs, Washington, DC

Session abstract:

The National Park Service has developed an action plan for increasing the servicewide emphasis on conservation of ocean and coastal resources. Various NPS regions have undertaken their own strategies based on the action plan and activities are already underway. This side meeting will bring participants up to date on progress at the national and regional levels and engage them in discussion on NPS ocean priorities.

Session 103 • State II • Invited papers

Interpreting Contested Cultural Heritage

Chair: Robert Fudge, Chief of Interpretation and Education, National Park Service Northeast Region, Philadelphia, PA

Partnerships and New Interpretations of Neglected Native American Stories and Places

Anne Ketz, The 106 Group, St. Paul, MN

Native peoples in North America have been made invisible within Euroamerican society. Their experience on the land has long been poorly understood and their stories have been largely unheard by non-Native ears. However, signs of hope and interpretive opportunities are emerging as the Euroamerican community begins to work with Native people to learn how to collaborate in telling their story—to learn how to better educate an increasingly interested public. A number of different places and projects will be discussed that show how partnerships and collaborative efforts are leading to exciting and meaningful interpretation of places that hold great cultural, historic, archaeological and/or spiritual significance to the Dakota and Ojibwe people. These places include a sacred cave, a Dakota ancestral village, a Mississippi River shoreline rich in archaeological sites, an inner city riverfront, and a 3,000-year-old archaeological site on the shores of a northern Minnesota lake. Each of these projects has experienced their own set of challenges and successes, all of which will be shared and discussed in an open and honest way. Lessons learned while working with the Dakota and Ojibwe can be applied in any place where a formerly dominant society wishes to begin to tell—and sincerely listen to—the story of a traditional people who have been neglected through the effects of colonialism and political domination.

The Ename Charter for the Interpretation of Cultural Heritage Sites: Evolution, Impacts and Opportunities

Suzanne Copping, Assistant Coordinator for Heritage Areas, National Park Service, Washington, DC

Claudia Liuzza, Ename Center for Public Archaeology and Heritage Presentation, Oudenaarde, Belgium

This paper presentation will analyze, five years after its initial elaboration, the Ename Charter for the Interpretation of Cultural Heritage Sites. The charter was first envisioned during scholarly discussions at a conference in Gent, Belgium, in 2002, and drafted by an international editorial committee. In 2004, ICOMOS assumed the review process and in 2006 created the International Committee on Interpretation and Presentation (ICIP) to coordinate and disseminate for review and comment a draft for ratification by the General Assembly in Quebec in 2008. We will detail the broad and substantial structural changes which occurred as various drafts were reviewed and refined, looking also at the reasons for these changes in the broader context of the evolution of the concept of interpretation worldwide. We will also outline some examples of authors and places that have used the principles contained in it for inspiration, and discuss possible future monitoring and research possibilities.

An Ename Charter Perspective on Interpreting the History of the Cane River, Louisiana Region

David Morgan, Chief, Archeology & Collections, National Park Service National Center for Preservation Technology and Training, Natchitoches, LA

Fiona J. L. Handley, AHRC Research Centre for Textile Conservation and Textile Studies, University of Southampton Winchester School of Art, Winchester, United Kingdom

Kevin C. MacDonald, Institute of Archaeology, University College London, London, United Kingdom

The historic sites along Louisiana's Cane River make an excellent case study for the applicability of the Ename Charter. Like many parts of the South, the Cane River's 19th-century wealth derived from the enslaved labor of African Americans. The places associated with this time period form a cornerstone of the area's heritage. Cane River has a long history of historic preservation, and the area is now turning its attention to how its historic resources and the contentious, sensitive issues they represent are interpreted to the public. The Cane River's multi-ethnic population adds a unique dimension to the usual interpretive dilemmas. Stakeholders include descendent groups of white European ancestry, African ancestry, and mixed European, African, and Native American ancestry. This paper will demonstrate how African American and Cane River Creole histories are being discovered, developed, and interpreted to form a sustainable resource

that serves the needs of stakeholders and visitors alike.

Whose Interpretation is It?

Lloyd Masayumptewa (Hopi), Ruins Preservation Project Leader, Flagstaff Area National Monuments, National Park Service, Flagstaff, AZ

Interpretations, how genuine are our interpretations? We see interpretation at various visitor centers and museums and believe all is fact. But could it be wrong or exaggerated? Most interpretation has come from the science field and most of society has taken what science has provided as fact. Here in the Southwest, researchers past and present have made conclusions about past life, behaviors, and artifacts solidifying their interpretation, which, when it becomes public, is sometimes questioned. It is usually affiliated native peoples who question the interpretations of science. Regardless of the fact that additional information can be obtained from living descendents, scientist often disregard this pool of knowledge. As we become more advanced in how we perform research and meticulously examine past life, behavior, and material remains, we still have seemingly not put the same amount of effort into interpreting them. What can we do to correct or modify such inaccuracies?

Session 104 • State III • Workshop

Indicators and Standards for NPS Units in the Great Lakes/Northern Forest Cooperative Ecosystem Studies Unit

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

Session abstract:

Indicators and standards are an important component of contemporary park and outdoor recreation management frameworks, including Limits of Acceptable Change (Stankey et al., 1985) and Visitor Experience and Resource Protection (National Park Service, 1997; Manning, 2001). Indicators are measurable, manageable variables that describe desired resource and experiential conditions. Standards define the minimum acceptable condition of indicators. Research to help formulate indicators and standards has been conducted in a number of a National Park Service units. However, little is known about the degree to which these indicators and standards can be generalized across sites. This workshop will discuss the concept of indicators and standards, describe examples of research to formulate a diverse set of indicators and standards, and explore the potential of a research project to study the degree to which indicators and standards can be generalized across similar sites within the Great Lakes/Northern Forest CESU.

Presenters:

Jerrilyn L Thompson, Research Coordinator, National Park Service, Great Lakes Northern Forest Cooperative Ecosystem Studies Unit, University of Minnesota College of Natural Resources St. Paul, MN

thursday, april 19 • early afternoon concurrent sessions • 1:00–3:05

Session 105 • Minnesota East • Workshop

Delivering Your Message to the Public: Engaging the News Audience through Complex Stories

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

Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, NPS Natural Resource Program Center, Fort Collins, CO

Jackleen de La Harpe, Workshop Coordinator, Portland, OR

Session abstract:

This workshop will match media representatives (e.g., radio and print), including plenary speaker Elizabeth Arnold, formerly of National Public Radio, with a non-journalist (resource manager) to discuss as a team

the nuts and bolts of bringing complex longer stories and issues to the public.

Presenters:
Elizabeth Arnold

Session 106 • Great River I/IV • Panel Discussion
Natural Resource Assessments: Approaches for Evaluating Resource Condition
Chair: William Knight, Director, Center for the State of the Parks, National Parks Conservation Association, Fort Collins, CO

Session abstract:
Parks Canada Agency, the National Parks Conservation Association, and the National Park Service have been collaborating in their efforts to measure and evaluate the integrity of natural systems, and to develop a simplified means of communicating information about trends in the condition of park resources and how our agencies are doing in protecting resources. Panelists will provide an update on the various efforts to assess natural resource condition and ecological integrity, and then lead an interactive discussion with the audience towards developing useful, credible, and affordable assessments of resource condition.

Panelists:
Stephen Woodley, Chief Scientist, Parks Canada Agency, Hull, QC, Canada
Donald McLennan, National Ecosystem Monitoring Biologist, Parks Canada Agency, Hull, QC, Canada
Steven Fancy, National Monitoring Program Leader, National Park Service, Fort Collins, CO
Jeff Albright, Program Manager, Watershed Condition Assessment Program, National Park Service, Fort Collins, CO
William Knight, Director, Center for the State of the Parks, National Parks Conservation Association, Fort Collins, CO

Session 107 • Great River II/III • Invited papers
When Preservation isn't Enough: The Case for Active Management in the NPS (Part 2)
Chair: Karl Brown, Vegetation Mapping Program Manager, NPS NRPC/BRMD, Fort Collins, CO

Managing to Give Nature a Chance
Jerry M. Mitchell, Chief, Biological Resource Management Division, National Park Service, Fort Collins, CO
It is valuable to recognize that there is a potential paradox in management of wild places like national parks—the more we try to preserve what the public expects to enjoy, the more we can be buffering those scenes to the processes that shaped them. Today there are real challenges to keeping the national parks natural. How do you keep the Grand Canyon natural when its lifeblood, the Colorado River, is dammed just outside the park? Unless civilization can be convinced to remove the dam, then management action must be considered to preserve what remains. Consider also the implications of climate change. What will we consider native when migrants seeking the ecosystems for which they are adapted, move onto lands they have never before inhabited? What is important is that we consider the full implications of our management actions and seek to find unique management alternatives that minimize the human fingerprint, but advance the mission of the National Park Service.

Data-driven Decision-making and Management
Mark Wotawa, Ecologist, National Park Service, Fort Collins, CO
Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, NPS Natural Resource Program Center, Fort Collins, CO
Can data collected across the National Park system advance NPS management objectives? The Biological Resources Management Division collects annual status and expenditure data on threatened and endan-

gered species, invasive animals, and species of management concern—the latter must be native to a park and have criteria of self-sustainability established in a management document. The NPS Endangered Species Act database, now eight years old and available in a public form on the NPS website, has demonstrated a steady upswing in the number of federally-listed park populations making progress toward recovery. The expenditures data shows that some high visibility species that have stable park populations getting disproportionate funds. There are two years of data on species of management concern and invasive animals, with the lists for each park getting refined. Over time this information will allow managers to demonstrate progress on organisms that place demands on park personnel and budgets.

Beyond Hunting: Increasing the Options for Effective Wildlife Management in the National Park System

Margaret Wild, Wildlife Veterinarian, NPS Biological Resource Management Division, Fort Collins, CO
Therese Johnson, Biologist, Rocky Mountain National Park, Estes Park CO
Michael Mayer, Environmental Protection Specialist, National Park Service, Environmental Quality Division, Denver, CO
Gary Johnston, Washington Office Liaison, National Park Service, Biological Resource Management Division, Washington, DC

Managing overabundant wildlife species is a challenging resource management issue. Hunting is the principle tool used by state wildlife management agencies to control wildlife populations. However, hunting is not appropriate in all situations, for example on national park lands where not explicitly authorized by Congress. Therefore, unique approaches are necessary to directly manage wildlife populations, or to indirectly mitigate their impacts. A variety of alternatives including sharp-shooting, euthanasia, contraception, predator restoration, relocation, and habitat modification have been discussed as management alternatives. Rocky Mountain National Park considered many of these alternatives in an elk and vegetation management plan and in the process gained insights into the benefits and difficulties associated with proposing unique solutions that go beyond hunting. If hunting is not an authorized or appropriate activity in many NPS units, then work must continue in the biological and social sciences to identify effective and acceptable approaches to provide long-term solutions.

Livestock as Management Tools in National Parks: Challenges and Opportunities

Ben Bobowski, Chief of Resource Management, Grant-Kohrs National Historic Site, Deer Lodge, MT

Herbivory is a natural process that has influenced many of the landscapes that the National Park Service manages. And, managed herbivory, through the use of domestic animals is increasingly a topic of discussion within parks that need to manage vegetation for weed control and wildland fire prevention. In addition, domestic herbivores are also being considered for introduction to restore an ecological disturbance process to a landscape where prescribed fire or native herbivore reintroduction (e.g., bison) is not practicable. This seemingly emerging topic has a rich cultural and scientific history that has successes, failures, and many "lessons learned" that will be shared. Through a discussion of practices at Grant-Kohrs Ranch NHS and the needs at several parks we will explore the utility of livestock as both tools to manage vegetation and as surrogates for native herbivore processes. Finally, we will provide a summary of guidelines to consider before investing in a livestock vegetation management program.

Moderated audience discussion: When do you think active management is appropriate in a national park?

Session 108 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (By invitation only)

Session 109 • Kellogg II • Panel discussion

Relationships and Understanding: The Building Blocks at Jeffers Petroglyphs and Pipestone National Monument

Chair: Thomas Sanders, Site Manager, Jeffers Petroglyphs Historic Site, Comfrey, MN

Session abstract:

Staff and members of the Indian community from two southwestern Minnesota sites will discuss different legacies arising from their approaches to consultation and understanding, institutional arrangements, and joint programs with the Indian and non-Indian communities that have relationship to the sites. At Jeffers Petroglyphs, members of the American Indian community and the Minnesota Historical Society perceived an opportunity to create cultural understanding out of competing interests held by the American Indian community and non-Indian communities. Jeffers Petroglyphs is a living sacred site at which the incorporation of elders as guides, instruction for site staff in Dakota culture, and the development of a site ceremonial use protocol have led to clear procedures, greater respect for American Indian culture, and cooperative efforts by the American Indian and archaeological communities throughout Minnesota to protect sacred sites. Participants will identify difficult elements as well as those that led to success, and discuss ramifications for Dakota and non-Indian communities.

Panelists:

Joe Williams, Elder, Sisseton-Wahpeton Oyate (Dakota), Rosholt, SD
Tom Ross, Upper Sioux Community (Dakota), Jeffers Petroglyphs Historic Site Staff Member, Granite Falls, MN
Thomas Sanders, Site Manager, Jeffers Petroglyphs Historic Site, Comfrey, MN
Gia Wagner, Resource Specialist, Pipestone National Monument, Pipestone, MN

Session 110 • Kellogg III • Workshop

External Review for Interpretive, Educational or Cultural Resource Programs: The Benefits and Challenges

Chairs: Doris Fanelli, Chief, Division of Cultural Resources Management, Independence National Historical Park, Philadelphia, PA
Steve Sitarski, Chief of Division of Interpretation and Visitor Services, Independence National Historical Park, Philadelphia, PA

Session abstract:

This workshop is intended to be an exchange among those who have used the external review process for interpretive, educational or cultural resource programs and those who are considering it. Whether a full site review or a specific project such as an HSR, long-range interpretive plan, or a convened session on a specific conservation topic, all experiences are welcome! We will consider such questions as: how and when have you incorporated external review into your planning and projects? How did the program benefit from the experience? How widely were you able to apply it? Should there be some sort of follow-up to larger reviews that would check on their value to parks? If so, how would you see that process working? Attendees are encouraged to share any products that resulted from the review.

Session 111 • Governors I • Contributed papers

Monitoring and Managing Avian Species

Chair: Steve Windels, Terrestrial Ecologist, Voyageurs National Park, International Falls, MN

Use of Digital Recordings to Supplement Avian Surveys

Skip Ambrose, Wildlife Biologist, Sandhill Company, Castle Valley, UT
Sonya Daw, Wildlife Biologist, ECOS Consulting, Flagstaff, AZ

In 2002, we collected digital audio recordings at one location in Canyonlands National Park where long-term

avian point count surveys were being conducted. The recording system collected high-quality 1-minute digital audio recordings every 5 minutes between 0500 and 0900 throughout the month May. Forty-five species of birds were detected using the audio recordings compared with 11 species detected during 2 days of point count field surveys in the same location. Audio data revealed patterns in the frequency of singing and in species richness, and also in peak vocalization times during the morning. The digital recordings were useful in supplementing species richness information gathered by avian surveys, and by revealing temporal patterns in vocalizations. High quality digital recordings of unusual species may potentially serve as an official voucher of presence, where existing documentation is questionable or inadequate. Digital recordings may be useful for documenting presence of other animals.

Human Dimensions of California Condor Reintroduction

Jim Petterson, Supervisory Wildlife Biologist, Pinnacles National Monument, Paicines, CA
Court Van Tassell, Wildlife Biologist, Field Crew Supervisor, Pinnacles California Condor Recovery Program, Paicines, CA
Denise Louie, Chief, Research and Resource Management, Pinnacles National Monument, Paicines, CA

California condor reintroduction at Pinnacles National Monument, within the central coast 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, fear exists that condors will attract unwanted governmental interference on private lands 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 surrounding lands are a minefield of carcasses possibly ladened with lead bullet fragments. Part of the solution for condor survival relies not just on science, but on the human dimension. Following the successful community outreach program for California condors in Arizona, Pinnacles National Monument is 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.

Population Ecology of Mexican Spotted Owl Prey in Grand Staircase-Escalante National Monument: Top Down or Bottom Up?

David Willey, Research Assistant Professor, Department of Ecology, Montana State University, Bozeman, MT

The paper will describe research focused on ecological drivers of the predator-prey relationships between Mexican spotted owls and associated prey in Grand Staircase Escalante National Monument, Utah. I am tracking the long-term (>10yr) demography of spotted owls and their prey in owl nesting habitat, where the objectives include: monitoring owl territories to estimate occupancy, owl fledging, and describe population dynamics of mammalian prey present within nest areas Utah's canyonlands. From 2000 to 2006 my lab has tracked both owl and prey demography at four owl nest areas. Populations of small mammals present on grids are investigated using mark-release-recapture techniques each summer. A significant drought during the early years of the study, followed by significant years of monsoonal rains provided opportunities to study the affects of climate change on both the owl and its prey. We present results from the first 6 years of work, including information on owl and prey responses to significant climate changes, where rainfall was rare or absent during 2000–2003 and increased significantly during 2004–2006. Abundance of prey was strongly positively associated with the mean monthly rainfall during May–July each year of the study. Spotted owl occupancy rates and fecundity were strongly associated with small mammal densities which appear linearly associated with monthly precipitation, suggesting classical bottom-up ecological control.

Managing Park Habitats for Viable Songbird Populations

Lisa Petit, Chief, Science and Resource Management Division, Cuyahoga Valley National Park, Brecksville, OH
Daniel Petit, Chief, Division of Natural Resources, Cleveland Metroparks, Cleveland, OH
Michael Johnson, Chief of Natural Resource Management, Summit County Metro Parks, Akron, OH

With support from the NPS Park Flight Migratory Bird Program international partnership, we developed models of habitat quality for songbird populations in mature forest and early successional habitats across the 33,000 acres of Cuyahoga Valley National Park in northeastern Ohio. Birds were surveyed using point

counts at 335 randomly selected points in forest and in 124 grassland and old field sites. Presence/absence of bird species was related to vegetation features and landscape measures using logistic regression to create species-specific models of habitat quality. Statistically significant models were created for a number of common species and species of regional or national conservation priority. Models based on specific vegetation and landscape features generally had 70–85% accuracy in predicting the presence/absence of a given bird species. These models have wide-ranging application as decision support for park managers in assessing current and desired future conditions for terrestrial habitats and bird populations.

Biological Integrity and Diversity: Waterfowl and the National Wildlife Refuge System

Anna Pidgorna, Ph.D. Candidate, University of Idaho Environmental Science Program, Moscow, ID

J. Michael Scott, Unit Leader, Idaho Cooperative Fish & Wildlife Research Unit, U.S. Geological Survey, Moscow, ID

Joshua J. Lawler, David H. Smith Conservation Fellow, Oregon State University, Corvallis, OR

The national wildlife refuge system (NWRS) is a network of 545 protected areas designated to manage and protect wildlife. The 1997 NWRS Improvement Act requires the NWRS to be managed in a manner consistent with the preservation of its biological integrity and diversity. We assessed both biological integrity and diversity of 45 waterfowl species on NWRS lands, as waterfowl species have been a priority conservation target for the NWRS. We examined diversity at three scales—national, flyway, and climatic—during each of the three life cycle stages of waterfowl. Assessment of biological integrity included parameters such as the size of refuges, their susceptibility to climate change, and the proximity of refuges to disturbance sites. Preliminary results of this study indicate that the biological diversity of waterfowl species in the U.S. is currently well captured by the NWRS at all the scales at which we analyzed our data.

Session 112 • Governors II • Contributed papers

Protected Areas and Democracy: Participation, Exclusion, Burdens, and Benefits

Chair: David Ostergren, Associate Professor, Northern Arizona University, Flagstaff, AZ

Lessons Learned: Evaluating Socio-cultural and Ecological Effectiveness in National Parks

Joleen Timko, Ph.D. Candidate, Department of Forest Resources Management, Faculty of Forestry, University of British Columbia, Vancouver, BC, Canada

Many national parks have been accused of being either socially unjust or ecologically unsustainable in terms of protecting biological resources within their borders, or both. This presentation focuses on the results of a comparative study carried out in case study national parks in Canada and South Africa. It asked: "are national parks effective at protecting ecological integrity, eliminating exploitation or occupation inimical to their purpose, and taking into account the needs of indigenous people?" To assess whether case study parks were simultaneously effective in both socio-cultural and ecological terms, key criteria within both these realms were evaluated including resolution of land claims, resource access and livelihood opportunities, participation in park governance, biological diversity, ecosystem processes, and threats and stressors. Park specific management objectives were used as indicators for these criteria. Along with the results of the study, this presentation discusses challenges involved in evaluating these two distinct realms of effectiveness.

The Historical Roots of Modern Exclusionary and Paternalistic Protected Area Policies toward Indigenous People

Dennis Martinez, Chair, Indigenous Peoples' Restoration Network, Society for Ecological Restoration International, Douglas City, CA

Nineteenth-century Western colonial paternalistic attitudes toward indigenous peoples are still alive and well in the management policies of modern national parks. Although largely unarticulated and unconscious, these policies nevertheless contribute to cultural genocide plus social dysfunction and disintegration in tribal communities. Environmental injustice occurs when indigenous peoples are denied legal access, equity (co-management), and the capability of practicing traditional management of their resources. Historically rooted in the notion that indigenous peoples are such an integral part of nature (like wildlife) that they cannot

separate themselves from nature, and therefore are not capable of managing nature or themselves—this profoundly mistaken idea has survived to our times as an unconscious justification for their exclusion from protected areas although it is presented as a justifiable conservation measure in a modern world that has turned the 19th-century notion of tribal peoples as wildlife into one in which they threaten wildlife. Both attitudes assumed ecological incompetence.

Protected Areas and Ecological Democracy in Nepal: Towards Community-based Protected Areas Management

Sudeep Jana Thing, Research and Documentation Coordinator, Community Development Organization (CDO), Kathmandu, Nepal

Somat Ghimire, Director, Community Development Organization (CDO), Kathmandu, Nepal

Nepal, a developing country in South Asia, constitutes 18% of its territory as protected areas (PAs). It celebrates rhetorics of participatory conservation despite excessive bureaucratic control and militarization of PAs. However, this paper attempts to demystify the miseries behind the current conservation paradigm and practices in PAs. It presents a glimpse of a grassroots social movement around PAs and reveals struggles of local people living around PAs due to erosion of traditional livelihoods, conflict with conservation authorities and the army, and vulnerability to wild animals. By challenging existing practices of PA management and policies concerning the same, the paper discusses critical issues for restructuring of PA management. It raises debates on environmental justice and ecological democracy in PA management from the perspective of natural resource-dependent tribal and indigenous communities around PAs. The paper finally discusses a proposed model of community-based PA management relevant for South Asia.

Community Perceptions of Wildlife and Protected Areas in Ethiopia

Rob Lilieholm, Associate Professor, School of Forest Resources, University of Maine, Orono, ME

Mekbeb Tessema, Graduate Student, Department of Environment & Society, Utah State University, Logan, UT

Nigel Leader-Williams, Durrell Institute of Conservation and Ecology, University of Kent, United Kingdom

Community perceptions of wildlife and protected areas (PAs) are central to the design, implementation, and management of conservation efforts. In many African countries, conflicts between communities and PAs stem from a lack of understanding of community interests, and policies that deprive or limit the use of wildlife and other resources. To better understand community–PA dynamics, we assessed local community perceptions of wildlife and PA management at four Ethiopian sites. Important factors influencing community attitudes included benefits and services from PAs, relationships with PA staff, levels of education, age, family size, household source of income, number of livestock owned, and frequency of animal predation. Managers can improve community relationships by ensuring a wide range of benefits to local communities, involving communities in PA design and management, honoring local tenure and user rights, and implementing conservation education programs to promote an awareness of the problems and values of wildlife and PAs.

Finding Identity with Cultural Protected Areas: The Vevè of Afa, Palma Soriano, Cuba

Maria Ayub, Graduate Student, Florida International University, Plantation, FL

The community-based project of the Vevè of Afa· in Palma Soriano, Cuba, explores the need of minority religious groups for establishing protected areas that will serve their religious practices, artistic endeavors and ecological awareness in a site of religious significance. The confluence of two rivers, the Yarayabo and the Cauto, in the Sierra Maestra mountains adjacent to the town of Palma Soriano, is a sacred site for the practitioners of Voodoo in this part of the island. The project is similar in scope to the Sacred Grove of Osun, a UNESCO World Heritage Site, in Osogbo, Nigeria. The project has been designated as a protected cultural/ecological community from the Ministry of Culture in Cuba. The presentation will include the given historical, cultural and religious aspects, and how a design concept was applied to arrive at a possible restoration plan for the site.

Session 113 • Governors III • Invited papers

Visitor Impact Monitoring Protocols as Applied to Yosemite National Park

Chairs: Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Session abstract:

Obtaining scientific data on visitor use and related impacts is essential for national park and protected area planners and managers to make informed decisions. The Visitor Experience and Resource Protection (VERP) process provides for the establishment of a visitor use inventory and monitoring program that allows area managers to make adaptive, science-based decisions about the types, levels, locations, and timing of visitor use. Yosemite National Park is in the third year of implementing a VERP monitoring program. A rich set of indicator variables have been developed that reflect visitor use impacts to natural and cultural resources and the quality of visitors' experiences. The park and its cooperators continue to evaluate and refine monitoring protocols. This session will present key indicator monitoring protocols in an effort to share knowledge on how best to measure and monitor visitor use and related impacts in an applied park setting. This session will provide an important avenue for VERP monitoring protocols to be peer-reviewed and undergo critical analysis from the broader national park and research community.

Establishing Water Quality Standards for the Merced and Tuolumne Wild and Scenic Rivers in Yosemite National Park

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

David Clow, Researcher, U.S. Geological Survey

Laura Clor, Physical Science Technician, Yosemite National Park, El Portal, CA

Rachael Peavler, Yosemite National Park, El Portal, CA

Kathryn Warner, Yosemite National Park, El Portal, CA

A central tenant of the Wild and Scenic Rivers Act is "to protect the water quality of such rivers" designated under the act. In the case of the Merced and Tuolumne Rivers in Yosemite National Park, water quality has been noted to be quite good based on sampling conducted over the past 20 years. The park seeks to maintain these conditions by establishing park-specific standards that are far more protective than existing state and federal regulations. Fixed-interval and storm event sampling of nutrients, *E. coli*, and petroleum hydrocarbons as well as measurement of temperature, pH, specific conductivity, and dissolved oxygen has been conducted at a set number of stations over the past two years to establish baseline water quality conditions. Additional work conducted in cooperation with the USGS Water Resources Division focuses on higher resolution storm and spring runoff sampling as well as sampling of waste water residuals such as caffeine. The park will use these data to establish standards as well as a long-term monitoring plan.

Keeping Wildlife Wild: Addressing Human-Wildlife Interactions in Yosemite National Park

Tori Seher, Wildlife Biologist, Yosemite National Park, El Portal, CA

Sherri Lisius, Wildlife Technician, Yosemite National Park, El Portal, CA

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

Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC

Amanda Clark, North Carolina State University, Raleigh, NC

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

The most prevalent way visitors adversely affect wildlife in Yosemite National Park is by purposely feeding animals or leaving food improperly stored. This leads to alteration in the animals' behavior and roles in the ecosystem, as animals exposed to human food continue to seek it out. As part of the Visitor Experience and Resource Protection monitoring program, a "wildlife exposure to human food" indicator has been identified as an important indicator. Data on the availability of human food to wildlife is documented through the park's bear patrol log database (BPLD) during nightly patrols, integrating park operational efficiencies and data collection efforts. During patrols, food storage violations, such as food left inside vehicles or

unlatched food lockers, are recorded in the BPLD. Such existing data is being systematically quantified in order to determine baseline conditions and to help determine the standards and viable management actions. This presentation discusses the progress of this indicator, scientific and practical considerations, and the value and limits of using existing patrol data.

Happy Trails: Combining Natural Resource Preservation and Visitor Use in Yosemite National Park

Crystal Elliot, Vegetation and Restoration Ecologist, Yosemite National Park, El Portal, CA
Judi Weaser, Branch Chief, Vegetation and Ecological Restoration, Yosemite National Park, El Portal, CA
Edward Canapary, Trail Specialist, Yosemite National Park, El Portal, CA
Jim Bacon, Outdoor Recreation Program Manager, Yosemite National Park, El Portal, CA
Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC
Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

The Visitor Experience and Resource Protection (VERP) program in Yosemite National Park is a monitoring framework designed to preserve the park's vast natural and cultural resources while safeguarding visitor enjoyment. Two VERP indicators designed to address both the ecologic and aesthetic effects of intense human use are "extent of non-formal trails" and "condition of formal trails." Monitoring the extent of non-formal trails was accomplished the past three field seasons, with efforts focused in sensitive and heavy-use areas of the Merced and Tuolumne river corridors, such as sub-alpine meadows and riparian zones near developed areas. Comparison of 2004 with 2005 monitoring data and scrutiny of results from mapping efforts revealed unacceptable conditions in some areas, which, consequently, led to management actions to ameliorate impacts. Assessment of the condition of formal trails using a systematic sampling approach was piloted in 2006, and results will assist in prioritization of trail maintenance efforts.

If the Shoe Doesn't Fit, Wear It! Integrating Cultural Resources and Visitor Use Management in Yosemite National Park

Laura Kirn, Branch Chief, Anthropology and Archeology, Yosemite National Park, El Portal, CA
Cindy Norum, Archeologist, Yosemite National Park, El Portal, CA
Crystal Elliot, Vegetation and Restoration Ecologist, Yosemite National Park, El Portal, CA
Jim Bacon, Outdoor Recreation Program Manager, Yosemite National Park, El Portal, CA
Niki S. Nicholas, Chief, Resources Management and Science, Yosemite National Park, El Portal, CA
Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC
Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO

Integrating cultural resource and visitor use management in national parks has been challenging. This is due to the fact that many cultural resources are non-renewable and even the slightest amount of impact from visitor use may be irreparable. The Visitor Experience and Resource Protection (VERP) framework is the Park Service's preferred method for planning and managing visitor use. Establishing indicators and standards for cultural resources, however, has proven difficult for many cultural resource managers. Yosemite National Park is attempting to make new strides in this area by piloting two cultural resource indicators. These indicators focus on assessing visitor use impacts to archeological and ethno-botanical resources. Initial inventorying and monitoring efforts suggest that the VERP framework may be used to address visitor use impacts to cultural resources, though continued work is needed. Results from these pilot efforts and a discussion of their management implications are provided.

Monitoring Visitor Use and Experiential Conditions in Yosemite National Park: A Case Study of Successes and Lessons Learned

Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO
Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC
Jim Bacon, Outdoor Recreation Program Manager, Yosemite National Park, El Portal, CA
Mark Fincher, Yosemite National Park, El Portal, CA

The NPS is challenged to protect both resource and experiential conditions of their units. This challenge is often met through the application of carrying capacity related frameworks such as VERP and LAC. This paper reports on monitoring protocols and results of visitor use and related experiential data collected in Yosemite National Park during the summers of 2004–2006. Experiential indicators included people at one time (PAOT) on the Merced River, at selected attraction sites, and on selected trail segments including the Half Dome cables. Vehicle congestion at selected parking areas in Yosemite Valley was also monitored. Results show the merits and challenges of such data collection efforts and suggest a set of experiential indicators that proved useful for park managers making capacity related decisions in Yosemite National Park.

Session 114 • Governors IV • Invited papers

The NASA/NPS Connection: Parks for Science, Science for Parks (Part 2)

Chair: Anita Davis, Education & Outreach Coordinator, NASA Landsat SSAI, Goddard Space Flight Center, Greenbelt, MD

Mike Story, Physical Scientist, National Park Service NRPC, Denver, CO

Climate Change and the National Park System

Cynthia E. Rosenzweig, Senior Research Scientist, NASA Goddard Institute for Space Studies, New York, NY

Radley M. Horton, Graduate Research Assistant, Goddard Institute for Space Studies, New York, NY

The national park system and the ecosystems it protects are vulnerable to climate change. Our research produces climate change scenario products tailored to individual regions. By identifying the range of various changes by region, these scenarios help national parks personnel to avoid negative climate impacts. One reason to protect the national park system is for its role in reducing climate change impacts. Gateway National Recreation Area serves as a buffer to protect the New York metropolitan area from coastal storms. Our team has been working with Gateway to understand wetlands loss and to prepare for the potential of more intense hurricanes. National parks are an excellent venue for both education and scientific research because they reach a large and inspired audience, and allow scientists to track changes as they occur. We therefore aim to help Park Service employees convey climate change science to the public through provision of climate change scenarios.

Visualizing Yellowstone through an Interactive Kiosk

Fred Watson, Professor, California State University Monterey Bay, Seaside, CA

Thor Anderson, Wendi Newman, Thomas Thein, Simon Cornish, Jordan Plotsky, Susan Alexander, Bob Garrott, P.J. White, Rick Wallen (no affiliations given)

We have developed a variety of landscape modeling and visualization products for Yellowstone National Park in support of visitor interpretation, research, and park management. One such product that we well demonstrate at this meeting is an interactive kiosk that is part of the new Canyon Visitor Education Center in Yellowstone. The kiosk takes visitors on a "virtual interpretive trail" through the Yellowstone landscape. Visitors chose to "fly" from one place to another in a virtual reality setting; stopping at points of interest where they may choose to view relevant video stories. The idea is that the virtual trail recalls a metaphor with a conventional interpretive trail, because it's virtual, it enables the visitor to traverse vast landscapes and whole seasons in just a few seconds. The product at Canyon Village centers on following the annual bison migration cycle, and the life history stories that accompany this journey. It is intended to add informed value to visitors' real experiences with bison in the park. We argue that products of this kind have wide-reaching applications within protected areas throughout the world.

Grand Canyon Fly-through Animation and Grand Canyon Comparison to Valles Marineris on Mars

Andy Pearce, Environmental Education Specialist, Grand Canyon National Park, Grand Canyon, AZ

Rachel Brown, NPS V.I.P. Geologist in the Park Program, Grand Canyon National Park, Grand Canyon, AZ

Christine Johnson, Mars Public Engagement, NASA Jet Propulsion Laboratory, Pasadena, CA

Zareh Gorjian, NASA Jet Propulsion Laboratory, Pasadena, CA

Fly through two canyons in the solar system—the Earth's awe-inspiring Grand Canyon and Valles Marineris on

Mars, the largest known canyon in the solar system. Accompany the creative team at NASA and NPS as they describe their journey in crafting visualizations that bring Earth/Mars comparisons alive for viewers. The presentation will cover how the animation was created using remote-sensing data, as well as how Grand Canyon staff selected the flight path and interpreted Grand Canyon geology in the narration. The presentation will discuss multiple informal education uses for the animations. Of particular focus will be the integration of this animation into the NPS Views Grand Canyon geology module, which will provide multimedia and interactive tools for teachers and students. Finally, the team will discuss ways in which other parks can become engaged in future efforts.

Use of LIDAR Digital Map Atlases in Natural Resources

Brian Witcher, Data Manager, South Florida/Caribbean Network, National Park Service, Miami, FL
Judd Patterson, Research Assistant, Department of Geography, Kansas State University, Manhattan, KS

A partnership between USGS and NASA has employed the EAARL sensor for several National Parks within the South Florida/Caribbean Inventory and Monitoring Network. The NPS used the resulting data to produce sets of LIDAR-derived maps representing both bare-earth and submarine topography for inclusion on a digital map atlas. The maps are further improved by adding contour lines, hill shade for 3D relief, custom color ramp, index map, and coral reef labels. The final map atlas is contained on DVD and can be browsed through an HTML web interface. The map atlas includes PDF maps, ArcMap documents that load from the DVD, as well as raw data. The maps have served in a variety of uses, including habitat mapping, ecological monitoring, change detection, and event assessment.

Urbanization in the Chesapeake Bay Watershed: A Modeling Tool to Support Decision-making for Watershed Management

Claire A. Jantz, Assistant Professor, Department of Geography–Earth Science Shippensburg University, Shippensburg, PA
Scott J. Goetz, Senior Scientist, The Woods Hole Research Center, Falmouth, MA
Peter Claggett, Land Data Manager, CBPO–U.S. Geological Survey, Annapolis, MD

Declining water quality in the Chesapeake Bay is due in part to disruptions in the hydrological system caused by urban and suburban development throughout the 168,000-sq-km watershed. Increases in this impervious surface cover alter the hydrological regime and have a negative impact on water quality, but can have differential effects depending on where and how land use change has occurred. We describe a regional predictive modeling system, based on the SLEUTH cellular automata model, that has been developed to provide regional assessments of future development and explore the potential impacts of different regional management scenarios. We will provide an overview of the model, an assessment of its performance, the results of calibration and spatial predictions, and the relevance of the work in terms of policy formulation and restoration of the bay and its tributaries.

Session 115 • Governors V • Invited papers

Aquatic Non-native Species: An Increasing Problem in the National Park System

Chair: James Tilmant, Fisheries Program Leader, NPS Water Resources Division, Fort Collins, CO

Session abstract:

The effect of non-native aquatic species is pervasive throughout the National Park System and continues to grow in species and area impacted. The prevalence of the problem stems from a history of purposeful legal and illegal introductions, accidental transfer of organisms by commercial and recreational activities, discard or release of organisms from aquaria, and transfer of organisms by wildlife. Although widespread, this issue has received only minor attention compared to concerns for terrestrial exotic species. This session will highlight the magnitude of this issue within the National Park System and increase awareness of invasive aquatic species issues. It will open with a very brief introduction to the overall problem by the session chair, followed by a series of five presentations from different geographical areas, each describing the history, cur-

rent extent, actions taken and future prognosis with regards to non-native aquatic species affecting these areas or parks.

Non-native Species in the Great Lakes

Jay Glase, Great Lakes Area Fishery Biologist, National Park Service / Isle Royale National Park, Houghton, MI
Brenda Moraska-Lafrancios, Aquatic Ecologist, NPS Midwest Regional Office, Marine on St. Croix, MN

Non-native flora and fauna have existed in the Great Lakes Basin since at least the early 1800s. Since then a multitude of species from around the globe have been introduced, both intentionally and unintentionally. Impacts from invasives such as the sea lamprey and zebra mussel have been well documented. Others, such as the spiny waterflea may pose threats due to potential cascading effects through several trophic levels. To date, nearly 140 species have been introduced to the basin, causing extensive ecological and economic impacts in the region. Until recently, only a few Great Lakes Network parks have been noticeably impacted by non-natives, however new species continue to invade the lakes and create increased threats to the parks. Parks have begun working with local Sea Grant institutions, university researchers and other agencies to investigate potential impacts and determine ways to reduce the threat of these unwelcome additions to the Great Lakes.

Non-native Aquatic Species Research, Monitoring and Removal at Point Reyes NS and Golden Gate NRA

Ben Becker, Director, Pacific Coast Science & Learning Center, Point Reyes National Seashore, Point Reyes Station, CA
Darren Fong, Aquatic Ecologist, Golden Gate National Recreation Area, Sausalito, CA
Sarah G. Allen, Senior Science Advisor, Point Reyes National Seashore, Point Reyes Station, CA

Point Reyes National Seashore and Golden Gate National Recreation Area both have marine, nearshore habitats, estuaries, and freshwater systems that are highly invaded. San Francisco Bay (adjacent to the national recreation area) is the "most-invaded" estuary in the world, with over 400 non-native aquatic species, and the proximity of less-invaded estuaries at Point Reyes makes them highly vulnerable to species transported from San Francisco Bay by nearshore currents and by human activities. We will describe a coordinated program of non-native aquatic species monitoring, research, and removal at these two parks with the goal of mitigating the most serious threats and detecting new invaders. We will also present various programs that include research on invasive snails, tunicates, fouling organisms, green crabs, fishes, invertebrates, plants, and algae in collaboration with local universities and organizations. Finally, we will discuss the state of California's new aquatic invasive species management plan and how the NPS may be involved.

Fish Introductions into South Florida National Parks: An Unforeseen Consequence of Restoration

William Loftus, Fisheries Ecologist, USGS, Florida Integrated Science Center, Homestead, FL
Jeffery Kline, Fishery Biologist, Everglades National Park, South Florida Natural Resources Center, Homestead, FL
Kevin Kotun, Supervisory Hydrologist, Everglades National Park, Homestead, FL
Danielle Bamford, Fisheries Biological Technician, Everglades National Park, Homestead, FL
Joel C. Trexler, Florida International University, Department of Biological Sciences, Miami, FL

Non-indigenous fishes are a concern to managers and scientists in south Florida national parks because they adversely affect native wetland communities and impede fulfillment of park-management objectives. By the mid-1980s, seven species of non-indigenous fishes had become established in South Florida parks; from then until 2000, no additional non-indigenous species were found during our studies. Since 2000, we have collected or observed six additional species of introduced fishes in the parks, demonstrating increased colonization of the region. During the same period (since 2000), two native fishes, previously not collected in southern Florida, colonized Everglades National Park from the northern Everglades region. Here we report the identity of those species, the factors aiding the range expansions, the routes of colonization, and discus unanticipated effects of restoration actions. Prevention and early detection are key components in the management of non-indigenous species, because few tools for control are available.

Unintended Consequences: The Continuing Impact of Fish Stocking in Rocky Mountain National Park
Mary Kay Watry, Biologist, Rocky Mountain National Park, Estes Park, CO

Prior to European settlement most of the high-elevation lakes and streams in Rocky Mountain National Park did not contain fish. Fish stocking began in the mid-1800s and continued after park establishment through 1968. The ramifications of these stocking programs result in many current management issues. Native trout no longer exist in their historic habitat because they have been displaced or hybridized by nonnative trout. Fish currently persist in many areas where they were not historically present. A primary issue is simply identifying the distribution of fish species in park waters and the degree of hybridization. A more difficult issue is deciding where and when to restore native fish or historically fishless waters. These issues are compounded by the controversy surrounding chemical techniques for fish restoration and managing a cutthroat trout subspecies that is listed as federally threatened.

Preventing Zebra Mussel *(Dreissena* spp.) Infestation at Lake Powell
Mark Anderson, Aquatic Ecologist, Glen Canyon National Recreation Area, Page, AZ
Jesse Granet, Biologist, Glen Canyon National Recreation Area, Page, AZ

Lake Powell is one of the most likely points of entry for zebra mussels *(Dreissena* spp.) into the Colorado River System. Glen Canyon National Recreation Area has operated a Zebra Mussel Infestation Prevention Program since 2001. The program includes a component to monitor the lake for early detection of infestation and a component to screen for potentially contaminated vessels, through targeted questions at entrance stations. Visitors with vessels that pose a risk of introducing zebra mussels are required to receive a free professional boat washing. Details of the program, its evolution, and results will be discussed. Through this model program, the first of its kind in the western United States, over 100 boats have been washed, and Lake Powell remains free of zebra mussels.

Session 116 • State I • Panel discussion
Renewing Connections to America's Wilderness in a Changing World
Chair: Connie Myers, Director, Arthur Carhart National Wilderness Training Center, Missoula, MT

Session abstract:

Recent studies document that children are gravitating away from outdoor experiences towards a virtual indoor reality resulting in a growing disconnect between children and nature, loss of the health benefits gained from nature-based activity, and potential decline in a supportive constituency for public lands. Studies also show that outdoor experiential learning opportunities, when correlated to classroom curriculum, contribute significantly to health, self-esteem, academics, and social development. What models do we have of successful outdoor experiential learning programs? What makes them successful? Can they be replicated? Should they be replicated? What are the implications of these successful models as the National Park Service launches the interpretation and education renaissance? Panelists will address these questions in an effort to lay a foundation for reconnecting children with their public lands to foster a healthier, more informed, and diverse constituency for all public lands.

Panelists:
Bill Paleck, Superintendent, North Cascades National Park, Sedro-Woolley, WA
Saul Weisberg, Executive Director, North Cascades Institute, Sedro-Woolley, WA
Cicely Muldoon, Deputy Regional Director, NPS Pacific West Region, Oakland, CA
Wyndeth Davis, Servicewide National Education Program Coordinator, National Park Service, Washington, DC
Laurel Boyers, Wilderness Manager, Yosemite National Park, El Portal, CA

Session 117 • State II • Contributed papers

Engaging Youth

Chair: Rebecca Conard, Professor and Director of Public History, Middle Tennessee State University, Murfreesboro, TN

Last Child in the Parks? Age Trends in U.S. National Park Visitation

Jim Gramann, Visiting Chief Social Scientist, National Park Service, College Station, TX
Steve Hollenhorst, Professor, University of Idaho Park Studies Unit, Moscow, ID
Margaret Littlejohn, Social Science Specialist, University of Idaho Park Studies Unit, Moscow, ID
Lena Le, Assistant Coordinator, University of Idaho Park Studies Unit, Moscow, ID

Several authors have argued that today's young people have lost their connection to nature because of protective parents and the distractions of TV and the digital world. This is advanced as one cause of declining visitation to national parks. We examine age trends in national park-going over a 10-year period and compare these with U.S. population trends. Age data come from the NPS Visitor Services Project. The 40 park surveys analyzed recorded the ages of 48,000 visitors in 1994-–95 and 2004–05. In 2004–05, the percent of visitors 16–24 years old was about half that of the U.S. population, but this was also true in 1994–95. No significant trend toward declining participation in this age group was noted. The percent under 16 was nearly identical for both visitors and the U.S. population during the same two periods. These patterns refute recent hypotheses regarding "nature-deficit disorder" and "videophilia."

Using Experiential Learning Opportunities in the National Parks to Inform Science Classroom Practice

Michael Marlow, Associate Professor of Science Education, University of Colorado–Denver, Denver, CO

The University of Colorado at Denver's science education program utilizes numerous national parks as living classrooms. These experiences are academic in nature and generally incorporate inquiry or research components. This paper evaluates how a series of activities and experiences within a national park impact a group of teachers' sense of professional self-efficacy and content understanding resulting in improved classroom practice. The methods used in these experiences include a combination of implicit, informal and formal activities. In some cases we utilize existing park materials and in others we design our own. The paper will describe what determines our choices of park material and what we choose to develop. A combination of the materials has resulted in successful experiences for the teachers. A case study example using Hawaii Volcano National Park will be included in the paper.

Teacher to Ranger to Teacher Program: Making Parks Relevant to a New Audience

Linda Lutz-Ryan, Interpretive Specialist, NPS Intermountain Region, Lakewood, CO
Neil DeJong, Chief of Interpretation and Education, NPS Intermountain, Lakewood, CO
Leslie DuBey, Education Specialist, Big Thicket National Preserve, Kountze, TX
Jacob Fillion, Environmental Education Branch Chief, Grand Canyon National Park, Grand Canyon, AZ

The challenge for the National Park Service (NPS) is providing opportunities for all Americans to connect to their national heritage as embodied by national parks. The Intermountain Region of the NPS Teacher to Ranger to Teacher (TRT) Program focuses on engaging teachers from schools that are not currently being reached with park programs, paying particular attention to ethnically diverse populations. Forty teachers have participated in the program. During their eight weeks as park rangers in a park, they perform various duties, including developing and presenting interpretive programs for the general public and curriculum-based materials for the parks. During the school year, teacher-rangers bring parks into the classroom through curriculum-based activities that draw on their summer's experience. In April, during National Park Week, teacher-rangers wear their NPS uniforms to school, discuss their summer as a park ranger, and engage students and other teachers in activities that relate to America's national parks.

Texas Latino College Student Outdoor Recreation Participation Levels and Natural Resource and Environmental Attitudes

Angelica Lopez, Graduate Student, Texas A&M University, Anderson, TX

Cruz C. Torres, Associate Professor, Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station, TX
Nova J. Silvy, Professor, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX
Roel Lopez, Assistant Professor, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX

Building rapport with emerging stakeholders and understanding differences in stakeholder attitudes is needed for the overall success of natural resource policies and management decisions. The Latino community (76% of Mexican descent) is one of the fastest growing ethnic groups in the U.S. Research on Latino environmental and natural resource attitudes which considers their unique sociocultural characteristics is limited. Additionally, research concerning Latinos of Mexican descent has been overlooked in various states, including Texas, who holds the second largest Latino population in the U.S. The objective of our study was to determine environmental and natural resource attitudes of Texas Latinos of Mexican descent and to compare these with their outdoor recreation participation levels. We surveyed Texas college students (n=635) and determined that acculturation did not have a significant effect on environmental attitudes and outdoor recreation participation. We recommend future research consider using multi-site, mixed-method surveys when working with the Latino population.

Session 118 • State III • Side meeting (by invitation only)
Annual Meeting of the NPS CESU Research Coordinators I
Chair: Gary Willson, Research Coordinator, Great Plains Cooperative Ecosystem Studies Unit, Lincoln, NE

NPS CESU research coordinators, NPS natural resource administrators, and the CESU national coordinator will meet to discuss research programs and administration of the individual CESUs and the CESU national network.

Part one of a two-part side meeting (continues in session #132)

thursday, april 19 • late afternoon concurrent sessions • 3:30–5:35

Session 119 • Minnesota East • Day-capper
Delivering Your Message to the Public: What's the Media Got to Do with It?
Chair: Mike Whatley, Chief, Office of Education & Outreach, NPS Natural Resource Program Center, Fort Collins, CO
Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, NPS Natural Resource Program Center, Fort Collins, CO
Jackleen de La Harpe, Workshop Coordinator, Portland, OR

Session abstract:
This day-capper is a round-table that includes the speaker and panelists from today's plenary and follow-up workshops and will be open to all GWS participants. The group will be presented with a news-breaking event occurring in a park—an event with scientific, cultural, and public safety aspects. The round-table participants will be asked to respond to unfolding events. There would be time for both questions and responses from the audience. Participants will include Elizabeth Arnold and other media presenters as well as at least one superintendent, one resource chief, one public affairs specialist or information officer, one scientist, and one archeologist.

Presenters:
Elizabeth Arnold
Others TBA

Session 120 • Great River I/IV • Workshop

Landscape Dynamics: Monitoring Approaches and Tools for Protected Area Managers

Chair: Donald McLennan, National Ecosystem Monitoring Biologist, Parks Canada Agency, Hull, QC, Canada

Session abstract:

Landscape-scale processes profoundly influence park resources. A key challenge is thus to identify cost-effective ways to identify, evaluate, and communicate the consequences of broad-scale factors such as changes in episodic disturbances, connectivity of habitats, and the flow of materials (pollutants, propagules, etc.) across park boundaries. These attributes may be altered by land use intensification, agricultural or forestry activities, or emission of pollutants. For the past several years, Parks Canada, NPS, and NASA have sponsored coordinated activities focused on the use of remotely sensed data. In aggregate, these projects have developed a broad conceptual foundation for landscape-scale monitoring, new techniques that simplify change detection across a variety of scales, provided operational protocols for evaluating landscape patterns, and developed defensible ways to link monitoring results to management assessments and actions. This workshop will focus on recent collaborative developments in this area, their applications to park management, and on current projects.

Presenters:

John Gross, Ecologist, NPS Inventory and Monitoring Program, Fort Collins, CO
Steven Fancy, National Monitoring Program Leader, National Park Service, Fort Collins, CO
Stephen Woodley, Chief Scientist, Ecological Integrity Branch, Parks Canada, Gatineau, QC, Canada

Session 121 • Great River II/III • Day-capper

Social Dynamics of Yellowstone's Snowmobile Controversy

Chair: John Sacklin, Outdoor Recreation Planner, National Park Service, Yellowstone National Park, WY

Session abstract:

Yellowstone's snowmobile debate has been one of the most visible and enduring NPS controversies. Public debate has centered upon several natural resource issues, and substantial progress has been made in addressing wildlife, air quality, and natural soundscape impacts. Nevertheless, the controversy continues, arguably because less attention has been given to its social dimensions. This day-capper session examines some social drivers of the debate. The session will be organized around three presentations collectively suggesting that resolution of the controversy requires addressing its social dimensions as much as its natural resource concerns. The first talk examines the controversy's history, another summarizes research into the values visitors associate with Yellowstone, and the last discusses NPS efforts to more effectively engage the issue's stakeholders to resolve it. The session will conclude with an open-ended discussion of this information's management implications (some natural resource scientists will also be available to discuss their monitoring efforts).

Snowmobiles in Yellowstone: Contested Landscape, Conflicting Meanings

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

Examining the Yellowstone snowmobile controversy's history and the positions of involved stakeholders reveals that contesting American values and ideas of national park purpose drive the controversy. Originally allowed to satisfy pressure from local communities to accommodate winter use, snowmobile use by the 1980s was well-established, serving as the foundation and identity of local winter economies. Snowmobilers have come to see their machines as icons of freedom, and thus view attempts to restrict park access as infringements of basic American freedoms. Meanwhile, environmentalists have long viewed parks as sacred nature temples, and therefore believe snowmobiles derogate the national park ideal of pristine nature. Yellowstone's primacy as the first national park helps to elevate the debate, as does intense political interest—from both sides of the aisle—in the policy. Such conflicts and visibility suggest that finding a compromise, while difficult, offers the most potentially durable solution.

The Relationship of Visitor Values and Meanings to Support for Yellowstone National Park Management

Wayne Freimund, Professor, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

Mike Patterson, Associate Professor, Department of Society and Conservation, College of Forestry and Conservation, University of Montana, Missoula, MT

Yellowstone National Park has been involved in numerous issues of national importance in the past 25 years. The management of fire, wolf reintroduction, bison and snowmobile access have led to precedent setting policies and managerial actions. This paper will discuss the values visitors associate with Yellowstone National Park and their implications for support of management policies and actions. We will first discuss the relationship between the visitors perceived purpose for the park and how that influenced the support of restrictions on snowmobile use and access. We will examine this support by comparing the values visitors hold for the park relative to the experiences that would like to attain while visiting. In the second half of the talk we will draw on research of wolf watchers to explore the nature of the values associated with this experience emphasizing those values and meaning unique to Yellowstone National Park. We will conclude with a discussion of how these values relate to support for the management of wildlife viewing.

It's All About Communication: Developing Shared Stewardship in the Winter Use Planning Process

Denice Swanke, Outdoor Recreation Planner, National Park Service, Yellowstone National Park, WY

The National Park Service (NPS) is in the process of completing an environmental impact statement (EIS) and rule-making for a long-term winter use management plan for Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway. Successfully doing so will require concerted, meaningful listening and discussion among all interested parties. To further this dialogue's chances of success, park managers explored a variety of public involvement options prior to initiating the EIS. Recognizing the limitations to a collaborative effort in this polarized situation, the NPS hired a private firm—Cadence, Inc.—to design and facilitate the public engagement process between the NPS, cooperating agencies and other stakeholders. Cadence also provides continual advice on the public involvement elements of the EIS and rule-making processes with the goal of effective information sharing with and by the NPS. This talk will summarize the public involvement efforts, successes, and challenges to date.

Session 122 • Kellogg I

National Park Service Midwest Region Superintendents' Conference—Business Meeting (**By invitation only**)

Session 123 • Kellogg II

Dealing with Recreational Impacts on Marine Resources: We're All in the Same Boat

Chair: Cliff McCreedy, Marine Resources Program Leader, NPS Water Resources Division, Washington, DC

Session abstract:

Millions of recreational boaters, anglers and divers seek and experience the beauty of the nation's ocean parks. However, just one careless drop of an anchor, or a boat running aground, can destroy hundreds of years of coral growth and damage other fragile benthic habitats. Intensive recreational fishing can deplete fish stocks and alter marine ecosystems. Fortunately, tools are available to minimize these impacts and restore the natural and recreational values of damaged habitats. This session explores successful approaches to prevention and restoration of marine resource degradation, with an eye toward helping recreational users protect the resources they enjoy. Presentations will cover cooperative fisheries management, educational partnerships, buoys and navigational aids, restoration techniques, monitoring and assessment and other solutions.

A Systematic Approach to Seagrass and Coral Reef Restoration in the National Parks

Joe Carriero, Restoration Project Manager, NPS Environmental Quality Division, Denver, CO

Each year, hundreds of vessel groundings injure seagrass and coral reef resources in our national parks. Selecting the best restoration implementation approach and performing the necessary planning and compliance can be time-consuming and costly. To facilitate and expedite seagrass and coral restoration projects, a team composed of NPS technical experts and scientists from the private sector has developed "toolboxes" of viable restoration methods for use in national parks. From these "toolboxes," site-specific approaches may be selected and restoration plans developed. This presentation will describe the restoration techniques and the typical injury types and site conditions for which they should be used. Several seagrass restoration techniques that have been used successfully will be described, and the costs of implementing these techniques will be discussed.

Managing Visitor Impacts to Coastal and Submerged Resources in Virgin Islands National Park

Ralf H. Boulon, Jr., Chief, Division of Resource Management, Virgin Islands National Park/Coral Reef National Monument, St. John, VI

Approximately one million visitors per year arrive at Virgin Islands National Park and Virgin Islands Coral Reef National Monument via land and sea. Coastal and marine impacts from these visitors include damage to coastal vegetation at beaches and mangrove-lined embayments, coral breakage from snorkelers, and anchor and vessel damage to marine resources. Managers have developed various strategies to reduce or eliminate these impacts, including beach access ramps, regulatory buoys, vessel moorings, and specialized moorings at traditional storm refuge sites. These actions have required innovative approaches to development of appropriate mitigative measures and public involvement to encourage understanding and acceptance. While a decrease in resource damage is immediate and easily observed with some measures, underwater assessment of effectiveness has required establishment of long-term monitoring programs. Many of the measures developed by the park have been utilized by other land management agencies in the U.S. and British Virgin Islands and elsewhere. The challenge in all cases is enabling access to the resource while protecting it in perpetuity.

Addressing Recreational Fisheries in Marine Parks through Interagency Cooperative Fishery Management Plans

James T. Tilmant, Fisheries Program Leader, NPS Water Resources Division, Fort Collins, CO

Recreational fishing at our marine parks is significant and continues to be one of the major causes of altered ecosystem conditions. The need for understanding fishery impacts and undertaking management actions to prevent impairment has long been recognized. However, control of fishing within marine parks is often complicated by state management authorities and resource jurisdictions, both within and outside park boundaries. Fishery resources typically move in and out of a park and unit stocks for effective management often exceed any single jurisdiction. Management of marine park fisheries therefore requires an interagency cooperative approach and broad agreement on management objectives. Cooperative efforts increase understanding of the mandates and desired conditions for all agencies involved and help define common objectives. This paper will discuss current fishery management issues at several parks that lend themselves to a cooperative planning approach and will highlight a cooperative fisheries management plan undertaken at Biscayne National Park.

Managing Recreational Activities in NOAA National Marine Sanctuaries

Brad Barr, Senior Policy Advisor, Office of the Director, NOAA's National Marine, c/o U.S. Geological Survey, Woods Hole, MA

National marine sanctuaries are magnets for diverse recreational users including recreational boaters and fishermen, whale watchers, scuba divers and snorkelers, and surfers. Each activity has some potential to "love to death" the resources targeted by these users. Unlike in most ocean parks, however, many of these recreational activities when added together to permitted commercial extractive uses, compound the potential for adverse impacts. Balancing commercial and recreational use while effectively preserving natural and maritime heritage resources in these sanctuaries is something akin to juggling swords or chainsaws. However,

sanctuary managers have developed some creative and effective, and perhaps not so effective, approaches to achieving this delicate social, political and scientific balancing act, and these will be reviewed and discussed in this presentation.

Marine Education: Charting a Course for Resource Protection

Cliff McCreedy, Marine Resources Program Leader, NPS Water Resources Division, Washington, DC

Hosting 75 million visits per year and generating over $2.5 billion in tourism revenues puts the ocean and coastal parks squarely on the horns of a dilemma: how do park managers provide recreational opportunities while ensuring that visitors use marine resources safely and responsibly? Although enforcement is essential, NPS will never possess enough boats or personnel to ensure compliance without a comparable effort to educate visitors about resource protection. Visitor-focused outreach programs, such as enhanced navigational maps, and techniques for avoiding impacts to fragile resources and disturbance of wildlife, are underway at ocean and coastal parks and national marine sanctuaries. This presentation will review these education and outreach programs for increasing citizen stewardship and reducing impacts on marine resources.

Session 124 • Kellogg III • Panel discussion

Youth Voice and Natural Parks

Chair: Corliss Wilson Outley, Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station, TX

Session abstract:

Today's youth are tomorrow's conservationists, park rangers and interpreters. If we don't instill in them the love of the outdoors at an early age, our national wildlands could be lost. Many of today's youth spend their time in front of the television, developing Myspace pages on the computer, or talking on the phone. This is especially true for youth living in urban cities and minority youth. The long-term disconnect from the natural world can have a significant impact on young children and America's outdoors. This session will examine Youth Voice and the implications of not including today's youth perspectives in future land management planning. Strategies will be presented related to elements of youth voice as a foundation for youth engagement. he issues facing youth today, current research on children and outdoor interactions, and current successful programs that engage youth in the outdoors will also be presented.

Panelists:

Corliss Wilson Outley, Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station, TX

Sonja Wilhelm, Department of Forest Resources, University of Minnesota, St. Paul, MN

Janise LaBoard, Recreation Specialist, Gateway National Recreation Area, Brooklyn, NY

Sam Roberson, Graduate Student, Texas A&M University, College Station, TX

Session 125 • Governors I • Invited papers / Panel discussion

Using Fire as a Restoration Tool: Examples from the Midwest Region

Chair: Kara Paintner, Fire Ecologist, Fire Management Program Center, National Park Service, Fort Collins, CO

Session abstract:

Prescribed fire and mechanical treatment are commonly used ecological restoration tools. Examples from across the Midwest region will be presented this session. Talks include: use of prescribed fire to restore grasslands in national park units of the Northern Great Plains; restoring ponderosa pine forests at Devils Tower National Monument and Mount Rushmore National Memorial using mechanical fuel reduction and prescribed fire; the effect of prescribed fire on herbaceous biotic diversity and cover in upland oak–hickory–pine forests at Ozark National Scenic Riverways; and monitoring restoration of a tallgrass prairie, Indiana Dunes National Lakeshore. The session concludes with a panel of park fire ecologists,

regional and national staff discussing the implementation and monitoring of fire and mechanical restoration treatments.

Use of Prescribed Fire to Restore Grasslands in National Park Units of the Northern Great Plains

Andy Thorstenson, Lead Fire Effects Monitor, Northern Great Plains Fire Management Office, Wind Cave National Park, Hot Springs, SD

Cody Wienk, Fire Ecologist, Northern Great Plains Fire Management Office, Wind Cave National Park, Hot Springs, SD

Invasion of native grasslands by non-native cool-season grass species has altered the vegetative composition of Northern Great Plains grasslands. The National Park Service Fire Ecology Program has established permanent vegetation plots to measure the effect of prescribed fire treatments on grasslands. The occurrence and persistence of native upland sedges *(Carex* spp.) on grassland sites has been observed following prescribed fire. Objectives of these prescribed fires are to reduce cover of non-native cool-season grass species, primarily Kentucky bluegrass *(Poa pratensi*s L.) and smooth brome *(Bromus inermis* Leyss.) and increase cover of native grasses, sedges, and forbs. Areas which had pre-fire populations of native sedge and showed post-fire decreases in non-native grass cover, generally exhibited increased cover of sedges at five years post fire. Monitoring results from five prescribed fires and twelve monitoring plots showed reduction in cover of target non-native grass as well as increases in cover of native forb and graminoid species.

Restoring Ponderosa Pine Forests at Devils Tower National Monument and Mount Rushmore National Memorial Using Mechanical Fuel Reduction and Prescribed Fire

Cody Wienk, Fire Ecologist, Northern Great Plains Fire Management Office, Wind Cave National Park, Hot Springs, SD

Andy Thorstenson, Lead Fire Effects Monitor, Northern Great Plains Fire Management Office, Wind Cave National Park, Hot Springs, SD

Accumulation of ground fuel, along with increases in ladder fuels and tree density has complicated the safe application of prescribed fire to ponderosa pine *(Pinus ponderosa)* forests without first applying a mechanical fuel reduction treatment. A restoration project has recently been completed at Devils Tower National Monument and one is nearly complete at Mount Rushmore National Memorial. Standard NPS *Fire Monitoring Handbook* (FMH) protocols were used at Devils Tower while a simplified monitoring design was implemented at Mount Rushmore. At Devils Tower, an 80-ha unit was mechanically thinned in 2001 and burned in fall of 2005. Pole-sized tree density was reduced from over 1,000 stems/ha to 24 stems/ha. The 46-ha Lafferty Gulch unit at Mount Rushmore was thinned during the summer of 2003 and much of the unit burned in an escaped prescribed fire in March 2006. Pole-sized tree density was reduced from more than 1,100 stems/ha to 90 stems/ha.

Effect of Prescribed Fire on Herbaceous Biotic Diversity and Cover in Upland Oak-Hickory-Pine Forests at Ozark National Scenic Riverway

Dan Swanson, Fire Ecologist, Ozark National Scenic Riverways, Van Buren, MO

Prior to European settlement in the Ozark highlands of Missouri, Native Americans frequently managed the landscape with fire which resulted in open oak-hickory and pine forests. Frequent fires maintained open, park-like forests with very little brush understory. High incident light reaching the forest floor brought high herbaceous cover and diversity. Variability in the fire-free interval allowed the fire-adapted oaks and pines to regenerate, become established, and have a degree of fire resistance to subsequent fires. After European settlement, the fire intervals lengthened, denser closed canopy forests developed, and herbaceous vegetative cover and diversity decreased. This presentation looks at the effect Ozark National Scenic Riverway's fire management program has had on restoring the herbaceous biotic diversity and vegetative cover in three Ozark highland vegetation communities. I will show how two successive prescribed fire treatments have opened up the midstory and brought an increase in ground cover species composition and abundance.

Monitoring Restoration of a Tallgrass Prairie, Indiana Dunes National Lakeshore

Scott Weyenberg, Fire Ecologist, National Park Service, Great Lakes Ecoregion, International Falls, MN

Amy Ortner, Lead Fire Effects Monitor, Indiana Dunes National Lakeshore, Porter IN

Tallgrass prairie restoration is a challenging task of which monitoring plays an important role. Fire is often the main or only treatment for restoration however fire alone may be limited in its effectiveness. Prairie restoration at Indiana Dunes shows truncated progress with fire alone due to the abundance of exotic and invasive species. These species resist fire or prevent it from occurring. A variety of cultural treatments such as mowing, herbicide applications and seeding are being used in conjunction with fire to help control these problem species. Without substantial reductions in these undesirables increases in native species can not be expected. Monitoring the progress by treatment type will help us fine tune restoration efforts.

Concluding Panelists:

Doug Alexander, Regional Fire Management Officer, Midwest Region NPS, Omaha, NE

Dan Swanson, Fire Ecologist, Ozark National Scenic Riverways, Van Buren, MO

Andy Thorstenson, Lead Fire Effects Monitor, Northern Great Plains Fire Management Office, Wind Cave National Park, Hot Springs, SD

Scott Weyenberg, Fire Ecologist, NPS Great Lakes Ecoregion, International Falls, MN

Cody Wienk, Fire Ecologist, Northern Great Plains FMO, Wind Cave NP, Hot Springs, SD

Session 126 • Governors II • Day-capper

When Sustainability is the Treasure

Chair: Delia Clark, Program Director, Center for Place-based Learning and Community Engagement, NPS Conservation Study Institute, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT

Session abstract:

As part of the international effort to work toward a sustainable future, many national parks have made internal commitments to carry out their daily activities through sustainable practices wherever possible. These activities, from adaptive reuse of buildings to alternative energy transportation systems represent an important and exemplary, yet largely unheralded, park story that can serve as an inspirational model for both community partners and visitors. Middlebury College Professor John Elder proclaims, "Adventure is the best starting-point for education and citizenship alike." Based on this premise, Questing offers an approach to creating adventurous treasure hunts that help promote the important homegrown sustainability efforts of today's parks. This day-capper session will treat participants to virtual NPS quests from California to Vermont and engage all in the serious lunacy of developing rhyming riddles and artful treasure maps to share their park's and other protected landscape's sustainability successes.

Session 127 • Governors III • Day-capper

A Workshop to Discuss the Approval Process for National Park Service-Sponsored Public Surveys

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

Session abstract:

Surveys of visitors to national parks (and other stakeholders) are a primary method of conducting social science research in the national parks. NPS-sponsored surveys require approval by the NPS Social Science Program and the federal Office of Management and Budget (OMB). Recent experience with this review process suggests a number of issues that warrant discussion. These issues include the time frame in which this process is conducted, subjects which may be addressed, methodological approaches that can be used, consistency in the review process, and communication about the review process. In addition to these issues, the NPS is preparing a proposal to continue the expedited review process that it has negotiated with OMB. This workshop will focus on the issues outlined above and will be an opportunity for researchers and managers interested in social science in the national parks to comment on the NPS proposal to continue the OMB-approved expedited review process. Representatives of the NPS Social Science Program and invited social science researchers will make initial presentations followed by open discussion.

Session 128 • Governors IV • Day-capper

The Craziest Thing I Ever Saw in Wilderness

Chair: Alan Watson, Research Social Scientist, Aldo Leopold Wilderness Research Scientist, Missoula, MT

Session abstract:

Scientists, managers, and the public are all convinced things are changing so quickly we can hardly keep up. Our protected lands and waters became protected at a particular time in our history and the purposes established for these places reflect that history. As technology changes, as people change their leisure patterns, as pressures on public lands increase, we are constantly exposed to things we hadn't anticipated before. Let's sit down and share some of the things we've seen in the past few years that have surprised us and talk about what managers did or may need to do in reaction to unanticipated demands on wilderness and other wild lands.

Presenters:

Alan Watson, Research Social Scientist, Aldo Leopold Wilderness Research Scientist, Missoula, MT
He Yang, College of Forestry and Conservation, University of Montana, Missoula, MT

Session 129 • Governors V • Panel discussion

Consultation Tales: Four Experiences

Chair: Gerard Baker (Mandan-Hidatsa), Superintendent, Mount Rushmore National Memorial, Keystone, SD

Session abstract:

Four individuals will discuss their experience with consultation, one process by which tribal/First Nations governments interact with federal and state/province entities. Speakers will address why consultation exists, challenges to consultation, and aspects of successful consultation. Gerard Baker (Three Affiliated Tribes of Fort Berthold Reservation) will chair the session, offering NPS experience. Tim Mentz (Standing Rock Sioux) will share extensive experience with cultural resources consultation; Nathalie Gagnon (Algonquin First Nation) will present Parks Canada's effort to educate staff about consultation practices; Glen Livermont will discuss consultation efforts at Pipestone National Monument.

Panelists:

Gerard Baker, Superintendent, Mount Rushmore National Memorial, Keystone, SD (Mandan-Hidatsa)
Tim Mentz, Tribal Historic Preservation Officer, Standing Rock Sioux Tribe, Fort Yates, ND (Standing Rock Sioux Tribe)
Nathalie Gagnon, Senior Analyst, Aboriginal Affairs Secretariat, Parks Canada, Gatineau, QC, Canada (Algonquin First Nation)
Glen Livermont, Chief Ranger, Pipestone National Monument, Pipestone, MN

Session 130 • State I • Day-capper

Building Leadership for the 21st Century in Public Land Agencies

Chair: Brian Kenner, Chief, Natural Resources and Science, Badlands National Park, Interior, SD

Session abstract:

The complexity of issues faced, changes in the workforce, and evolving ideas of leadership require public land management agencies to recognize, just as successful private sector organizations have recognized, that greater investment is needed to develop quality leaders. Quality leaders at all levels of organizations are essential for success in the 21st century. This panel is intended to identify different avenues and options for natural resource professionals to improve their management and leadership skills. There will also be opportunity for attendees to identify skills needed and explore options for participating in existing training or developing new training to meet those needs.

Presenters:
Brian Kenner, Chief, Natural Resources and Science, Badlands National Park, Interior, SD
Kathy Jope, Program Chief, Natural Resources, Pacific West Region, NPS, Seattle, WA
Dan Evak, Director, Executive Programs, Smeal College of Business, Penn State University, University Park, PA

Session 131 • State II •
Wildland/Urban Interface
(SESSION IN DEVELOPMENT)

Session 132 • State III • Side meeting (by invitation only)
Annual Meeting of the NPS CESU Research Coordinators II

Part two of a two-part side meeting. See description under session #118.

friday, april 20 • early morning concurrent sessions • 8:00–10:05

Session 133 • Minnesota East • Invited papers
Research for Management: Paleoecological Baseline Information for Conservation Biology
Chairs: Shinya Sugita, Assistant Professor in Paleoecology, Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN
Diane Larson, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, St. Paul, MN

Session abstract:
Good communication between researchers and resource managers is critical to ensure that natural resources benefit from limited research dollars. In this session, we first discuss the broader issue of communication, then move into the more focused example of the interface between paleoecological research and resource management. Paleoecology provides important baseline information on climate and vegetation change that can be used to establish target conditions for conservation. For example, the openness of the forested areas in northern Europe before the intensification of human impacts 5,000–6,000 years ago is currently a controversial topic. One hypothesis suggesting heavy grazing in the early Holocene has been challenged by several paleoecologists on the basis of fossil pollen data. Management implications are substantial. This session aims to bridge the gap between practitioners of nature conservation and paleoecologists and to discuss implications and applications of paleorecords for resource management using examples from northern Europe and North America.

Using Research to Improve Management: The Two-way Street of Communication
Diane Larson, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, St. Paul, MN
Teresa Woods, Special Assistant to the Regional Director, U.S. Fish and Wildlife Service, Fort Snelling, MN
Anthony Starfield, Professor Emeritus, Department of Ecology, Evolution, and Behavior University of Minnesota (Dallas, TX)
Douglas H. Johnson, Research Statistician, USGS Northern Prairie Wildlife Research Center, St. Paul, MN
Resource managers frequently identify research needs. Researchers develop proposals and conduct studies to address those needs. Unfortunately, the completed research may do little more than gather dust if the research did not exactly hit the manager's target. To improve the chances of conducting research that is relevant to resource management, we have developed a graduate-level course in the Conservation Biology Program at the University of Minnesota in which U.S. Fish and Wildlife Service personnel present resource management problems and graduate students develop proposals for research to address those issues. We have found that the precision with which managers articulate their problem, and the subsequent interaction between researchers and managers, strongly influence the satisfaction managers have with the pro-

posed research. Likewise, complex management problems may require thinking outside the box by researchers, who must adequately explain their reasoning if they are to be taken seriously, and supported, by managers.

Future Maintenance of Biodiversity within the South Swedish Cultural Landscape: Contribution of Palaecological Studies

Marie-José Gaillard, Professor (Botany, Palaeoecology), Department of Biology and Environmental Sciences, University of Kalmar, Kalmar, Sweden

The relationships between biodiversity, landscape features, and ecosystem sustainability are the subject of much ecological research. In this respect, palaeoecology is a powerful tool to help explore the relationships between biodiversity and environmental changes at the local to landscape scale. It is an ideal approach to gain a better understanding of the possible processes and controls on long-term ecosystem variability and trajectories over different temporal and spatial scales. This presentation illustrates a palaeoenvironmental perspective on ecosystem sustainability in showing the results of a few case studies performed in southern Sweden. The overall aim is to infer the factors and processes (natural or human-induced) involved in long-term landscape/vegetation and floristic diversity changes using a range of biostratigraphical data from lake sediments and peat in small deposition basins. We make use of a database of modern pollen assemblages from traditional cultural landscapes in southern Sweden, and of various numerical techniques.

Signals of Landscape Destabilization from Paleoecological Records: Their Relevance to Management of Michigan's Public Lands

Walter Loope, Research Ecologist, USGS, Munising, MI

David Lytle, Director of Forest Conservation Programs, The Nature Conservancy, Ohio Chapter, Dublin OH

Recent paleoecological studies conducted in eastern Upper Michigan have significance for contemporary land management issues. Through pollen and charcoal analyses, former vegetation states, not predicted by contemporary models of plant succession, have been identified. Moreover, these reconstructed states resemble extant, highly altered, "stump prairies" in areas cut over and repeatedly burned in the late 19th century. This work gives managers a window on the potential for type conversion of forest tracts during extremes of temperature and fuel dynamics that have no modern equivalent but may simulate future conditions in a warming world. The dynamics of plant communities of lake-edge coastal dunes, recently linked by studies of intra-dune paleosols to lake-level driven changes in sand supply, may be altered as the Great Lakes respond to changing amounts and periodicity of precipitation. We should expect changes in vegetation patterns in eastern Upper Michigan as anthropogenic climate change accelerates.

Paleoecology for Conservation Biologists and Park Managers in North America

Shinya Sugita, Assistant Professor in Paleoecology, Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN

Climate and other environmental factors change constantly in all spatial and temporal scales. In many parts of North America, anthropogenic impacts on environmental changes after Euro-American settlement are not well known. It is thus hard for managers and policy makers of nature reserves and parks to decide what and where would be worth preserving. Paleoecological records potentially provide baseline information to identify the "moving targets" for nature conservation Compared to European countries, however, application of paleo-records for conservation lags behind in North America. It is also hard to evaluate impacts of native Americans on natural environment pre-settlement (e.g., ca. 1850 AD in the Midwest and 1600 AD in New England) using sediment records. Examples from New England, Southwest, and Midwest elucidate potential and limitations of application of paleo-records for conservation, and future directions of paleoecology as a practical tool for environmental policies and management will be discussed.

Session 134 • Great River I/IV • Panel discussion

The National Park Service Interpretation and Education Renaissance

Chair: David Larsen, National Park Service, Harpers Ferry, WV

Session abstract:

The National Park Service is in the midst of an interpretation and education renaissance—a commitment to build on and evolve existing success, learn, grow, and respond to our changing society. Two watershed documents drive the renaissance: The interpretation and education national program business plan, the first business plan ever developed for an NPS national program area; and the interpretation and education renaissance action plan, a document designed to implement findings from the business plan. Both documents were enthusiastically and unanimously endorsed by the NPS National Leadership Council in August 2006. The business plan details the complexity of recent (past five years) funding, management, and policy history for interpretation and education, identifies gaps between national standards and current practice, and outlines strategies for closing those gaps. The action plan provides five strategic areas of focus, prioritized action steps, funding projections, and policy recommendations for the next five years to catalyze the renaissance. This session will detail findings from the business plan and outline the strategic areas of focus in the action plan.

Panelists:

David Larsen, National Park Service, Harpers Ferry, WV

Julia Washburn, NPS Conservation Study Institute, Takoma Park, MD

Patti Reilly, Director, NPS Northeast Center for Education Services, Boston, Massachusetts

Session 135 • Great River II/III • Invited papers

Sustaining Indigenous Cultures in an Alaska–Canada Border World Heritage Site

Chair: Barbara Cellarius, Cultural Anthropologist / Subsistence Specialist, Wrangell-St. Elias National Park and Preserve, Copper Center, AK

Session abstract:

The Kluane / Wrangell-St. Elias / Glacier Bay / Tatshenshini-Alsek World Heritage Site of 24 million acres encompasses a wilderness of inexpressible grandness. But the World Heritage Site is a complex landscape complete with a human tradition of thousands of years of occupation. This tradition is expressed through multiple cultures including the interior Athabascan Ahtna and Upper Tanana, and the coastal Eyak and Tlingit people. Native people continue to use this protected area and struggle to preserve traditional values in a rapidly changing world. Socio-economic changes have impacted village life making it difficult for elders to teach language and traditional practices. Managers and indigenous people are working together to more fully appreciate this unique collection of special places which sustain all life. Recognizing and honoring the intrinsic connection between culture and place can promote cultural preservation and lead to better management decisions as evidenced by cooperative programs already underway.

Introducing the Kluane / Wrangell-St. Elias / Glacier Bay / Tatshenshini-Alsek World Heritage Site

Vicki Snitzler, Outdoor Planner, Wrangell-St. Elias National Park and Preserve, Copper Center, AK

Peter Levy, Planning Section Head, Smithers, BC, Canada

Bridging the Alaska-Canada border in northern North America is the Kluane / Wrangell-St. Elias / Glacier Bay / Tatshenshini-Alsek World Heritage Site. The site encompasses 24 million acres and is recognized internationally for its outstanding natural values. Initially established in 1979, the site is the largest internationally protected land-based ecosystem on the planet. 1992 and 1994 additions led to its present configuration of four parks. This site is one of 830 recognized under the provisions of UNESCO's 1972 World Heritage Convention. The international program's purpose is to ensure the identification, protection, conservation and presentation of the world's irreplaceable natural and cultural heritage. It includes 644 cultural, 162 natural and 24 mixed properties. This Alaskan-Canadian World Heritage Site is important for a variety of

reasons: promotion of international cooperative management, protection of natural and cultural resources, and preservation of traditional life ways of the indigenous and rural residents of this land.

Healing Broken Connections

Craig McKinnon, Kluane National Park and Reserve, Haines Junction, YT, Canada

When Kluane National Park and Reserve was proposed in 1943, First Nations were excluded from their traditional hunting grounds, but today after an absence from the park of over 50 years, a new program called "Healing Broken Connections" is using traditional knowledge to help reintroduce the Southern Tutchone to the resources of the park. The Southern Tutchone people of this area have a rich culture based on strong ties with the natural world. In addition, the Champagne and Aishihik First Nations and the Kluane First Nation are now recognized as having direct management interests within Kluane National Park and Reserve and are jointly responsible for the management of all natural and cultural resources in their traditional territory.

Return to K'wát' Aaní (Seagull Eggs Land): Restoration of a Native Tradition in Glacier Bay

Kenneth Grant, Management Assistant, Glacier Bay National Park and Preserve, Gustavus, AK

Following the Little Ice Age, Glacier Bay became the "icebox" of the Huna Tlingit people, providing an abundance of edible foods. Among the most prized were seabird eggs gathered from nesting colonies on the bay's recently deglaciated islands. Spring outings involved entire families and served to maintain important cultural ties to food, nature, sacred place, social values, family and ancestors. However, provisions of the 1917 Migratory Bird Treaty Act and enforcement of NPS regulations beginning in the 1950s curtailed and eventually eliminated egging in Glacier Bay. This led to estrangement of the Huna Tlingits from their homeland and tense relations with NPS. Beginning in 1997, in a spirit of healing and cooperation, both groups began to explore ways that egg gathering might resume. Currently NPS and the Huna Tlingit are involved in a legislative environmental impact statement to determine the feasibility of a resumption of Huna Tlingit egg gathering in Glacier Bay.

The Role of Subsistence in Ahtna Village Economies Today

Katherine Martin, Vice President, Ahtna, Inc., Glennallen, AK

Less than 75 years ago the Ahtna people of the Copper River Valley had an economy based on the harvest of natural resources governed by cultural norms and traditional practices. Today villages are adapting by a majority culture that is based on a cash economy. Subsistence harvest of natural resources is still an important part of village life even as cash transactions account for more and more of the economy. The subsistence harvest including fish, big game, and berries accounts for a significant portion of the diet and it is a vehicle for the preservation of cultural practices and traditional values.

Connecting Place and Science: Katie John and the Tanada Creek Fish Weir

Vicki Penwell, Park Ranger Interpretation, Wrangell-St. Elias National Park and Preserve, Slana, AK

Batzulnetas, an Upper Ahtna sockeye salmon fishing village, is located near the confluence of Tanada Creek and the Copper River within Wrangell-St. Elias National Park and Preserve in Alaska. Elder Katie John grew up there. She believes that Ahtna people, salmon, and Batzulnetas are inherently linked and so she filed a law suit against the federal and state government so that she and her family could continue fishing there. The case led to the federal management of fisheries on federal lands in Alaska. Today Katie and residents of Mentasta harvest sockeye salmon at Batzulnetas during an annual culture camp. Since 1997 the park has had a fish weir at Tanada Creek adjacent to Batzulnetas to monitor sockeye salmon. During culture camp researchers, park managers and people from local villages share knowledge and experiences. Through Katie we learn that when connections to place are honored, strong relationships based on trust can evolve benefiting everyone.

Session 136 • Kellogg I • Contributed papers

From the Antiquities Act to Eternity: How Conservation Law Shaped 20th-Century American History

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

The 1906 Antiquities Act in Historical Context

Richard West Sellars, Historian, National Park Service, Santa Fe, NM

The Antiquities Act was one of a number of important preservation and conservation acts passed during the Progressive Era. Congressman John Lacey of Iowa, in whose honor the Antiquities Act is informally named (the "Lacey Act"), was the first member of the U.S. Congress to make conservation and preservation the centerpiece of his political agenda, and his efforts produced results still familiar to Americans. This paper will discuss the background to the Antiquities Act in the context of Lacey's career and interests. The act has had a tremendous impact on the national park system, and this paper will also explore the relationship between the Antiquities Act and the 1916 National Park Service Act.

The Role of Law within the Fabric of United States Archaeology

Hilary Soderland, Faculty Visitor, American Bar Foundation, Seattle, WA

Across the globe, law is the mechanism increasingly relied upon to guide the path of cultural heritage. In the United States, it has been just over a century since the first federal law was enacted to regulate the material remains of the past. This corpus of law governing archaeology has sustained consistency, yet also has witnessed great change. Since law represents a vector of changing social, political, cultural, and ethical mores, it serves as a conduit that captures change. The meaning and inferences ascribed to the archaeological record thus have been influenced continuously by contemporaneous societal values and profoundly shaped by law. By utilizing legislative archival material to examine the history of law's regulation of archaeology, this paper examines the intertwined development of, and integral connection between, the discipline of archaeology and the law. Such an analysis underscores the significance of law in the protection of archaeological heritage.

The 1916 National Park Service Act and Cultural Resources

Richard West Sellars, Historian, National Park Service, Santa Fe, NM

Unlike previous analyses of the historical background to the National Park Service Act (which have focused almost exclusively on the concern for protecting the large national parks), this paper will discuss the role of cultural resource concerns in the act's legislative history. It will discuss not only the cultural resource role in the overall act, but also in the act's all-important "statement of purpose"—to leave the parks "unimpaired for the enjoyment of future generations."

Last Great Wilderness: The Campaign to Establish the Arctic National Wildlife Refuge

Roger Kaye, Wilderness Specialist / Pilot, U.S. Fish and Wildlife Service, Fairbanks, AK

In the early 1950s, three decades before the battle over oil development in the Arctic Refuge began, a group of visionary conservationists launched a campaign to protect northeast Alaska as an archetypal wilderness. This is the story of the transformation of this little-known expanse of mountains, forest, and tundra into a symbolic landscape embodying the ideals and aspirations that led to passage of the Wilderness Act of 1964. It examines the interwoven set of tangible and intangible values—cultural, spiritual, and symbolic—as well as wildlife, ecological, and recreational values that underpinned the campaign. As it traces the beginnings of a landmark conservation unit of unprecedented size and purpose, the story chronicles the evolution of the wilderness concept during a pivotal period of American environmental history. It reveals how the struggle over this distant place was emblematic of the larger contest between competing views of the appropriate relationship between postwar America and its changing environment.

Session 137 • Kellogg II • Side meeting (by invitation only)

Coastal Watershed Condition Assessment Implementation Meeting

Chair: Kristen Keteles, Coastal Watershed Condition Assessment Coordinator, Water Resources Division, National Park Service, Denver, CO

Session abstract:

This side meeting is for park, network, and region staff and any interested stakeholders involved in the coastal watershed condition assessment of Apostle Islands National Lakeshore and Pictured Rocks National Lakeshore.

Session 138 • Kellogg III • Contributed papers

Ecological Restoration

Chair: Mary Foley, Regional Chief Scientist, Northeast Region, National Park Service, Boston, MA

National Park Service CD Workbook for Planning, and Specifications for Ecological Restoration

Wendell Hassell, Plant Materials Specialist, Natural Resource Conservation Service (retired), Arvada, CO
Nancy Dunkle, Revegetation Specialist, National Park Service (retired), Lakewood, CO
David Steensen, Geologist, National Park Service, Lakewood, CO
Sarah Wynn, Revegetation Technical Specialist, National Park Service, Lakewood, CO

This CD workbook was prepared for use by the National Park Service (NPS). Because of the unique environments in many national parks, standards and specifications must frequently be modified. This workbook assembles, links, and organizes planning guidance, planning document outlines, sample scopes of service, construction specifications, and restoration manuals previously used in many different types of NPS revegetation and restoration projects. Standard specifications such as those published by the American Institute of Architects (AIA), the Construction Standards Institute (CSI), and the Federal Highway Administration (FHWA) must frequently be modified for park projects. Reference Manual #77, NPS-77, and the National Park Service Management Policies are referenced for policy guidance. This handbook contains 26 specifications from AIA and CSI, and 27 park packages with specifications associated with past land restoration projects. This document (over 550 pages) uses "object links" for ease of navigation and locating specific subjects. The examples will help improve the efficiency of specification writing and better ecological restoration.

Ecological Restoration Standards and Guidelines for Protected Areas

Mike Wong, Executive Director, Ecological Integrity, Parks Canada, Gatineau, QC, Canada
Don Rivard, Ecological Integrity Branch, Parks Canada, Parks Canada, Gatineau, QC, Canada
Kathie Adare, Ecological Integrity Branch, Parks Canada, Parks Canada, Gatineau, QC, Canada
Stephen McCanny, Ecological Integrity Branch, Parks Canada, Parks Canada, Gatineau, QC, Canada

Ecosystem restoration is a prime responsibility in managing national parks. Such intervention should be done according to a consistent set of standards and guidelines. Parks Canada is developing just such a set of guidelines, not just for its own natural areas, but on behalf of all the provinces and territories of Canada. The guidelines will enunciate an overall approach for setting ecological restoration objectives, prioritizing projects and measuring progress; give specific advice on best practices in the restoration of ecosystem structure and function; and provide guidance on respecting a balance between ecological and commemorative integrity. A small network of practitioners and experts has been created to guide the project and contribute material. It includes representatives of Canadian parks agencies, Aboriginal peoples, the U.S. National Park Service and the Society for Ecological Restoration International. Our intent is a product that can be adapted for use throughout North American protected natural areas.

The Science of Large Dam Removal: Creation of the Elwha Research Consortium

Jerry Freilich, Research & Monitoring Coordinator, Olympic National Park, Port Angeles, WA

One of the grandest ecological restorations of a lifetime will begin in 2009 when the two hydroelectric dams on the Elwha River in Olympic National Park are removed. Five species of salmon will return to waters blocked

to them since 1911. The Elwha dams, the largest ever to be removed, constitute a nearly perfect experiment in dam removal with implications for the value of dam removals as a general conservation strategy. Surprisingly, although $185 million in federal money has been allocated for this project, research and educational funding was not provided. Seeing the urgent need, a group of local partners banded together to create the Elwha Research Consortium. This talk will outline the steps used in bringing together a wide-ranging partnership of universities, agencies, and entities. Together this group successfully competed for National Science Foundation funding in 2005 and has greatly energized a broad program of research into dam removal.

Formation of a Cooperative to Conduct Research on Native Plants and Restore Damaged Ecosystems

Steven Link, Research Professor, Washington State University, Richland, WA

Rico Cruz, Research Scientist, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering, Pendleton, OR

Sally Simmons, Research Scientist, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering, Pendleton, OR

Barbara Harper, Research Scientist, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering, Pendleton, OR

The Confederated Tribes of the Umatilla Indian Reservation and Washington State University are teaming to create a new capacity to address some of society's most difficult natural resource problems in natural areas. These problems include maintaining native plant diversity and combating invasive species. We present recent successes in the development of our Cooperative/Institute for Native Plant Propagation and Research for Ecological Restoration, Native Plant Research, Awareness, Propagation, Uses, and Preservation. We are building greenhouses to propagate native species for restoration and research. Our cooperative will include members of society with an interest in native plant research including land management agencies, Native American groups, commercial greenhouses, nurseries, and ecological restoration contractors among others. We will discuss our experiences forming the cooperative and our local experience collecting native plant seed and growing them in greenhouses. We discuss success controlling invasive species by establishing native bunchgrasses on U.S. Fish and Wildlife lands.

The Development of a Restoration Rapid Assessment Tool

Ron Hiebert, Colorado Plateau CESU, Northern Arizona University, Flagstaff, AZ

Linda Drees, Natural Resource Program Center, National Park Service, Fort Collins, CO

Although U.S. National Park Service areas contain some of the most pristine native ecosystems, they also contain disturbed sites in need of restoration. Some of the areas may not be restorable due to the inability to remove stressors (e.g., dammed rivers). Other sites may be restorable but require differing levels of effort to approach a reference or desired future condition. Disturbed sites also vary as to ecological and social value. The National Park Service desires to direct limited resources towards restoring sites of highest value and those with the highest feasibility of success. Thus, a tool is being developed to rapidly assess the relative site value and restoration feasibility of a group of sites within a park or among a group of parks. A summary of the development process and an overview of possible applications will be presented.

Session 139 • Governors I • Contributed papers

Seeing and Valuing Biodiversity and Nature

Chair: Dorothy Anderson, H.T. Morse Distinguished Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN

The Lords of the Wings: A Quest to Understand the Human Dimensions of Dragonfly-viewing

Harvey Lemelin, Assistant Professor, Lakehead University, School of Outdoor Recreation, Parks & Tourism, Thunder Bay, ON, Canada

One of the struggles of invertebrate research has been to educate humanity about the extraordinary contributions made by insects (i.e., Odonata), while also convincing management agencies and decision-makers to

increase conservation procedures and policies (Losey and Vaughan 2006; Kellert 1993). Participants attending Odonata symposiums (e.g., the Great Lakes Odonata Meeting) may be able to provide us with greater insights into the role of charismatic microfauna in protected area management and interpretation strategies. Literature review, participant observations, and interviews with dragonfly enthusiasts will establish stronger insights into the socio-ecological dimensions of Odonata viewing. This understanding of "dragonfliers" will be enhanced by adopting a perspective grounded in environmental sociology (Dunlap and Jones 2002; Scarce 1999) and natureworks (Fine 2002).

Boston Harbor Islands All Taxa Biodiversity Inventory

Jessica Rykken, Post-doctoral Associate, Museum of Comparative Zoology, Harvard University, Cambridge, MA

The Boston Harbor Islands All Taxa Biodiversity Inventory (ATBI) is a collaborative effort between the Museum of Comparative Zoology at Harvard University and the National Park Service to combine scientific research and public education in an island setting both "wild" and accessible to a large urban community. Primary objectives of the first phase of this ATBI are to: (1) catalogue the insect fauna across the Boston Harbor Islands national park area; (2) engage, educate, and excite the public about biodiversity on a very local scale through outreach and educational activities; and (3) use biodiversity data to inform park resource management. Activities and products such as student research projects, teacher trainings, a publicly accessible data base, state-of-the-art digital images, and public events all contribute to the goal of fostering appreciation for the biodiversity that exists in the "microwilderness" of this very human-influenced landscape.

Sensing the Park: The Park Experience through Sight and Sound

Patricia A. Taylor, Professor, Department of Statistics, University of Wyoming, Laramie, WY
Burke D. Grandjean, University of Wyoming, Laramie, WY
Michael Coburn, Ph.D. Student, Utah State University, Logan, UT

Attempts to affect the park experience of visitors have varied from simple safety concerns, to housing and food, and to the quality of the environment in all areas of the park. A recent intercept survey of visitors to Rocky Mountain National Park asked questions of visitors' experience in the park with respect to sight, sound, smell and touch. While not all the senses equally lend themselves to survey methods, questions on the experience in the park with respect to sight and sound provided some unusual but consistent findings for park managers. Specifically, visitors to the park varied in the experience of sight and sound by season, and by reason for their park visit. Moreover, what visitors did not see or did not hear was equally important. Since soundscape especially may be managed by the park, these findings provide some useful guidance as park managers attempt to increase the satisfaction of visitors with the park experience.

Rethinking Evaluation of Terrestrial Biodiversity Conservation in Protected Areas Systems of Tropical Islands

Suzanne Davis, Ph.D. Student, Department of Geography and Environmental Studies, Wilfrid Laurier University, Waterloo, ON, Canada

A case is made for special attention in the assessment of biodiversity conservation effectiveness in protected areas systems of tropical islands. An island-specific evaluation framework for the effective conservation of terrestrial biodiversity, currently under development, is presented. Critical ecological, management and socio-economic issues are highlighted as the basis for the development of evaluation framework criteria. Field data for the development of this evaluation framework is being collected from two case study islands in the Caribbean, namely Jamaica and the Dominican Republic. A preliminary analysis of field data and information is presented and discussed.

Session 140 • Governors II • Panel discussion

How Do You Manage Your Resources if They are Being Stolen and Sold at the Swap Meet?

Chair: Todd Swain, Special Agent, National Park Service, Twentynine Palms, CA

Session abstract:

Every year a myriad of protected area resources such as plants, artifacts, and wildlife are taken by those seeking commercial gain. This panel session will highlight successful interdisciplinary protection efforts to stop the theft of park resources. The panelists come from law enforcement and resource management and all have worked on poaching and looting cases that were successful due to their interdisciplinary approach. The session will be in four parts: (1) introduction; (2) three case studies (archaeological looting, plant theft, and megafauna poaching; 20 minutes each); (3) discussion of how to reinforce strategies to combat the general problem of theft/poaching (20 minutes); (4) questions, ideas, and discussion with the audience (20 minutes).

Panelists:

Timothy Alley, Special Agent, National Park Service, Luray, VA
Joseph Johns, Assistant U.S. Attorney, U.S. Attorney's Office, Los Angeles, CA
Alice Newton, Botanist, Lake Mead National Recreation Area, Boulder City, NV
Todd Swain, Special Agent, National Park Service, Twentynine Palms, CA

Session 141 • Governors III • Invited papers

Informal (Visitor-Created) Trails: Management and Monitoring Challenges and Solutions

Chair: Jeff Marion, Research Biologist, U.S. Geological Survey, Blacksburg, VA

Session abstract:

The proliferation of informal (visitor-created) trails in protected natural areas can be a vexing management issue for land managers. Formal trail systems never provide access to all locations required by visitors seeking to engage in a variety of appropriate recreational activities. Traveling off-trail is necessary to engage in activities such as nature study, fishing, or camping. Unfortunately management experience reveals that informal trail systems are frequently poorly designed, including "shortest distance" routing with steep grades and alignments parallel to the slope. Such routes are rarely sustainable under heavy traffic and subsequent resource degradation is often severe. Creation of multiple routes to common destinations is another frequent problem, resulting in "avoidable" impacts such as unnecessary vegetation/soil loss and fragmentation of flora/fauna habitats. This session includes five papers that review these problems and present a range of options for managers to consider relative to the management and monitoring of informal trail impacts.

Informal Trail Impacts: Impact Description, Decision Process, and Management

Jeff Marion, Research Biologist, U.S. Geological Survey, Blacksburg, VA

This paper reviews the range of resource impacts associated with informal trail creation, including vegetation trampling, dispersal of non-native plants, soil erosion, fragmentation of flora/fauna habitats, wildlife disturbance, and impacts to water quality. Informal and formal processes for guiding decisions about managing visitor-created trail networks and impacts will be presented. Management decisions should also be guided by area-specific factors such as the type and amount of use and resource resistance. Methods for avoiding and minimizing impacts along informal trails and for closing informal trails will also be highlighted.

The Efficacy of Management Alternatives Designed to Discourage Off-trail Hiking

Logan Park, Ph.D. Candidate, Virginia Tech, Blacksburg, VA
Jeff Marion, Research Biologist, U.S. Geological Survey, Blacksburg, VA

Educational, regulatory, and site management alternatives for discouraging off-trail hiking are presented. Managers often seek to discourage off-trail hiking in areas of high visitation or where resources are particularly fragile or vulnerable. The summit of Acadia National Park's Cadillac Mountain is an example of a site

with high use and fragile resources. The objectives of this study were to evaluate the efficacy of selected management practices applied to encourage visitors to stay on a 0.3-mile paved summit trail. Five management practices were experimentally applied: (1) educational signage, (2) directive signage, (3) reminder signage, (4) personally delivered educational messages with ethical appeals, and (5) fencing along trail margins. Unobtrusive observation was used to test the effectiveness of these management practices for reducing off-trail hiking. Study findings show statistical and substantive differences in the effectiveness of the alternative management practices.

Applying a Spatially Balanced Probability-Based Sampling Design to Locate and Quantify Informal Trails in Rocky Mountain NP

Dave Pettebone, Ph.D. Candidate, Colorado State University, Fort Collins, CO
Peter Newman, Assistant Professor, Department of Natural Resources, Recreation, and Tourism, Colorado State University, Fort Collins, CO
David Theobald, Associate Professor, Department of Natural Resources, Recreation, and Tourism, Colorado State University, Fort Collins, CO

The creation of informal trails by protected area visitors are a park management concern because they cause a variety of impacts, including vegetation and soil loss. Efficient techniques that identify where such impacts occur are needed in order to inform park managers where to focus intensive monitoring and mitigation efforts. This study applied a spatially-balanced probability based sampling design to locate and quantify informal trail proliferation along the Glacier Gorge trail in Rocky Mountain National Park. GPS and GIS technologies were used to collect and analyze informal trail data. Results included spatially explicit maps of informal trail distribution and estimated that 2.2% (12.8 acres) of the study area was impacted by informal trail development. Moreover, analyses identified informal trail "hot-spots" that allow managers to identify and prioritize allocation of resources and management actions.

Methodological Approaches for Monitoring the Number, Lineal Extent, and Condition of Informal Trails

Jeremy Whimpey, Ph.D. Candidate, Virginia Tech, Blacksburg, VA
Jeff Marion, Research Biologist, U.S. Geological Survey, Blacksburg, VA

Protected natural area managers could benefit from the application of protocols that assess and monitor the number, lineal extent, and condition of informal trails. Potential uses include objective evaluations of the nature and extent of impacts to natural resources, establishment and monitoring of standards of quality within carrying capacity decision making frameworks, and evaluating the relative success of actions implemented to minimize informal trail impacts. Many options, ranging from simple condition class evaluations, GPS surveys, trail width and depth measurements, or detailed assessments of soil and vegetation loss are possible. These approaches are described, along with reviews of their utility, advantages, and disadvantages.

Using Indices to Characterize Impacts of Informal Trails: Past Research and Current Development

Yu-Fai Leung, Associate Professor, North Carolina State University, Raleigh, NC

Proliferation of informal (visitor-created) trails is a growing management concern in many protected areas. This problem has recently received more research attention, especially on the issues of sampling and measurement. As monitoring data on informal trails become available, an important research and practical question is how such data can contribute to the problem evaluation with respect to its intensity, spatial extent and distribution, temporal trends. One useful approach to facilitating problem evaluations is through characterization of informal trail impacts using indices that integrate two or more variables. This paper reviews past applications of indices in informal trail evaluation, discusses some of the current ideas, and provides recommendations for future research. Examples from selected national parks will be provided to illustrate the utility and properties of different indices.

Session 142 • Governors IV • Side meeting (open to all)

NPS Fisheries Scientists Meeting

Chairs: Samuel Brenkman, Fisheries Biologist, National Park Service, Olympic National Park, Port Angeles, WA
James Tilmant, Fisheries Program Leader, Water Resources Division, Fort Collins, CO

Session abstract:

Fisheries biologists, aquatic ecologists and others involved in fisheries management from the National Park Service are invited to a special informal session to discuss fisheries issues, management, research, and monitoring in national parks. This open roundtable discussion will allow all in attendance to meet others doing fisheries work within the Service, briefly discuss their respective programs, and learn about the fisheries management programs of other parks. A particular area of interest will be on current challenges in the preservation of native fish that inhabit protected areas. Specific topics will include harvest management in recreational fisheries, non-native fish invasions, and restoration of native fish habitat and populations. The Natural Resource Program Center fisheries staff will also provide an overview of current servicewide issues, program funding opportunities available to parks, and the most recent federal fisheries management initiatives. All resource managers directly involved in fisheries management are encouraged to attend.

Session 143 • Governors V • "Café conversation" workshop

A Socratic Workshop to Explore Marine Reserve Performance Measures

Chair: Gary Davis, Ocean Branch Chief, National Park Service Water Resources Division, Ventura, CA

Session abstract:

Join researchers from the U. S. Geological Survey, National Oceanic and Atmospheric Administration and academia and ocean stewards from the National Park Service, coastal states and territories as they explore new adaptive, ecosystem-based, management approaches to restore and sustain ecological integrity, stability, beauty, and capacity for self-renewal of special ocean places. Fishing has been prohibited in several special areas of the ocean recently. Scientists, resource stewards, economists, and fishers are working together to discover what happens to people and to nature in these special places, and to learn how stewardship can be improved. The focus of this workshop will be on national parks and sanctuaries in Alaska, California, Florida, and the U.S. Virgin Islands, but the concepts are applicable worldwide. Participants will share experiences, describe resource conditions, discuss plans for research and monitoring, and explore potential collaborative programs for the immediate future, including education and outreach.

Presenters:

Jim Taggart, USGS, Alaska Biological Center, Juneau, AK
Matt Patterson, NPS, South Florida and Caribbean Monitoring Network, Palmetto Bay, FL
Caroline Rogers, USGS, Caribbean Field Laboratory, St. John, USVI
Robert Brock, NOAA, Silver Spring, MD

Session 144 • State I • Side meeting (by invitation only)

Exotic Plant Management Team Meeting

Chair: Rita Beard, Invasive Plant Coordinator, NPS, Biological Resources Management Division, Fort Collins, CO

Session abstract:

This is a meeting for members of the Exotic Plant Management Team to discuss, budgets, strategies, coordination, and collaboration.

Session 145 • State II • Workshop

Environmental Communications: Interpreting Complex Natural Resource Issues and Topics

Chair: Mike Whatley, Chief, Office of Education & Outreach, National Park Service, Fort Collins, CO

Session abstract:

Preserving the natural resources in our parks depends on our ability to communicate clearly and effectively with a wide variety of audiences. First and foremost, however, we must be able to communicate results from scientific research and extensive management efforts with all staff including park interpreters, public affairs personnel, and managers. This workshop will emphasize the history and culture of science communication, and the need to develop effective communication and outreach strategies for both internal and external audiences. Participants will review examples of how researchers, managers, interpreters, and other staff worked together to develop integrated communication strategies. Presenters will highlight effective communication tools and products that are available. This workshop will (1) examine the use of interpretive techniques to develop messages and communication products for target audiences in order to help solve complicated natural resource problems, (2) provide an example of how to bridge the gap between resource scientists, interpreters, and the public.

Presenters:

Marcus Koenen, I&M Network Coordinator, National Park Service, Sausalito, CA

Christie Anastasia, Learning Center Education Specialist, Point Reyes National Seashore, Point Reyes Station, CA

Dawn Adams, I&M Coordinator, Point Reyes National Seashore, Point Reyes Station, CA

Sara Melena, Interpretive Specialist, National Park Service, Fort Collins, CO

Session 146 • State III • Panel discussion

Wildlife Habituation: Finding the Middle Ground

Chair: Margaret Wild, Wildlife Veterinarian, National Park Service, Biological Resource Management Division, Fort Collins, CO

Panel moderator: Daniel Decker, Professor, Cornell University, Ithaca, NY

Session abstract:

Habituated wildlife poses an ever-growing challenge to resource managers, particularly on public lands. Habituation is most likely when humans value close approaches to wildlife or when habituation is associated with resource acquisition. In such situations, habituation typically generates costs, usually measured as risk, and benefits for both humans and wildlife. Finding the right middle ground —where wildlife exhibit enough tolerance to persist without compromising human, wildlife, or ecosystem health—is a challenge for managers. Through an anchor presentation we will establish context and terminology to be used when discussing habituation, including the relation between habituation and food conditioning. An interactive discussion between panelists and the audience will follow to explore approaches using identification of objectives and adaptive management to find the right middle ground.

Kickoff presentation:

Wildlife Habituation: Finding the Middle Ground

Colleen Cassady St. Clair, Associate Professor, Department of Biological Sciences, University of Edmonton, Edmonton, AB, Canada

This anchor presentation will establish context and terminology to be used throughout the session, including the relation between habituation and food conditioning. The costs (usually measured as risk) and benefits, for humans and wildlife, of habituation will be addressed. An approach using identification of objectives and adaptive management to find the right middle ground —where wildlife exhibit enough tolerance to persist without compromising human, wildlife, or ecosystem health—will be proposed for discussion.

Panelists:

Colleen Cassady St. Clair, Associate Professor, Department of Biological Sciences, University of Edmonton, Edmonton, AB, Canada

Bruce Connery, Wildlife Biologist, Acadia National Park, Bar Harbor, ME

Peter Dratch, Endangered Species Program Manager, Biological Resources Management Division, NPS, Fort Collins, CO

Jim Schaberl, Wildlife Ecologist, Mount Rainier National Park, Ashford, WA

Harry Zinn, Associate Professor, Pennsylvania State University, University Park, PA

poster, computer demo, and exhibit abstracts

Abstracts are listed alphabetically by the lead author. The number in parentheses following the abstract title denotes the location of the presentation (see chart in the Daily Schedule of Events). A "cd" following the number means that the presentation is a computer demonstration; an "exh" means that it is an exhibit.

Responding to Shrinking Budgets: How to Keep Controlling Invasive Plants with Reduced Funding (#69)

James Akerson, Forest Ecologist, NPS Mid-Atlantic EPMT, Luray, VA

Flat and shrinking budgets have greatly eroded most organizations' ability to manage their resources. As parks reduce staffs and program activities, threats to natural and cultural resources are being neglected. Invasive, exotic plants are expanding to dominate their surroundings. The Mid-Atlantic Exotic Plant Management Team and Shenandoah National Park, with the support of the National Parks Foundation and Tauck Foundation, have formed a short-term volunteer program that provides man-power and a modicum of supplies to address this difficult period. This poster describes the Shenandoah National Park Short-term Volunteer Program and describes its accomplishments and goals for the future. Other means of economy and sufficiency are also described.

Adjusting Sound Levels Near the Noise Floor of Acoustic Monitors (#08)

Skip Ambrose, Wildlife Biologist, Sandhill Company, Castle Valley, UT

Shan Burson, Ecologist, Grand Teton National Park, Moose, WY

Cynthia Lee, Acoustician, Volpe Center, Cambridge, MA

Aaron Hastings, Acoustician, Volpe Center, Cambridge, MA

The National Park Service has conducted acoustic measurements in several national parks in recent years. Sound levels at or near the lower measurement limit of standard acoustic monitors (referred to as "noise floor" and generally 15–18 dBA) were frequently recorded; such data indicate that actual sound levels were below the noise floor. The purpose of this poster is to present options for "adjusting" sound levels near the noise floor of the instruments in order to more accurately determine sound levels. While "adjusted" low sound levels may not meet ANSI/IEC Type 1 standards, such adjusted levels do more accurately reflect real acoustic conditions. Low sound levels (those near the system noise floor) can generally be adjusted to within about 3 dB of actual conditions, and thus offer a better representation of actual conditions than simply reporting data at the noise floor of the instrument.

RLC Goal I: Facilitating Use of Parks for Scientific Inquiry (#76; **second of in a set of six posters on NPS Research Learning Centers**)

Christie Anastasia, Research Learning Center Education Coordinator, Point Reyes National Seashore, Point Reyes, CA

Ben Becker, Director and Research Coordinator, Pacific Coast Science & Learning Center, Point Reyes National Seashore, Point Reyes, CA

Krista Lee, Chemist & Laboratory Manager, Atlantic Research Center, Cape Cod National Seashore, Wellfleet, MA

Mark Adams, GIS & Science Communication Specialist, Atlantic Research Center, Cape Cod National Seashore, Wellfleet, MA

Judy Visty, Research Administrator, Continental Divide Research Learning Center, Rocky Mountain National Park, Estes Park, CO
Jim McKenna, Research Center Coordinator, Schoodic Education and Research Center, Acadia National Park, Bar Harbor, ME

National Parks have been utilizing the model of the Research Learning Centers (RLCs) to shift the National Park Service (NPS) from a consumer of science to an active, welcoming collaborator. While each RLC has a specific focus unique to the needs of the parks it serves, all RLCs facilitate the use of parks for scientific inquiry through a combination of one or more of the following tools: explicitly sharing research opportunity catalogs, providing researcher facilities and/or laboratories, creating strong multi-level partnerships, facilitating funding and/or fellowships, and in all cases, assisting scientists with the logistics of accomplishing research on public lands. In this poster, we present an overview and show examples of the kinds of activities and services undertaken by RLCs to provide parks much needed research about park resources.

Trends, Power and Sample Design: Lessons Learned During Eight Years of Coral Reef Monitoring (#16)

Andrea Atkinson, Quantitative Ecologist, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL
Jeff Miller, NPS South Florida / Caribbean Network, St. John,
Rob Waara, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL
Matt Patterson, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL
Alexandra Wright, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL
Brian Witcher, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL
Kevin R.T. Whelan, National Park Service South Florida/Caribbean Network, Palmetto Bay, FL

The U.S. Geological Survey and National Park Service implemented a pilot protocol in 1999 for monitoring selected coral reef communities and later expanded the monitoring to nine sites in four National Parks within the South Florida / Caribbean Network. The protocol uses annually gathered digital video from 20 permanent, ten meter, randomly-located transects per site. Benthic cover is determined from 250-300 random points placed on images captured from the video. 3–8 years of data from the nine sites are used to re-evaluate the sample design, including sample size per site, use of permanent vs. non-permanent transects, and the addition of new sites to allow park-wide inferences. The ability of the design to detect both trends and sudden changes (i.e. bleaching events) is assessed. This analysis will allow the pilot monitoring phase to transition to an efficient, statistically robust sampling design for long-term coral reef ecosystem monitoring.

Ecological Restoration Projects in Yosemite National Park: Based on Clues from the Past (#38)

Sue Beatty, Ecological Resource Biologist, Yosemite National Park, El Portal, CA
David J. Cooper, Department of Forest, Rangeland and Watershed Stewardship, Colorado State University, Fort Collins, CO

The gathering of data when planning an ecological restoration project can be necessary to help answer the question of "What are we restoring the land to?" This is especially helpful when there are no unimpacted sites to use as a baseline reference. Resource managers in Yosemite National Park have found that establishing ground water monitoring wells, analyzing soil samples, researching historical records, maps, and photos, and looking at fire frequency provides important clues to what ecosystem function was like before the human-caused disturbances changed the system. Results from these investigations have allowed managers to develop the best management practices for restoring disturbed lands in Yosemite. This poster will highlight some of the results of our data gathering efforts for a large floodplain restoration project.

Detectability and Occupancy of Anurans in NPS Units (Apostle Islands and Sleeping Bear Dunes National Lakeshores) of the Western Great Lakes (#44)

Erik Beever, Quantitative Ecologist, NPS Great Lakes Inventory & Monitoring Network, Ashland, WI
George E. Host, Senior Research Associate, Natural Resources Research Institute, University of Minnesota–Duluth, Duluth, MN
William T. Route, Network Coordinator, NPS Great Lakes Inventory & Monitoring Network, Ashland, WI

Occupancy metrics are a currently favored approach for extracting signal from noise in amphibian status and

trends, given that amphibians exhibit: (1) strong interannual variability in population size; and (2) secretive habits, making their detection difficult. We performed repeated surveys of anurans in two national lakeshores using nighttime calling surveys and various daytime methods (e.g., dip-netting, perimeter surveys) during each of three activity periods to estimate detectability and occupancy of several frog species. Nighttime surveys were performed along roads in areas with mapped hydric soils, largely following NAAMP protocols. Nighttime surveys generally allowed for sampling of many more sites/unit-effort, albeit in a road-biased domain. Daytime surveys are the only viable survey technique for remote island areas (e.g., Apostle Islands), except for remote call-recorders. However, logistical hurdles remain for implementing either of these approaches. PRESENCE analyses suggested that spring peepers were most ubiquitously distributed and consistently detected, in contrast to other, less-common species. Ten-minute surveys detected more species than 5-minute surveys in only 7% of surveys, whereas a parabolic reflector detected species undetected by paired naked-ear surveys in 25% of surveys.

Archeological Mentorship Program (#**59**)

Susan Bender, Archeologist, NPS Alaska Regional Office, Anchorage, AK

For three seasons young people from five northwest Alaska villages participated in the Archeological Mentorship Program, funded by a Shared Beringian Heritage Program grant. The Shared Beringian Heritage Program celebrates the exchange of resources and heritage shared by Russia and the United States on both sides of the Bering Strait. The unique Archeological Mentorship program provided training and archeological fieldwork opportunities to teenagers from the villages of Anaktuvuk Pass, Noatak, Kiana, Pt. Hope, and Kotzebue. The students used their training and experiences to create projects of local cultural interest to share with their home communities. Mentors in the program included archeologists from the NPS Alaska Regional Office and several Alaska National Parks.

A Picture is Worth a Billion Years of Geologic History (#**39**)

Callan Bentley, Geology Instructor, Northern Virginia Community College, Annandale, VA
Giselle Mora, Science Education Coordinator, Urban Ecology Research Learning Alliance, Washington, DC

Jargon-free, visual analogies are powerful tools to summarize and illustrate complex geologic stories. For example, we can compare the formation of the Appalachian Mountains to having one iced cake shove up and over another separate iced cake. Using analogies, a Geoscientist-in-Parks volunteer has communicated geologic data of the Chesapeake & Ohio Canal NHP (Maryland and the District of Columbia) to park managers and the public. Geologically speaking, the C&O Canal NHP is one of the most complex national parks in the northeastern U.S. As this narrow park transverses five physiographic regions, its rocks tell the story of the formation of two supercontinents (Rodinia and Pangea) and the opening of two ocean basins (Iapetus and Atlantic). The park also provides a transect across the entire Appalachian Mountain range and a billion years of geologic history. This poster shows the effective use of analogies in explaining the park's complex geologic stories.

Mapping Cheatgrass *(Bromus tectoum)* in North Cascades National Park Complex (#**62**)

Mignonne Bivin, Plant Ecologist, NPS, North Cascades National Park Service Complex, Marblemount, WA
Karen Kopper, North Cascades National Park Service Complex, Marblemount, WA
Regina M. Rochefort, North Cascades National Park Service Complex, Sedro-Woolley, WA

Cheatgrass *(Bromus tectorum)* is highly invasive plant species that has been document to have a variety of disruptive effects on ecosystems. One of the most significant effects of cheatgrass populations is to alter fire severity and frequency in ecosystems in which it becomes established. North Cascades National Park Service Complex plans to introduce prescribed burns on large landscape scale units to provide protection for wildland urban interface for the community of Stehekin and the Park's infrastructure in Hozomeen. Although, cheatgrass was known to occur in these areas, the extent and density of the grass was unknown. In order to develop a management strategy for control or containment of the cheatgrass prior to prescribed burning, a mapping effort began in the 2006 field season. Western Washington University Geography students and park staff developed protocols for mapping. SCAs were hired to begin the mapping effort. This project was supported by Skagit Environmental Endowment Commission and NPS funding.

Hurricane Katrina and Park Employees: Evaluating Inundation by House Address in the City of New Orleans (#**24**)

Gillian Bowser, CESU Liaison, Gulf Coast CESU, National Park Service, College Station, TX
Jung Eun Hung, Graduate Student, College of Architecture, Texas A&M University, College Station, Texas
Darrin Fannin, Computer Specialist, Department of Recreation Park, and Tourism Sciences, Texas A&M University, College Station, Texas
Tomye Ann Foltes, Graduate Student, Department of Recreation Park, and Tourism Sciences, Texas A&M University, College Station, Texas

Hurricane Katrina slammed into the Gulf Coast region and caused one of the nations most devastating natural disasters when the levees around the City of New Orleans failed. Three National Park Units were impacted in the New Orleans area along with additional units impacted along the Gulf Coast path of the storm. From the initial work done for the Incident Management Teams on Katrina on the inundation of employee homes in the Gulf Coast region, the Texas A&M project team is developing tools to predict storm impacts on park resources and employees using census data, environmental variables, and other spatially referenced data sources. These tools will be useful for pre-storm activities and well as assessing probabilities of storm damages to park resources.

The Effects of Fire on Beach Grass *(Ammophila breviligulata)* at Apostle Islands National Lakeshore (#**49**)

Peggy Burkman, Biologist / GIS Specialist, Apostle Islands National Lakeshore, Bayfield, WI

Beach grass *(Ammophila breviligulata)* is found in 7 states in the Midwest Region in Great Lakes Dune and Swale communities present at several National Parks. In early July of 2006 at Apostle Islands National Lakeshore a visitor was lighting fireworks and a small wind driven fire ignited in beach grass. Little is known about how this species responds to fire. Monitoring was completed one and three months post-fire in the burned area and adjacent unburned community. Data collected included area determination; photographic documentation; point line-intercept transects to discern the number of points with vegetation, litter, or sand; and plant height comparisons. Results indicate significant differences between the two areas for the number of points with vegetation, vegetation and litter, or sand only; as well as plant heights. However, beach grass sprouting and rapid height attainment indicate that this species has the ability to successfully regenerate after a fast moving fire.

Many National Parks are Very Quiet and Often Quieter than Conventional Acoustic Instrument Measurement Capabilities (#**09**)

Shan Burson, Ecologist- Soundscape, Grand Teton National Park, Moose, Wyoming
Skip Ambrose, Sandhill Company, Castle Valley, Utah
Cynthia S.Y. Lee, Acoustics Engineer, Volpe National Transportation Systems Center, USDOT, Cambridge, Massachusetts
Aaron Hastings, Acoustics Engineer, Volpe National Transportation Systems Center, USDOT, Cambridge, Massachusetts

Acoustic data have been collected at more than 39 units in the National Park System. Several years ago measurements using special low-noise microphones within the crater at Haleakala National Park indicated that sound levels of natural soundscapes approaching 0 dBA were possible. In fact, instead of this being a uniquely quiet place on earth as was previously thought, recent studies indicate that many other areas within national parks also have natural ambient sound levels lower than can be measured by conventional high-quality instruments (<18 dBA). New research found natural ambient sound levels below 6.5 dBA at Canyonlands, Yellowstone, Grand Teton National Parks, and Natural Bridges National Monument. These very low sound levels lead to two important conclusions. Natural soundscapes are often far quieter than previously suspected, and standard sound level measurements do not adequately represent the lowest sound levels in many areas. Both conclusions have important management implications.

What Do We Know about Oversnow Vehicle Sounds in Yellowstone and Grand Teton National Parks? (#**10**)

Shan Burson, Ecologist- Soundscape, Grand Teton National Park, Moose, Wyoming

Intensive monitoring, modeling, and research the past four years augment knowledge of the impacts of oversnow

vehicles on the natural soundscapes of Yellowstone and Grand Teton National Park. Direct measurements of oversnow vehicle pass-bys, continuous acoustic monitoring throughout the winter, and sophisticated computer modeling estimate the sound levels and percent time audible of snowmobiles and snowcoaches. Summary statistics and acoustic metrics are useful and necessary, but disguise substantial variability in both the natural and non-natural soundscapes. Examples of overall trends and some exceptions are presented for developed areas, travel corridors and backcountry areas. Comparisons between monitoring and modeling are illustrated. Innovative techniques and analyses are shown that "visualize" the parks' soundscapes. Although we now know a great deal about oversnow vehicle sounds, there are still gaps in our understanding that hinder efforts to reduce the impact of winter use activities on the parks' natural soundscape.

Bridging the Gap: Integrating Vital Signs Monitoring and Interpretation at Nez Perce National Historical Park (#**07**)

Alyse Cadez, Education Specialist, Nez Perce National Historical Park, Spalding, ID
Tom Rodhouse, Ecologist, Bend, OR
Jason Lyon, Integrated Resources Manager, Nez Perce National Historical Park, Spalding, ID
Lisa Garrett, NPS Upper Columbia Basin Network Coordinator, Moscow, ID

Nez Perce National Historical Park has teamed up with the Upper Columbia Basin Network Inventory and Monitoring Program to forge new ground integrating vital signs monitoring with park interpretation and public involvement. In 2005 and 2006 we worked with Native American high school students to survey camas lily *(Camassia quamash)*, a plant of both cultural and ecological importance, at the park's historic Weippe Prairie. Camas has been identified as a key park resource and high-priority vital sign and we have used student data to design and test a rigorous camas monitoring protocol. This has provided a fantastic opportunity to bring together two typically disparate NPS programs. Our poster will detail this successful program and our plans for the future. We believe this example provides a transferable model not only to other monitoring efforts within the Upper Columbia Basin Network but to other parks and networks across the country.

Mercury Deposition, Transport, and Bioaccumulation in Rocky Mountain National Park (#**45**)

Donald Campbell, Research Hydrologist, U.S. Geological Survey, Colorado Water Science Center, Lakewood, CO
M.A. Mast, U.S. Geological Survey, Lakewood, CO
G.P. Ingersoll, U.S. Geological Survey, Lakewood, CO
D.W. Clow, U.S. Geological Survey, Lakewood, CO
C. Kennedy, U.S. Fish and Wildlife Service, Lakewood, CO
B. Rosenlund, U.S. Fish and Wildlife Service, Lakewood, CO

Mercury (Hg) deposition, transport, and fate are being studied in Rocky Mountain National Park. Atmospheric wet deposition Hg is moderately high (6–10 $\mu g\ m^{-2}\ y^{-1}$) at high elevations of Colorado. In the alpine watershed of Andrews Creek, export of Hg was less than 20% of deposition, indicating that most of the Hg is accumulating in the ecosystem. Concentrations of Hg were measured in fish tissue collected from 15 lakes and streams in the park. None of the trout had Hg concentrations exceeding the EPA guideline for human consumption of fish (0.3 ppm wet weight), indicating that conditions in these alpine and subalpine watersheds generally do not promote bioaccumulation of Hg in fish. On-going studies aim for better understanding of processes controlling methylation and bioaccumulation in high elevation ecosystems. Interactions between potential future changes in Hg deposition, nutrient deposition, and climate in mountain environments are also being considered.

Squares in the Woods: Lessons in Eastern Forest Monitoring Program Design from Shenandoah National Park (#**43**)

Wendy Cass, Botanist, Shenandoah National Park, Luray, VA

Shenandoah National Park has spent the last seventeen years developing a long-term forest vegetation monitoring program. Throughout this time, the program has experienced challenges that were unforeseen during the design process. Most notable among these challenges are implementation of a field protocol that was too labor intensive, and collection of data that did not yield sufficient statistical power to detect forest changes

of interest. This presentation will use the Shenandoah experience as an example to discuss ways to gather meaningful data about forest change within existing funding and time constraints. Discussion will cover challenges of sampling in diverse Eastern forest vegetation communities, and highlight project design and field sampling changes used by Shenandoah that streamlined data collection. We will tour the program design from inception, initial implementation, re-evaluation, design changes, and revised implementation, and discuss the lessons learned and degree of success achieved by the new design and sampling protocol.

Midwest Natural Resources Group: Multi-agency Collaboration to Address Terrestrial Invasive Species in the Great Lakes Basin (**#41**)

Carmen Chapin, Coordinator, Great Lakes Exotic Plant Management Team, National Park Service, Ashland, WI

The Midwest Natural Resources Group (MNRG) is a voluntary partnership that provides a forum for Federal agency senior executives to coordinate activities in the Midwest, including the Upper Mississippi River, Missouri River, Ohio River and the Great Lakes watersheds. At their meeting in November 2005, the MNRG undertook development of an Action Plan to address terrestrial invasive species in the Great Lakes Basin. Staff from the member agencies developed a draft action plan that contained recommendations in nine areas: Leadership & Coordination; Prevention; Early Detection & Rapid Response; Control & Management; Restoration; Cooperation; Research; Data Management; and Education & Public Awareness. The group has compared the action plan's recommendations with each agency's priorities and developed a consensus of initial priorities to pursue.

The U.S. Geological Survey: Science for a Changing World (**exh**)

Colleen Charles and Janet Cushing, U.S. Geological Survey, Reston, VA

The exhibit highlights the mission and recent activities of the Biological Resources Discipline of USGS, the country's largest water, earth, and biological science, and civilian mapping agency.

Note: This exhibit will be displayed in the lower-level foyer near the Registration Desk.

National Park Service Geologic Resource Evaluation: Geology Isn't Just for Scenery Anymore (**#54**)

Tim Connors, Geologist, National Park Service, Geologic Resources Division, Denver, CO
Bruce Heise, National Park Service, Geologic Resources Division, Denver, CO

The National Park Service (NPS) Geologic Resource Evaluation (GRE) Program is a systematic approach to gather and disseminate useful digital geologic information to support natural resource management in some 270 NPS units with "significant" natural resources. This involves documenting the features, issues and processes specific to that park and to make a "crosswalk" between a digital geologic map and these features, issues and processes. Numerous steps are involved in completing a park's GRE including conducting scoping meetings, assembling geologic bibliographies of all known applicable references, producing digital geologic maps (bedrock, surficial, abandoned mines, caves, coastal features, etc.), and then assembling all of this information into a usable database. Many cooperators are active in the entire process (federal, state, academic, private etc.)and contribute at various levels from educating park management on geologic resource issues to actually producing geologic field maps. The end result of this multi-faceted cooperation is better stewardship of geologic resources in NPS areas for the enjoyment of future generations.

Sharing a World of Resources: Incorporating Science Content in Effective Interpretation (**#63**)

Anita Davis, Landsat Education and Outreach Lead, SSAI at NASA Goddard Space Flight Center, Greenbelt, MD
Ruth Paglierani, Coordinator of Public Programs, NASA, University of California–Berkeley, Berkeley CA

Incorporating science content in presentation of resource issues to the public is essential for effective interpretation. Science professionals are eager to share their work; interpreters are equally eager to learn about relevant science. Yet, interpreting science and resource issues remains a challenge. Professional development for interpreters is critical to effectively address this challenge. This poster describes a proven model for integrating science into interpretation: the NPS-NASA Earth to Sky Institutes. These institutes resulted in the creation of a variety of products using science in dynamic interpretation at many National Parks. We highlight the methodology of the Earth to Sky Institutes, and share strategies of successful training including authentic work time, opportunity for reflection, and the creation of a resource-rich learning environment.

Behavioral Responses of Wildlife to Snowmobiles and Coaches in Yellowstone National Park (#20)

Troy Davis, Biological Technician, Yellowstone National Park, Yellowstone National Park, WY
P.J. White, Yellowstone Center for Resources, Yellowstone National Park, WY
John J. Borkowski, Montana State University, Bozeman, MT
Robert A. Garrott, Montana State University, Bozeman, MT
Daniel P. Reinhart, Resource Management and Visitor Protection Division, Yellowstone National Park, Yellowstone National Park, WY
D. Craig McClure, Resource Management and Visitor Protection Division, Yellowstone National Park, Yellowstone National Park, WY

Managers of Yellowstone National Park are charged with protecting some of our nation's most important natural resources while simultaneously providing for their use by visitors. To better understand the effects of motorized winter recreation on wildlife in Yellowstone, we sampled more than 5000 interactions between groups of wildlife and groups of over snow vehicles (OSVs) and used multinomial logits models, odds ratios, and predicted probabilities to identify conditions leading to behavioral responses. Wildlife in Yellowstone has used the same core winter ranges during the past three decades despite large winter-to-winter variability in cumulative exposure to OSVs, and we found no evidence that OSV use has adversely affected the demography or population dynamics of studied species. However, differing interpretations of the behavioral and physiological response data will continue to exist because of the diverse and sometimes conflicting values held by the many constituencies invested in Yellowstone's future.

Successful Intra-Agency Partnership to Efficiently Control Non-Native Plant Invasions at Assateague Island National Seashore (#70)

Ron Dean, Supervisory Exotic Plant Specialist, National Park Service, Washington, DC
Jonathan Chase, Biological Science Technician (Plants), Assateague Island National Seashore, Berlin, MD
Mark Sturm, Resource Manager, Assateague Island National Seashore, Berlin, MD

Assateague Island National Seashore (ASIS) encompasses some 48,000 acres of coastal habitat. The island has been influenced by human activities for some 400 years including the presence of a wild horse population which remains today. These factors produce a unique assemblage of flora and fauna. Additionally, the island is increasingly important as a refuge for many endangered and threatened species due to local development. Compounding this threat is the introduction of invasive non-native plant species. In 2005, ASIS requested assistance from the NPS's Exotic Plant Management Teams (EPMT) to help combat this threat. After two years of partnering and sharing of resources, the park, the Northeast Region and National Capitol Region EPMTs have reduced many populations of these invasive species to manageable levels. This presentation will show that such partnering is successful and serves as an example to neighboring land-management entities to better manage these invasions on a landscape scale.

Kolob Fire Burned Area Restoration, Zion National Park (#21)

Cheryl Decker, Vegetation Management Specialist, Zion National Park, Springdale, UT
Kelly Fuhrmann, Fire Ecologist, Zion National Park, Springdale, UT

The Kolob Fire was the largest wildland fire in Zion National Park's recorded history. It altered the landscape and created a vegetation type conversion scenario on over 10,000 acres of national park land. Planned rehabilitation efforts will be vital to restoring the burned area. A major concern from the fire's impacts was the loss of native vegetation and its replacement by non-native species, especially cheatgrass. A regional Burned Area Emergency Rehabilitation Team (BAER) assessed damage and made recommendations. Rehabilitation efforts include replacement of burned boundary fence, use of herbicide to prevent large-scale establishment of cheatgrass (based on information from a Joint Fire Science research project implemented in Zion Canyon), re-establish native plant species through seeding and monitoring of treatment effectiveness. This poster will take you from assessment and planning of the treatment to implementation and monitoring of the largest herbicide application in the park's history.

Monitoring Landscape Integrity of National Parks: Influence of Ecological Succession, Management Practices, and Urbanization (#67)

Tulia Defex, Ph.D. Student, Texas A&M University, College Station, TX
William E. Grant, Professor, Texas A&M University, College Station, TX
Roel Lopez, Professor, Texas A&M University, College Station, TX
Dusty Perkins, Network Coordinator, Southern Plains Network National Park Service, Johnson City, TX

To better understand the condition and health of our national parks, the National Park Service initiated an inventory and monitoring program (I&M) in the early 1990s. One of the major goals of this program is to conduct long-term monitoring for key indicators of ecological health. This program organized all parks with significant natural resources into 32 networks based on proximity and ecological similarity. The Southern Plains Network (SOPN) is composed of 11 parks in Colorado, New Mexico, Oklahoma, Kansas, and Texas. One of the key ecological indicators for the SOPN is the landscape mosaic in and adjacent to the parks. Towards developing a protocol for monitoring landscape dynamics over time, we propose the application of a flexible methodology, which allows the synthesis of both categorical and numerical data into a single composite index (CI) of the condition of the landscape of interest (LOI).

Preventing Introduction of Non-native Weeds and Resource Damage During Construction in Yosemite National Park (#22)

Denise Della Santina, Vegetation and Restoration Ecologist, Yosemite National Park, El Portal, CA
Victor Goldman, Resource Monitor, Yosemite National Park, El Portal, CA

Resource managers at Yosemite National Park initiated a program to inspect heavy equipment used for reconstruction of flood damaged utility lines, roads, and employee housing in Yosemite Valley. These construction projects brought large numbers of heavy construction equipment such as loaders, excavators, and backhoes into the Park from other environments throughout California and other States. Unfortunately, there was a high risk that this heavy equipment carried invasive non-native seeds in the dirt found on its tires, tracks, and buckets. Therefore, an inspection program was initiated to enforce the contract specifications which required construction equipment to be cleaned before entering the park. This successful program was managed by a project-funded resource monitor to ensure that natural resources were protected during construction. The resource monitor was also present at the various job sites to ensure that resource protection guidelines were followed and that unexpected impacts were recognized and mitigated as soon as possible.

Stewardship Begins with People: An Atlas of Places, People & Hand-Made Products (#84)

Rolf Diamant, Superintendent, Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT
Nora J. Mitchell, Director, Conservation Study Institute, NPS, Woodstock, VT

Stewardship Begins with People: An Atlas of Places, People & Hand-Made Products, published by the NPS Conservation Study Institute and Eastern National, is a guide to the work of friends and neighbors of national parks, heritage areas, and national historic landmarks who are practicing a stewardship ethic and a commitment to sustainability. Their work, and the food and craft products they make, contribute to the preservation of authentic traditional cultures and important landscapes. These stories are gathered from more than two dozen national park areas, from Blue Ridge Mountains to the Hawaiian Islands. At first glance this national park "atlas" may appear to be a little different from its more conventional map-oriented cousins. Like all atlases, however, it will help us to understand the geography of special places, local foods, and authentic crafts and gain a deeper appreciation of the powerful but at-risk relationship between people and land. Complimentary copies will be available.

Integrated Pest Management: Science Based Solutions to Reduce Risks and Maintain Resource Integrity (#30)

Carol DiSalvo, Biologist/ Integrated Pest Management Coordinator, National Park Service, Washington, DC
Bruce Badzik, IPM Coordinator, Golden Gate National Recreation Area, San Francisco, CA
Craig Hauke, IPM Coordinator, Colorado Plateau Cluster NPS, Canyonlands National Park, Moab, UT
Jill Swearingen, IPM Coordinator, National Capital Region, NPS, Washington,
Gerald McCrea, IPM Coordinator, Intermountain Regional Office, NPS, Santa Fe, NM

Erv Gasser, IPM Coordinator, Columbia Cascade & Pacific Great Basin Clusters, NPS, Seattle, WA
Wayne Millington, IPM Coordinator, Northeast Region, NPS, University Park, PA
Steve Anderson, IPM Coordinator, Pacific Islands Cluster, NPS, Haleakala National Park, Makawao, HI
Steve Cinnamon, IPM Coordinator, Midwest Region, NPS, Omaha, NE
Denise Klein, IPM /Archives Technician, Midwest Region, NPS, Omaha, NE
Chris Furqueron, IPM Coordinator, Southeast Region, NPS, Atlanta, GA
Pat Owen, IPM Coordinator, Alaska Region, NPS, Denali Park, AK
Michelle Carter, Biological Technician, Antietam National Battlefield, Sharpsburg, MD
The National Park Service uses Integrated Pest Management (IPM) to reduce risks to people, resources, and the environment from pests and pest related management strategies. The National Park Service uses an 11-step process to develop solutions to pest problems. This process is effective for any pest situation. Through planning and consensus building the IPM process ensures decision-makers, technical experts, and site users are engaged to understand specific site management goals. Implementation involves pest prevention, detection, monitoring, setting action thresholds, management and education. Resource integrity and ecosystem process are protected through this approach. All federal agencies are directed under Title 7 USC 136r-1, to implement Integrated Pest Management Strategies in procurement and pest management activities.

Ashfall Fossil Beds—The Nation's Newest National Natural Landmark (#28)

Janet Eckhoff, Regional National Natural Landmarks Coordinator, National Park Service, Midwest Region, St. Paul, MN
Margi Brooks, Program Manager, National Natural Landmarks, National Park Service, Tucson, AZ
The designation of Ashfall Fossil Beds National Natural Landmark (NNL) in May of 2006 was the first such designation in 18 years. This Nebraska state park protects the only known site where a large number of fossil mammals are preserved intact as three-dimensional skeletons. The designation of this site as a NNL recognizes its national significance and will strengthen conservation and education efforts. The NNL program supports the cooperative conservation of nationally significant natural areas throughout the country and relies on partnerships and voluntary participation from federal, state, municipal and private landowners.

Protection and Restoration of Riparian Corridor Integrity through Monitoring Riverbank Stability and Plant Communities (#60)

Crystal Elliot, Vegetation and Restoration Ecologist, National Park Service, Yosemite National Park, El Portal, CA
Jim Roche, Park Hydrologist, Yosemite National Park, El Portal, CA
Yu-Fai Leung, Assistant Professor, North Carolina State University, Raleigh, NC
The Merced River in Yosemite National Park attracts intense year-round visitor use. While enjoyment of the river is a large component of most visitors' experience of Yosemite, damage to and subsequent loss of riparian vegetation has lead to extensive riverbank erosion over the past 80 years. Building on monitoring and restoration efforts over the past 15 years, the park seeks to establish robust indicators of riverbank health and to monitor these indicators to evaluate restoration project success and to identify areas that may be undergoing degradation. An inventory of riverbank conditions along seven miles of the Merced River in Yosemite Valley was conducted in 2005. This information was used to establish long-term monitoring reaches as well as a rapid assessment sampling protocol. In 2006, long-term monitoring was piloted and intensive characterizations of river morphology, riparian vegetation, substrate, and degree of human impact at permanent established cross-sections were achieved. These techniques will be expanded and refined while we continue to refine a systematic approach for alternating long-term monitoring and rapid assessment methods to adequately ascertain changes in riverbank conditions.

Coastal Recreation and Manager Awareness: Does a Knowledge Gap Exist? (#82)

Chris Ellis, Human Dimensions Program, NOAA Coastal Services Center, Charleston, SC
Numerous studies have focused on visitor preferences for specific coastal recreation activities. Few studies, however, have examined whether these visitor preferences are known and understood by those in the coastal management community, specifically by coastal managers exercising jurisdiction over public lands. This session presents findings from a study of recreational beach visitors in North Carolina—a study that exam-

ines the connection between recreational-activity engagement and awareness of such activities by coastal managers. The study and the proposed session address assumptions and knowledge gaps regarding the recreational preferences and behaviors of coastal visitors. In the North Carolina study, researchers collected data from April 2003 to November 2003 at seven distinct beaches within the state by means of a self-completed questionnaire. When selecting beaches, researchers considered a number of factors, including geographic distribution, responsible management agency, and various physical and social characteristics. The study obtained 672 successful surveys by means of a modified systematic sampling strategy.

The Cooperative Ecosystem Studies Units (CESU) Network (exh)

Angie Evenden, Research Coordinator, Great Basin Cooperative Ecosystem Studies Unit, National Park Service

This exhibit highlights the national CESU network, which was created so that federal land management, environmental, and research agencies, along with the nation's universities, can collaborate to produce high-quality science, usable knowledge for resource managers, responsive technical assistance, continuing education, and cost-effective research programs.

Note: This exhibit will be displayed in the lower-level foyer near the Registration Desk.

Fire, Elk, and Aspen Population Dynamics in Bandelier National Monument: Recommendations for Post-fire Aspen Sustainability (#37)

Steve Fettig, Wildlife Biologist, National Park Service, Los Alamos, NM
Kevin Buffington, Student, University Wisconsin--Eau Claire, Eau Claire, WI

The influence of browsing by elk *(Cervus elaphus)* on aspen (Populus tremuloides) and other woody shrubs in Bandelier National Monument has been a controversial topic throughout the last decade. Using two seasons of observational and statistical data we examined the hypothesis that physical barriers such as fallen trees help to protect aspen and other woody shrubs from ungulate browse. In 2005, we explored randomly selected sites in our search for refuged trees. In 2006, we traversed the entire study area searching for definitively refuged trees. Our findings suggest that refuges of fallen trees with a height greater than 80 cm allowed aspen to escape ungulate browse and attain heights above 2 m.

Potomac Gorge BioBlitz: Engaging Citizen Scientists and the Public in Biodiversity Exploration on National Park Land (#35)

Stephanie Flack, Potomac Gorge Project Director, The Nature Conservancy, Bethesda, MD
Mary Travaglini, Potomac Gorge Habitat Restoration Manager, The Nature Conservancy, Bethesda, MD
Arthur Evans, Potomac Gorge BioBlitz Coordinator, Richmond, VA

During the weekend of June 24--25, 2006, 135 field biologists and naturalists volunteered for the Potomac Gorge BioBlitz, an effort to search for historically understudied species groups in the Potomac River Gorge—the 15-mile river corridor just outside Washington, D.C., that includes parts of Chesapeake & Ohio Canal National Historical Park and George Washington Memorial Parkway. The 18 field survey teams focused their efforts on invertebrates and non-vascular plants and turned up more than 1,000 species, including several new park and state records. An educational event that was part scientific endeavor, part festival, and part outdoor classroom, the BioBlitz brought together leading experts in their scientific fields with beginner and seasoned naturalists, fostering excitement for the process of biological exploration and making connections among fellow field enthusiasts. The BioBlitz also included a public education program to raise local community awareness of the conservation importance of the Potomac Gorge.

Recording, Measuring, and Identifying Sounds in National Parks (#18)

Charlotte Formichella, NPS Natural Sounds Program Center, Fort Collins, CO
Damon Joyce, NPS Natural Sounds Program Center, Fort Collins, CO
Emma Lynch, NPS Natural Sounds Program Center, Fort Collins, CO
Ericka Pilcher, NPS Natural Sounds Program Center, Fort Collins, CO

More than three-quarters of the American public believe that preserving the sounds of nature is a very important reason for having national parks. The NPS Natural Sounds Program Center (NSPC) develops methods for monitoring sounds and utilizes these to quantify current conditions in park units. NSPC is concerned

with ambient sound levels (which affect listening opportunities), identifying sources of sound, and quantifying their patterns of occurrence. Improved equipment makes it easier and less expensive to monitor acoustic environments: the new systems cost less, are more compact and lightweight, and use less energy. Rapid characterization of sound levels is possible using new data processing routines; daily images of received sound levels can be computed in less than a minute, and summary statistics for a month of monitoring data can be computed in less than an hour. NSPC is currently using a team of listeners to identify sound sources in recordings. These identifications will provide opportunities to develop and test automatic software to monitor the activity of recognizable sound sources. The combination of these improvements will make acoustic monitoring increasingly accessible to all managers of parks and natural areas.

Assessment of Bias in Productivity Outcomes Assigned in Long-term Loon Monitoring at Voyageurs National Park (#**29**)

Jennifer Fox, Biological Technician, Voyageurs National Park, International Falls, MN
Steve Windels, Terrestrial Biologist, Voyageurs National Park, International Falls, MN
Lee Grim, Resource Management Biologist, Voyageurs National Park, International Falls, MN
Mike Broschart, Assistant Wildlife Area Manager–Red Lake, Minnesota Department of Natural Resources, Roosevelt, MN

Since the late 1970s, Voyageurs National Park has been surveying Common loon *(Gavia immer)* territories and productivity on two reservoirs and numerous interior lakes in the park, by visiting each historic loon territory 2–3 times per breeding season (early, mid, and late season). From 2004–06 research investigated the impacts of international lake level fluctuations on loon nest success in the two reservoirs with visits to 129 territories every 3–5 days. In conjunction with this intensive nest research, in 2006 the park's long-term loon survey methodology was tested to determine the accuracy of occupancy and productivity estimates. Three independent observers surveyed a subset of 20 loon territories, using the park's current 3-visit-per-season protocol. The average proportion of correctly assessed loon territory occupancy, hatching, and fledging estimates were 0.73, 0.80, and 0.71. Premature fledge determinations, dynamic territory boundaries, environmental conditions, and prior field experience appear to be the prominent biases in these estimates.

A Simple Cost Surface Tool to Aid in Sampling Design (#**15**)

Brent Frakes, Science Data Manager, National Park Service, Rocky Mountain Network, Fort Collins, CO
Colin Talbert, GIS Technician, National Park Service, Rocky Mountain Network, Fort Collins, CO

The Rocky Mountain Network is developing weighted sampling designs for vital sign monitoring that depend on access to the parks. Accessibility is particularly important for the larger backcountry parks where travel cost is high and highly variable. To aid in the design, the Network has developed an ArcGIS tool using model builder that has a simple user interface which calculates total travel time to any location in a park. Model inputs include starting points, roads, slope, land cover, and barriers to movement such as cliffs, lakes or rivers. This model has universal application to other planning and scientific efforts were access to remote regions of the park is an important consideration.

Movement of *Phytophthora ramorum* among *Camellia* Spp. in a Nursery Setting (#**53**)

Sibdas Ghosh, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA
Lisa Baird, University of San Diego, San Diego, CA
Marianne Elliott, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC, Canada
Simon Shamoun, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC, Canada
Mietek Kolipinski, National Park Service, Pacific West Regional Office, Oakland, CA
Paula Mancilla, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA
Desareé D. Williams, Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA

Phytophthora ramorum is a causative pathogen of sudden oak death (SOD) in various oak species and other susceptible host plants. The objective of this study was to observe dispersal of *P. ramorum* in camellia within a

nursery setting. Although the mode of pathogen entry is inconclusive, interactions between stomates and hyphae were observed. Currently, an investigation is underway for potential biocontrol of *P. ramorum*. We wish to eliminate resprouting of infected cut tanoak *(Lithocarpus densiflorus)* and California bay laurel *(Umbellularia californica)*, which are known to harbor the pathogen *P. ramorum*, and serve as inoculum sources. We plan to use the registered biological control agent, Chontrol, *Chondrostereum purpureum*, as a treatment for cut tanoak and bay laurel stumps. If effective, this treatment may effectively eradicate *P. ramorum* from selected sites. The treatment will also be suitable for areas where herbicides and burning are not permitted, for example, in some situations within national parks or other public land.

Vehicles in Streams: Effects of Driving through Pools on *Bufo woodhousii* (Woodhouse toad) Egg Survival (#**57**)

Tim Graham, Research Ecologist, USGS, Moab, UT

Effects of roads on species are varied, ranging from destruction of habitat, to invasive species corridors. Land managers must balance recreation demands with habitat protection as recreation increases on the Colorado Plateau. Salt Creek, Canyonlands National Park contains extensive riparian habitat. It was used by livestock and vehicles prior to 1964; the upper part of the road was gradually closed, only 20 km were still open in 1998 when the upper 14 km (8.5 mi) of road was closed. The road crosses Salt Creek over 60 times, and frequently the stream channel is the road. Known numbers of *Bufo woodhousii* eggs were placed in road crossing pools. A vehicle was driven through the pool once at low speed and eggs remaining in the pool were counted. A single pass significantly reduced the number of eggs recovered from the pool immediately after the pass.

Willingness to Pay for Access to Federal Recreational Lands (#**83**)

Burke D. Grandjean, University of Wyoming, Laramie, WY
Patricia A. Taylor, Professor of Statistics and Sociology, University of Wyoming, Laramie, WY
Ben Simon, University of Wyoming, Laramie, WY

The Federal Lands Recreation Enhancement Act, Public Law 108-447, which was signed into law on December 8, 2004, established the principle of one pass to access all federal recreational lands which charged entrance fees. This law attempts to create more efficiency in the management of federal lands, by having one fee rather than different agency pass fees for different types of federal lands (national parks, national forests, BLM, etc.) As part of the process to implement this law, a national survey of 2020 Americans was conducted to ascertain citizen response to the cost of such a pass. Using a contingent valuation method, respondents were asked a series of questions whose answers provided boundaries on the willingness to pay for a federal recreational land pass. We provide an analysis of the respondents' answers to the several questions on their willingness to pay, and as well discuss the dichotomy in the public between those who visit public lands and those individuals who do not.

Establishing a Live FalconCam at Shenandoah National Park (#**33**)

Rolf Gubler, Biologist, Shenandoah National Park, Luray, VA

Shenandoah National Park and the Center for Conservation Biology at William and Mary installed remote webcams near the park's only active peregrine falcon nest. This was done so biologists can obtain peregrine falcon nesting information throughout the breeding season (March through July). The remote webcam images provide biologists with specifics such as time of egg laying, hatching success, species of prey brought back to the nest, and the timing of young-fledging. Another goal of FalconCam is to provide peregrine biology and nesting information to students in the classroom (via website). Ordinarily, a field trip to a state-threatened peregrine's nest wouldn't be possible due to the presence of so many students. But by using web cameras, solar power, and WiFi technology we can take students there without disturbing the nesting peregrine falcons and their young. This poster serves as an example for establishing raptor webcams in similar remote settings.

Preserving Geoheritage in the Nation's National Parks and Landmarks (#**17**)

Robert Higgins, Supervisory Geologist, NPS Geologic Resources Division, Denver, CO

Geoheritage consists of geologic features and landforms which benefit society. They are therefore preserved to ensure their enjoyment by future generations. The Park Service manages these sites in the National Park System, and through the National Natural Landmarks and National Historic Landmarks programs. Examples of geoheritage sites include: 1) places where geologic features, rock types, or type specimens of fossils were first recognized and described; 2) textbook examples of geologic features and processes; and 3) historic sites where cultural events were directly related to an area's geologic features—Native American sites, historic mines, and geologic features associated with western exploration and settlement. Such sites generally have great potential for scientific studies, use as outdoor classrooms, enhancing public understanding and enjoyment. Geoheritage features and landscapes are fundamental to understanding and managing surface processes, climatic changes over time, evolution of landforms, and the origin of mineral deposits.

Exotic Plant Surveys in Shenandoah National Park, Virginia (#**27**)

Jacob Hughes, Biological Science Technician, Shenandoah National Park, Luray, VA
James Akerson, Supervisory Forest Ecologist, Shenandoah National Park, Luray, VA

Exotic plant surveys were conducted in three zones of potential habitat in Shenandoah National Park: Park roadsides (1997 to 2000), the park boundary (2003) and former home sites (2004). The objectives were to determine the species present, to quantify the extent of invasion and dominance of each, to identify their geographical distribution, and to characterize possible environmental conditions favoring invasion. Species cover was estimated in plots placed every 50 m along 300-m transects. Eighty two percent of transects in the roadside survey, 70% in the boundary survey, and 74% of the homesites were found to contain exotic plants. Common exotics included *Alliaria petiolata*, *Polygonum caespitosum*, *Celastrus orbiculatus*, and *Ailanthus altissima*. There was a slight tendency for more exotics to be found in the north district of the park and on east-facing, gentle slopes. These data will be used to plan exotic plant management work in the park.

Using the Watershed Condition Assessment Program as a Tool for Natural Resource Management (#**14**)

Rick Inglis, Hydrologist, NPS Water Resources Division, Fort Collins, CO
Jeff Albright, Watershed Condition Assessment Program Manager, NPS Water Resources Division, Fort Collins, CO

The Water Resources Division's Watershed Condition Assessment Program is a Natural Resource Challenge program funded by Congress to assess and report on conditions of watershed resources in national park units. These natural resource assessments are targeted to park and regional resource management and planning staff, with an executive summary that communicates key findings to park superintendents. The assessments will have a strong geospatial component, and result in both a written report and GIS interpretive maps that convey findings about current resource conditions, critical data gaps, and existing/emerging threats associated with park-managed natural resources, watersheds, and habitats. While the focus of these assessments is on providing an interdisciplinary evaluation (synthesis) of existing data and information, from the Vital Sign Monitoring network and other sources, as needed to support resource stewardship planning by parks and performance reporting by parks, it is expected to be useful for varied types of park resource management activities.

Yosemite Prescribed Burning: An Example of Cooperative Restoration (#**46; cd**)

Brent Johnson, Botanist, Yosemite National Park, El Portal, CA
Jun Kinoshita, Fire Archeologist, Yosemite National Park, El Portal, CA
Kristin Ramsey, Videographer, Yosemite National Park, Yosemite, CA

In the fall of 2005, Yosemite National Park conducted a 13-acre prescribed burn aimed at reducing fuel accumulation, controlling invasive Himalayan blackberry, restoring the hydrology of the wetland meadow, and encouraging traditionally-used plants. The park, with partners The Yosemite Fund, Yosemite Institute, and local Native American tribes, developed a restoration and research effort. Research plots examining plant community response to burning and mechanical thinning were installed. Initial results suggest that although blackberry responds to fire by sprouting, pulling sprouts after burning yields better root visibility and less biomass for disposal. Fuels and encroaching conifers were reduced while traditional fire-starting

practices reduced petroleum accelerants in the wetland. A documentary film of the project educates the public, park staff and researchers, illustrating positive effects of this cooperation. Exposure to a legacy of fire management inspired a proposal to invite the tribe each fire season to participate in igniting a burn.

USGS Center for EROS: Who We Are (**exh**)

Carrie Jucht, Outreach Coordinator, U.S. Geological Survey Center for Earth Resources Observation and Science (EROS), Sioux Falls, SD

The nearly 600 members of the workforce of the U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) conduct science for a changing world. Operated by the USGS, EROS is a national data reception, processing, archiving, distribution, and research facility for remotely sensed data and other forms of geographic information. The Center's employees manage the world's largest civilian archive of global land remote sensing data, and they ensure that anyone can readily access the data for the lowest costs possible. Scientists, resource managers, and planners worldwide use the Center's data and technologies for applications in homeland security, global change, wild land fire, agriculture, volcanology, population sustainability, and drought, to name only a few. Thus, the Center's work is dynamic, multi-scale (global, national, regional, and local), and potentially affects millions of lives each day.

Note: This exhibit will be displayed in the lower-level foyer near the Registration Desk.

Non-native Plants in Burned Areas as a Function of Burn Severity (**#51**)

Kristen Kaczynski, Graduate Student, University of Colorado, Boulder, CO
Susan Beatty, Department of Geography, University of Colorado, Boulder, CO
Jan van Wagtendonk, USGS Yosemite Field Station, El Portal, CA

There is uncertainty about the role of fire and the subsequent ability of non-native species to establish, which is of great concern to land managers. This study took place in Yosemite National Park in the 2003 Tuolumne burn. A total of five non-native species were found. *Cirsium vulgare* was the most abundant. Neither invasive species presence as a whole ($F = 2.384$; $P = 0.0781$) nor *Cirsium vulgare* presence ($F = 1.238$; $P = 0.30$) were related to burn severity. There was no significant difference in non-native species presence between riparian or upland areas ($P = 0.22$; $F = 1.265$). There was a significant difference in invasive species presence between high and low severity riparian sites ($F = 4.582$; $P = 0.004$), with invasive species more prevalent in high severity sites. While invasives are only minor constituents of this forest community, high severity burns in riparian areas have the potential for providing conditions conducive to non-native plant invasion.

Landscape Change Monitoring in the Tropical Pacific (**#23**)

Fritz Klasner, Ecologist, National Park Service, Pacific Island Network, Hawaii National Park, HI
Sandy Margriter, Geographer, National Park Service, Pacific West Region, Hawaii National Park, HI
Page Else, Ecological Monitoring Data Associate, Hawaii-Pacific Island Cooperative Ecosystem Studies Unit, Hawaii National Park, HI
Viet Doan, Ecological Monitoring Spatial Data Associate, Hawaii-Pacific Island Cooperative Ecosystem Studies Unit, Hawaii National Park, HI
Allison Snyder, Database Programmer, Hawaii-Pacific Island Cooperative Ecosystem Studies Unit, Hawaii National Park, HI
M. Melia Lane-Kamahele, Supervisory Cartographer/GIS Coordinator, National Park Service, Pacific West Region, Honolulu Office, Honolulu, HI

A long-term Vital Sign monitoring protocol to detect change in earth surface (land) cover and use, an indicator of ecosystem health, is being prepared for the US National Park Service, Inventory and Monitoring Program. Encompassing islands and marine waters in Hawaii, Guam, American Samoa, and the Northern Mariana Islands, monitoring will include parks and adjacent areas, complementing other inventory and monitoring efforts such as invasive species detection and vegetation mapping. Land cover monitoring methods utilize remote sensing, while detailed land use monitoring emphasizes GIS and ancillary data sources (such as census, public infrastructure, zoning, and tax maps). Synthesis analyses will document landscape change, interpret observed changes, and evaluate their significance for park managers. Partnerships with

University of Hawaii, US Forest Service, and others have enhanced the value and utility of these efforts, expanding the geographic extent where comparable monitoring is occurring.

In Favor of the People—Traditional Ecological Knowledge of the Upper Yukon River Fisheries (#64)

David Krupa, Cultural Anthropologist, NPS, Fairbanks, AK

This poster will present visual and textual information summarizing a two-year effort to document traditional and local knowledge of the Upper Yukon River Salmon Fishery. The study was prompted after disastrous returns in 1999 in 2000 resulted in federally qualified subsistence fishers not meeting their essential needs. Local observers were able to articulate a number of observations relating to the stock status and health of the fishery that are being used to generate new research foci as well as suggestions for better regulation and management of the fishery. Likewise, direct consultation with affected stakeholders has increased communication and trust between federal land managers and local residents.

New Partnerships in Response to the Changing Needs of National Parks and Universities (#34)

Mark Kuusisto, Research Assistant, St. Cloud State University, St. Cloud, MN
Matthew Julius, Associate Professor, Department of Biological Science, St. Cloud State University, St. Cloud, MN
Chris Holbeck, Chief of Resource Management, Voyageurs National Park, International Falls, MN

Voyageurs National Park and St. Cloud State University have formed a long-term partnership in an effort to mutually support on-going resource monitoring and management efforts in the park and expand educational opportunities at SCSU. Projects of mutual interest (POI) have been and continue to be identified, currently these include water quality issues, cyanobacterial toxin risk assessment, and micro-organismal diversity in aquatic systems. An intersession course has been conducted during the spring to develop protocols for POIs and a graduate student remains in residence over the remaining portion of the field season to complete the research. To support these activities VNP provides lodging, space to set up laboratory equipment, and watercraft. This joint venture has proven beneficial to both the National Park and University partners.

Integrated Forest Monitoring System for Central Africa (INFORMS) and the Protected Area Watch in the Albertine Rift (PAWAR): Remote Sensing Tools for Conservation Policy (#31)

Nadine Laporte, The Woods Hole Research Center, Falmouth, MA
Wayne Walker, The Woods Hole Research Center, Falmouth, MA
Jared Stabach, The Woods Hole Research Center, Falmouth, MA
Grace Nangendo, Wildlife Conservation Society, Kampala, Uganda
Andrew J. Plumptre, Wildlife Conservation Society, Kampala, Uganda

In the absence of conservation action, the biological diversity of forests worldwide will continue to be degraded. The national park system of the United States has relevance to protected area management elsewhere, including the tropical countries of Africa in which we work. Many of these countries have adopted national plans for biodiversity conservation and ecosystem management, but most lack basic information on the rates and extent of environmental change required for effective decision making and conservation policies. Space-based earth monitoring technologies can provide detailed analyses of the state of tropical ecosystems. We will discuss two projects designed to support the development of operational remote sensing and geographic information system tools adapted to conservation and forest management needs. The Integrated Forest Monitoring System for Central Africa (INFORMS) and Protected Area Watch in the Albertine Rift (PAWAR) incorporate research findings into national park and forest management plans.

Using State-of-the-Art Media to Showcase Northern Great Plains Parks and Park Management (#72; cd)

Daniel Licht, Program Manager, Northern Great Plains Inventory & Monitoring Network, National Park Service, Rapid City, SD
Joel Brumm, Data Manager, Northern Great Plains Inventory & Monitoring Network, National Park Service, Rapid City, SD

As technology advances and proliferates, and more and more entities compete for the public's attention, it behooves the National Park Service to keep pace so its message will be heard. This requires using state-of-the-art technology and productions of the highest quality. The Northern Great Plains Network of parks has

developed two high-definition (HD) videos. This new video format with its high resolution and stunning clarity is ideally suited for showing the grandeur and beauty of national parks. The first video is an overview of the 13 national park units in the Northern Great Plains. The second video describes the nascent ecological monitoring program the network is developing. In addition to HD footage, both videos utilize three-dimensional virtual landscape software and Google Earth capabilities. Both videos will run in a loop-fashion on a high-definition monitor.

Applications of Bedrock, Surficial Geology and Landform Maps in Resource Management (#**12**)

Greg Mack, Geologic GIS Specialist, National Park Service, Pacific West Regional Office, Seattle, WA
Marsha Davis, Geologist, National Park Service, Pacific West Regional Office, Seattle, WA
Jon Riedel, Geologist, North Cascades National Park, Marblemount, WA

Geologic maps provide park planners and resource managers with site-specific information—showing bedrock geology, surficial geology, and geomorphic landforms, and derived thematic maps—important in guiding development, resource and visitor protection, and interpretation. Geographic Information Systems (GIS) are being used to create digital geologic maps. These maps are an integral part of the National Park Service Geologic Resources Evaluation Program (GRE)—one of 12 baseline inventories of the NPS Inventory and Monitoring Program (I&M). Maps for many NPS units have been completed and are available for download in GIS format from the NPS NR Metadata and Data Store (http://science.nature.nps.gov/nrdata/index.cfm). Examples of geologic map information applied to park planning and resource management will be presented

A Spatial Characterization of the Water Quality of Rainy Lake and the Namakan Reservoir (#**06**)

Ryan Maki, Aquatic Ecologist, Voyageurs National Park, International Falls, MN
Larry W. Kallemeyn, Aquatic Biologist, U.S. Geological Survey, Biological Research Division, International Falls, MN
Chris Holbeck, Chief of Resource Management, Voyageurs National Park, International Falls, MN

Water quality characteristics of Rainy Lake and the Namakan Reservoir, Minnesota/Ontario, were investigated for spatial variation in summer 2004 and 2005, respectively. Resource managers at Voyageurs National Park coordinated a volunteer effort to conduct the otherwise cost-prohibitive investigation, during which a team of 20-30 volunteers sampled each site twice on these border waters. Unlike past studies in which spatial coverage was limited by lack of personnel, the inter-agency cooperation and large number of volunteers involved allowed sampling in all major basins of these substantial bodies of water (approximately 118,000 ha total). Nonmetric multidimensional scaling ordination (PC-ORD V 4.25) was used to investigate relationships between sites. Considerable spatial variation in water quality was apparent which may reflect the influence of the numerous tributaries in the watershed. This spatial variation, along with historical data, was considered during the development of a long-term monitoring program for the water quality of this system.

Professors for Parks: Volunteer Opportunities for Retired Academics (#**66**)

Jane Manaster, Director, Professors for Parks, Austin, TX
Guy J. Manaster, Professors for Parks, Austin, TX

Professors for Parks, a non-profit organization, will recruit retired university and college faculty to volunteer in the National Park Service, sharing the expertise they have acquired during their professional career. Many of the parks have multiple projects awaiting attention. The volunteers enlisted will be available during the seasons when parks have fewer visitors; they will have considerable knowledge in their field, and will be reliable self-starters requiring minimal attention from park personnel. There is evident need for renovation, repair, and even redesign within many of the four hundred NPS locations. Volunteers drawn from multiple disciplines will be matched with individual parks. While many of the projects involve environmental sciences, parks that have been approached across the United States have indicated a significant need for help with projects requiring specialized knowledge in cultural, technological, educational, business, and other fields.

Using Views of the National Parks for Educational Purposes: Developing Teaching Modules (#**73; cd**)

Michael Marlow, Associate Professor, University of Colorado at Denver, Denver, CO
Christine Renda, Research Associate, University of Colorado at Denver, Denver, CO
Austine Luce, Research Associate, University of Colorado at Denver, Denver, CO

The University of Colorado at Denver in partnership with the Views of the National Parks project is developing a series of interactive, student science inquiry modules for use in grades 3-12 classrooms. These modules incorporate national park sites, ranger interviews, virtual trips incorporating GIS and GPS data, and interactive student inquiries. This computer demonstration will show the process we use in developing these materials, how we are incorporating them into standards-based curricula and examples of units developed.

Pesticides in Precipitation and Lake Sediment from Rocky Mountain and Glacier National Parks (#**65**)

Alisa Mast, Hydrologist, U.S. Geological Survey, Denver, CO
William Foreman, U.S. Geological Survey, National Water Quality Laboratory. Denver CO

Current-use pesticides (CUPs) and organochlorine compounds (OCCs) were measured in precipitation (rain and snow) and lake sediment. Frequently detected CUPs were atrazine, carbaryl, and dacthal in rain and endosulfan, dacthal, and chlorothalonil in snow. Chlordane, hexachlorobenzene, and 2 PBC congeners were the only OCCs detected in snow. Annual deposition rates of CUPs to Rocky Mountain NP ranged from 2.6 to 9.9 μg/m2, of which >85% occurred during summer. In lake sediment, DDE and DDD were the most frequently detected OCCs, however, concentrations were very low and pose little threat to aquatic organisms. OCC concentrations in an age-dated sediment core from Rocky Mountain NP suggest that atmospheric deposition of banned compounds has been decreasing since the 1970s. Dacthal and endosulfan were the only CUPs detected in lake sediments. Both pesticides were frequently detected in snow, confirming that some CUPs entering high-elevation lakes via atmospheric deposition are accumulating in sediments and potentially in aquatic biota as well.

Grasslands Restoration in Parks of the National Capital Region: Sharing Knowledge and Aiding Managers (#**26**)

Giselle Mora, Science Education Coordinator, Urban Ecology Research Learning Alliance, NPS National Capital Region, Washington, D.C.
Katharina Engelhardt, Assistant Professor, University of Maryland, Center for Environmental Science Appalachian Laboratory, Frostburg, MD

Managers of the National Capital Region parks manage their grasslands to preserve the historical viewscape while maintaining or enhancing the natural resources and services grasslands provide. A sustained two-year effort involving faculty from the University of Maryland Center for Environmental Studies, the regional Research Learning Center, the Chesapeake Watershed CESU, and park managers resulted in two workshops designed to increase understanding of grassland ecology, restoration practices, regional and park-specific restoration goal setting, funding opportunities, and resource sharing. We present this partnership model for resource-specific education, knowledge sharing and regional planning as an important tool to aid managers pursuing grasslands restorations in small park units and with very limited resources.

Science Informing Policy: Implementing a Critical Load for Rocky Mountain National Park (#**68**)

Kristi Morris, Atmospheric Deposition Specialist, National Park Service Air Resources Division, Denver, CO
Tamara Blett, National Park Service Air Resources Division, Denver, CO
Ellen Porter, National Park Service Air Resources Division, Denver, CO
Jeff Collet, Colorado State University, Atmospheric Science Department, Fort Collins, CO
Courtney Gorin, Colorado State University, Atmospheric Science Department, Fort Collins, CO
Bret Schichtel, National Park Service Air Resources Division, Denver, CO
Bill Malm, National Park Service Air Resources Division, Denver, CO

Sensitive aquatic and terrestrial resources in Rocky Mountain National Park are being affected by nitrogen deposition. One of several ecological effects includes a shift in phytoplankton communities that occurred around 1950 from species typical of oligotrophic lakes to species typical of disturbed, more eutrophic lakes. Hindcasting has determined that the critical load for high elevation aquatic ecosystems in the park is 1.5

kilograms of nitrogen per hectare per year (kg N ha^{-1} yr^{-1}) in wet deposition. Current wet nitrogen deposition is 3.1 kg ha-1 yr^{-1}. In order to address the harmful impacts of air pollution to park resources, the National Park Service, the Colorado Department of Public Health and Environment and the U.S. Environmental Protection Agency have entered into a Memorandum of Understanding (MOU). Parties to the MOU have agreed to reverse the current increasing trend in nitrogen deposition and are currently considering a glide-path approach to achieve emission reductions over the next several decades. The Rocky Mountain Atmospheric Nitrogen and Sulfur Study (RoMANS), a source attribution study, was conducted in 2006 to help focus emission reduction strategies.

"Views of the National Parks": A Multimedia Education Program at Your Fingertips (#**74; cd**)

Bruce Nash, Ecologist, NPS Natural Resource Program Center, Office of Education and Outreach, Lakewood, CO
David Krueger, Information Technology Specialist National Park Service–NRPC, Lakewood, CO
Erika Matteo, Visual Information/Education Specialist, University of Colorado at Denver, Lakewood, CO
Kristen Lucke, Education Specialist, University of Colorado at Denver, Lakewood, CO

The NPS "Views of the National Parks" (Views) Project continues to expand on the internet and on DVD. This free multimedia educational program now lets you explore paleontology and prairie ecosystems at Badlands NP, natural and cultural history in the Sonoran Desert, geology at Devils Tower NM, biodiversity at Whiskeytown NRA, volcanism at Petroglyphs NM, and lets you 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 Visitor Center, check out the Teacher Resource Center with its lesson plans and educational curriculum guides. Join the NPS Views Team and its partners for a hands-on virtual journey of exploration through the national parks. There's plenty of room for additional parks—maybe Views would be right for your park?

Sharing Mana'o in Pacific Island Network: Arrows of Information in the Sea of Natural Resources (#**55**)

Corbett Nash, Program Facilitator / Science Communications and Outreach Coordinator, Research Corporation of the University of Hawaii, Hawaii National Park, HI

The NPS Inventory and Monitoring (I&M) Program is charged with many and various tasks in America's national parks. Outreach and science communications play a strong, albeit secondary, role in the Nation's I&M program. So how do we get this information where it needs to go? Many NPS networks are championing methods of sharing the information they collect with parks, resource managers, and the public. The Pacific Island Network (PACN) is no different. The PACN has devised several methods of science communications aimed at both the network parks and the public. Newsletters, species lists, educational programs, participation in local fairs and festivals, web links, and a brochure are just the tip of the iceberg. The PACN has also had success in an innovative program of engaging park staff and cultural advisors in a quest for two-way information sharing. These myriad approaches to outreach have had resounding positive effects.

Integrated Remote Sensing Applications for the Ecosystem-Based Management of Coastal Parks (#**52**)

Amar Nayegandhi, Computer Scientist ETI / U.S. Geological Survey, St. Petersburg, FL
John C. Brock, Oceanographer, U.S. Geological Survey, Florida Integrated Science Center, St. Petersburg, FL

The USGS Geologic Discipline's Coastal and Marine (CM) Program has supported the creation of new capabilities for the synoptic remote sensing of coastal marine and terrestrial environments based on aircraft and satellite sensors. Through partnerships with NASA and the NPS, these capabilities have been applied to create highly detailed benthic maps of portions of the Florida reef tract within Biscayne National Park (BNP) and Dry Tortugas National Park (DTNP). In a similar collaboration with NASA and NPS, aircraft lidar and color-infrared imaging have been acquired and processed to create high-resolution sub-aerial topographic maps of barrier island geomorphology and vegetated habitats for national parks along the Northeast Atlantic and the Gulf coast. In total, these new coastal remote sensing, mapping and point monitoring tools constitute a unique integrated package of instrumentation and software that may be deployed in support of appropriately timed and scaled zoning decisions by management authorities in order to conserve and sensibly exploit near shore marine ecosystems.

RLC Goal II: Supporting Science-informed Decision Making (**#77; third in a set of six posters on NPS Research Learning Centers**)

Diane Pavek, Research Coordinator, Urban Ecology Research Learning Alliance, NPS National Capital Region, Washington, DC

Giselle Mora-Bourgeois, Science Education Coordinator, Urban Ecology Research Learning Alliance, NPS National Capital Region, Washington, DC

Leigh Welling, Director, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT

Sallie Hejl, Resource Education Specialist, Crown of the Continent Research Learning Center, Glacier National Park, West Glacier, MT

Ann Rodman, Learning Center Coordinator, Greater Yellowstone Science Learning Center, Yellowstone National Park, WY

Rick Toomey, Director, Mammoth Cave International Center for Science and Learning, Mammoth Cave National Park, Mammoth Cave, KY

Research Learning Centers (RLCs) put science into action by supporting science-informed decision making. Park managers must be able to incorporate and adapt new information from monitoring and research into decisions. The application of science to inform decisions allows better management through assessments of credible, peer-reviewed scientific analyses in addition to shared experiences, expertise, and solutions. Only when a concerted effort is made to translate, present, and connect technical results is applying science to the protection and restoration of resources possible. Examples will be given of how RLCs put science into action by: transferring knowledge and information through workshops and other outreach tools; connecting managers with experts to identify and explore management issues and use new technologies; promoting collaborative efforts to develop and apply the best available science to park resource issues. These efforts are enhancing and expanding the capacity of resource managers to improve their expertise and advance effective management.

Using GIS Visitor Accessibility Modeling to Inform Recreation Use Management in Yosemite National Park (#**11**)

David Pettebone, Ph.D. candidate, Colorado State University, Department of Natural Resources Recreation and Tourism, Fort Collins, CO

Peter Newman, Assistant Professor, Colorado State University, Department of Natural Resources Recreation and Tourism, Fort Collins, CO

Jim Bacon, Yosemite National Park, Yosemite, CA

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

Identifying where potential recreation opportunities occur is important for park mangers trying to make sound decisions about visitor use. The Recreation Opportunity Spectrum defines the physical settings of recreation opportunities in terms of linear distance from roads and other human made structures. However, simple linear distance does not account for landscape variation such as slope or vegetation cover. These physical impedances affect visitors' ability to access areas within a park and partially determine the spatial distribution of visitor use. Recently, methods to model visitor accessibility, defined as a hikers travel time to a given location, have been developed using Geographic Information Systems. This project applied accessibility modeling to recreation opportunities in Yosemite National Park to inform parts of the Tuolumne Wild and Scenic River master plan. Results produced spatially explicit maps of visitor accessibility, estimated extent of day use, and potential recreation opportunities.

From Tires to Trees: Restoration of the Bradford Tract at Prince William Forest Park, Virginia (#**48**)

James Pieper, Hydrologic Technician, NPS National Capital Region Center for Urban Ecology, Washington, DC

Disturbed lands reclamation is a long-term commitment, and is as much hard labor as it is science. The Bradford Tract, a 14.2-acre site, at Prince William Forest Park was no exception. Prior land use of the site was primarily residential, but included an unpermitted land fill and tire dump. Level I and II surveys were conducted and baseline groundwater data collected to determine any possible contaminants. Reclamation

began in 2002, with the local jurisdiction removing the structures, and park staff and volunteers removing 3,000-plus tires and several hundred pounds of trash. With assistance from the Geological Resources Division, the park successfully re-graded the natural terrain and restored historic drainages. Today, the site exists as a native grassland meadow slowly healing the scarred land.

Environmental Contaminant Hazards to Wildlife at National Capital Region and Mid-Atlantic National Park Service Units (#56)

Barnett Rattner, Ecotoxicologist, U.S. Geological Survey, Patuxent Wildlife Research Center, Beltsville, MD
Betty K. Ackerson, U.S. Geological Survey, Patuxent Wildlife Research Center, Beltsville, MD

Pollutant data for air, water, soil and biota were compiled from databases and internet sources and by staff interviews at 23 National Park Service (NPS) units in 2005. A metric was derived describing the quality and quantity of data for each park, and in combination with known contaminant threats, the need for ecotoxicological study was identified and ranked. Over half of NP units were near Toxic Release Inventory sites discharging persistent pollutants, and fish consumption advisories were in effect at or near 22 of the units. Pesticide and herbicide use was found to be minimal, with the exception of those units with agricultural leases. Only 70 reports were found that describe terrestrial vertebrate environmental contaminant data at or near the units. Of the >75,000 compounds in commerce, empirical exposure data were limited to merely 58 halogenated compounds, insecticides, rodenticides, metals, and some contemporary compounds. Further ecotoxicological monitoring and research is warranted at several units including Shenandoah National Park, Richmond National Battlefield Park, Chesapeake & Ohio Canal National Historical Park, Valley Forge National Historical Park, Hopewell Furnace National Historic Site, Monocacy National Battlefield, and Harpers Ferry National Historical Park. The types of investigations vary according to the wildlife species present and potential contaminant threats, but should focus on contemporary use pesticides and herbicides, polychlorinated biphenyls, mercury, lead, and perhaps antibiotics, flame retardants, pharmaceuticals, and surfactants. Other management recommendations include inclusion of screening level contaminant risk assessments into the NPS Vital Signs Program, development of protocols for toxicological analysis of seemingly affected wildlife, alternative methods and compounds for pest management, and use of non-toxic fishing tackle by visitors.

Yellowstone Air Quality and Winter Vehicle Emissions (#19)

John Ray, Atmospheric Chemist, NPS Air Resources Division, Denver, CO
Gary Bishop, Research Associate, Department of Chemistry, University of Denver, Denver, CO

The use of snowmobiles in Yellowstone National Park has created controversy and has lead to revisions of the winter use plan. Air quality has been one of the issues. Measurements of air quality at several locations and of the emissions by winter use vehicles have been made for use in the adaptive management plan. Pollution from carbon monoxide (CO) and smoke (particulate matter) have decreased in the last several years as the number of snowmobiles having been limited and cleaner emission snowmobiles having been required. The latest data from Yellowstone comparing emissions from snowmobiles and snow coaches are presented along with the observed air quality.

Restoring Native Prairies in the Pacific Northwest (Ebey's Landing NHR & San Juan Island NHP) (#58)

Regina Rochefort, Science Advisor, North Cascades National Park Service Complex, Sedro-Woolley, WA
Bill Gleason, San Juan Island National Historical Park, Friday Harbor, WA
Leigh Smith, Ebey's Landing National Historical Reserve, Coupeville, WA

Prairies were an important component of the Puget Trough prior to the arrival of Europeans in the 1800s. Today, only about 20 fragments of native prairies remain in western Washington and Oregon. Park landscapes at Ebey's Landing National Historical Reserve and San Juan Island National Historical Park include some of western Washington's best examples of native prairie fragments, but that also embrace large expanses of degraded prairies. Prairie restoration has been listed as a major resource management issue for each park in Vital Signs workshops and Resource Management Plans. During FY2004 and 2005 a project was funded to develop prairie restoration methods through Small Park NRPP. There are three components of this project: research, education, and partnerships. Restoration and monitoring is underway due to partner-

ships with Edmonds Community College, the Native Plant Society, AuSable Institute, and a cadre of volunteers.

RLC Goal IV: Promoting Resource Stewardship through Partnerships (**#79; fifth in a set of six posters on NPS Research Learning Centers**)

Susan Sachs, Education Coordinator, Appalachian Highlands Science Learning Center, Great Smoky Mountains National Park, Lake Junaluska, NC

Paul Super, Science Coordinator, Appalachian Highlands Science Learning Center, Great Smoky Mountains National Park, Lake Junaluska, NC

Kim Tripp, Research Coordinator, Jamaica Bay Institute, Gateway National Recreation Area, Brooklyn, NY

Mac Brock, Supervisory Biologist, Crater Lake National Park, Crater Lake, OR

Theresa Thom, Director, 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

Research Learning Centers (RLCs) promote resource stewardship by engaging a wide range of internal and external partners. This poster will give an overview of partnership activities and will highlight successful research and education examples from four different RLCs. Several RLCs use citizen scientists to collect data about park resources. Partnerships allow RLCs to expand researcher capacity by training volunteers to search for Ivory-billed woodpeckers in Congaree National Park and to work side-by-side with researchers performing Inventory and Monitoring studies in Great Smoky Mountains National Park. In Gateway National Park, over 15,000 students took a virtual field trip to explore estuaries with scientists and park staff. Through these kinds of efforts, RLCs are helping parks obtain new knowledge about parks.

Effects of Methylmercury on Fish Reproduction: Are Fish Populations in Voyageurs National Park at Risk? (**#04**)

Mark Sandheinrich, Professor, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

Paul E. Drevnick, Department of Zoology, Miami University, Oxford, OH

James Wiener, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

Brent C. Knights, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI

Laboratory experiments with fathead minnows have demonstrated that dietary methylmercury at environmentally relevant concentrations alters reproduction, most likely by induction of apoptosis of gonadal cells and subsequent suppression of gonadal hormone production. Although assessment of reproductive success of wild fish is difficult, concentrations of sex hormones are biomarkers that have been linked in the laboratory to altered fish reproduction due to methylmercury exposure. We measured testosterone and 11-ketotestosterone in plasma and mercury in axial muscle of male northern pike from interior lakes of the Voyageurs National Park. Concentrations of sex hormones were inversely related to mercury exposure, suggesting that reproduction of individual fish may be affected although consequences for populations are unknown. However, assessment of mercury and fish population dynamics for other species suggest that some populations of northern pike in Voyageurs National Park may be at risk due to methylmercury exposure.

Fin Clips as a Non-lethal Method for Monitoring Mercury in Fish in National Parks (**#05**)

Mark Sandheinrich, Professor, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

Kristofer Rolfhus, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

James Wiener, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

Sean Bailey, University of Wisconsin-La Crosse, River Studies Center, La Crosse, WI

We evaluated the use of fin clips for assessing mercury concentrations in axial muscle tissue of fish. Concentrations of mercury were determined in the axial muscle and fins of northern pike and/or walleye from 21 lakes in northern Wisconsin and northern Minnesota, including northern pike from interior lakes of Voyageurs National Park. Both methylmercury and total mercury in fins were positively correlated with total mercury in axial muscle. Our analysis indicates that total mercury concentrations of about 32 ng/g dry weight in pelvic fins of walleye and 43 ng/g dry weight in pelvic fins of northern pike were indicative of the

upper bound of the 95% confidence interval of a methylmercury criterion of 0.3 mg/kg wet weight in edible muscle from these species. Analysis of fin clips could be used as a non-lethal approach for monitoring and evaluating methylmercury concentrations in game fish.

Predictive Modeling of Invasive Plants within the National Parks of the Great Lakes Network (#13)

Lindsey Shartell, Graduate Student, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI
Linda M. Nagel, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI
Andrew J. Storer, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI
Michael D. Hyslop, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI
Christopher R. Webster, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI

Invasive plants are invading ecosystems at an alarming rate. These plants impair the long-term health of ecosystems by changing characteristics such as species composition, water flow, and nutrient availability. For this reason, invasive plants are one of the "Vital Signs" monitored annually by the National Park Service (NPS). The Great Lakes Network of the NPS is made up of nine parks totaling 471,264 hectares. The development of a spatial model that predicts the locations at highest risk for invasion would improve monitoring efforts and allow the NPS to utilize resources and time efficiently. Predictive models were developed using a geographic information system (GIS) for ten invasive plants. These multicriteria risk models determine the level of risk based on biological, environmental, and human-induced factors, and weight the factors based on assigned importance and confidence values. Maps highlighting the areas at risk within individual National Parks are being produced for three phases of invasion: introduction, establishment, and spread. The models will be tested and refined using existing invasive plant GIS layers and by ground-truthing within select National Parks. The risk maps, models, and a user manual will be provided to the NPS, allowing personnel to focus monitoring efforts on areas with high-risk of introduction and establishment, and to further prioritize areas with high-risk of spread for control.

Shifting Demographics: Hispanics/Latinos and Physical Activity on Public Lands (#40)

Sonja Wilhelm Stanis, Graduate Research Assistant, University of Minnesota, St. Paul, MN
Ingrid Schneider, Associate Professor and Director, Tourism Center, University of Minnesota, St. Paul, MN
Deborah Chavez, Project Leader, PSW-4902 Pacific Southwest Research Station, Riverside, CA
Kim Shinew, Associate Professor, University of Illinois, Champaign,
David Olson, Pacific Southwest Research Station, Riverside, CA
Nancy Knap, Pacific Southwest Research Station, Riverside, CA
Mary Vogel, Director of the Center for Changing Landscapes, University of Minnesota, Minneapolis, MN
Andrew Kerins, Associate Professor, University of Illinois, Champaign, IL

Health benefits of physical activity are well recognized and documented, yet obesity rates remain high in the U.S., particularly among Hispanics/Latinos. As our population becomes more urban and ethnically diverse, a greater understanding of specific populations may help facilitate agencies to better address obesity and sedentary lifestyles. This study examined use of urban-proximate outdoor recreation sites for physical activity and differences in use, experience use history and self-reported Body Mass Index between Hispanics/Latinos of all races, and non-Hispanic/Latino Whites to inform efforts in increasing physical activity levels. Data were collected through onsite interviews in urban-proximate parks in California, Illinois and Minnesota used by a variety of race and ethnicity groups for purposeful and non-purposeful physical activity. Findings indicate that parks and recreation areas remain important places for physical activity among both Hispanics/Latinos and non-Hispanic/Latino Whites. Differences between the two groups as well as management implications will be presented.

Releasing Another Beast? Secondary Invasion vs. Native Plant Recovery in Treated Canada Thistle Patches (#47)

Amy Symstad, Research Ecologist, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Rapid City, SD

In NPS units, the ultimate goal of invasive plant control efforts usually is to restore native vegetation that had been invaded. Depending on the composition of the standing and surrounding vegetation and seed bank, removal of an invasive may result in secondary invasions or releases of other non-native species. This experiment investigates this problem in Canada thistle *(Cirsium arvense)*-infested areas at Badlands National Park. Because only about half of the non-thistle plant cover within and around infested areas was comprised of native species, there was a high risk of secondary invasions. One year after chemical treatment of the thistle, the proportion of standing plant cover comprised of non-natives remained approximately the same in treated plots, even though it had increased in un-treated and some reference plots. Implications of these results for restoration and prioritization of control efforts will be discussed.

Making Technical Plant Community Descriptions Useable in the National Capital Region: Creating Field Guides (#32)

Judy Teague, Vegetation Ecologist & Project Manager, NatureServe, Durham, NC
Rob Riordan, Director of Marketing and Communications, NatureServe, Arlington VA 22209
Diane Pavek, Research Coordinator, NPS Urban Ecology Research Learning Alliance, Washington, DC
Giselle Mora, Science Education Coordinator, National Park Service, National Capital Region, Washington, DC

In partnership with the National Park Service and the Virginia, Maryland and West Virginia Natural Heritage Programs, NatureServe developed a draft classification of plant communities in 2006 for the National Capital Region, which follows the NPS standard of the National Vegetation Classification. This effort resulted in technical descriptions of about 150 communities in the 11 parks in National Capital Region. To facilitate the use of these data by park managers and the public, the Urban Ecology Research Learning Alliance, NCR's Research Learning Center, and NatureServe are designing reader-friendly and technical versions of field handbooks and brochures in printed and web-based formats. The spiral-bound field guides will accurately identify and increase knowledge about the incredible array of plant communities. The goals of this project are to communicate effectively about vegetation classification and the plant communities of the parks and to make data usable by NPS managers and the public.

RLC Goal III: Communicating Relevance and Providing Access to Research Knowledge (#78; **fourth in a set of six posters on NPS Research Learning Centers**)

Susan Teel, Director, California Mediterranean Research Learning Center, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA
Morgan Robertson, Research Learning Center Specialist, California Mediterranean Research Learning Center, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA
Jim Pfeiffenberger, Education Coordinator, Ocean Alaska Science and Learning Center, Kenai Fjords National Park, Seward, AK
Peter Armato, Director and Research Coordinator, Ocean Alaska Science and Learning Center, Kenai Fjords National Park, Seward, AK
Joy Marburger, Research Coordinator, Great Lakes Research & Education Center, Indiana Dunes National Lakeshore, Porter, IN
Wendy Smith, Education Coordinator, Great Lakes Research & Education Center, Indiana Dunes National Lakeshore, Porter, IN
Ingrid Nixon, Education Coordinator, Murie Science and Learning Center, Denali National Park and Preserve, Denali National Park, AK
Jerry Freilich, Director/Research and Monitoring Coordinator, North Coast and Cascades Research Learning Network, Olympic National Park, Port Angeles, WA

Research Learning Centers (RLCs) promote science literacy through a range of high quality science communication and educational activities. Education coordinators at RLCs create products and activities used by teachers, students, park resource managers, interpreters, concessioners, and the general public. These

include on-line multi-media approaches such as digital video, audio recordings, live distance education programs, and electronic field trips along with more traditional products such as project summaries, newsletters, brochures, resource and site bulletins, wayside and visitor center exhibits, and nature trail guides. RLC staffs hold workshops, seminars, and trainings on resource issues such as coastal erosion and restoration, avian ecology, saltmarsh loss, global climate change, wetland health, grassland restoration, invasive plant mapping and eradication, wildlife and vegetation monitoring, air quality, forest pathogens and pests, and a host of other topics relevant to parks. Through RLCs teachers and students engage in hands-on science activities in and about parks.

The Living RRAT (**#71; cd**)

Kathryn Thomas, Ecologist, U.S. Geological Survey Southwest Biological Science Center, Sonoran Desert Research Station, University of Arizona, Tucson, AZ

Nicole Tancreto, U.S. Geological Survey Southwest Biological Science Center, Sonoran Desert Research Station, University of Arizona, Tucson, AZ

Dustin Haines, Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN

Diane Larson, U.S. Geological Survey Northern Prairie Wildlife Research Center, St. Paul, MN

Ron Hiebert, National Park Service, Colorado Plateau Cooperative Ecosystem Studies Unit, Northern Arizona University, Flagstaff, AZ

Talise Dow, Center for Environmental Sciences and Education, Northern Arizona University, Flagstaff, AZ

The Restoration Rapid Assessment Tool (RRAT) is a decision support tool that allows resource managers to systematically evaluate the restoration potential of disturbed habitats. RRAT can be used to compare and prioritize potential restoration sites within a national park. RRAT works by combining environmental data, field collected for a set of ecological indicators, with a knowledge base previously developed from the input of restoration experts and scientific literature. RRAT is a stand-alone application based on the Esysx Corvid expert shell. The user provides information to the application on each habitat, as requested, and RRAT provides analytic output in graphic and text format. In this computer demonstration we illustrate the application of the initial module of the RRAT for analysis of restoration potential of disturbed riparian habitats. Various graphic output, documentation, and information supporting the use of RRAT will be also demonstrated.

Interpreting Denali's Landcover Types with Fabric (**Quilt**) (**#85/86; exh.**)

Lucy Tyrrell, Research Administrator, Denali National Park and Preserve, Denali Park, AK

Jon Paynter, GIS Specialist, Denali National Park and Preserve, Denali Park, AK

Denali Quilters created a huge quilt to interpret Denali National Park and Preserve's landcover types at large and small scales. The central map is based on a satellite image, in which 23 landcover types are different colored fabric pixels (13,600 pixels, each 3/4 in. on a side). Twenty-two blocks surround the map as an illustrated legend, each depicting a close-up view of selected plants and animals (e.g., nose and curl of horn of Dall sheep among mountain avens and rock) of a cover type (e.g., Dwarf Shrub–Rock). The blocks are bordered by the same fabric (color) as the pixels for the landcover type. The machine quilting outlines the park's boundary, highlights river drainages and topographic lines (contour interval of 2500 ft), and depicts tracks of wolf and caribou (two species not included in the border blocks). The quilt will be available to foster learning about ecological park themes, science, and art.

Monitoring Garlic Mustard Populations in Anticipation of Future Biocontrol Release (**#61**)

Laura Van Riper, Research Associate, University of Minnesota, St. Paul, MN

Luke C. Skinner, Natural Resources Specialist, Minnesota Department of Natural Resources, St. Paul, MN

Bernd Blossey, Associate Professor, Cornell University, Ithaca, NY

Garlic mustard *(Alliaria petiolata)* is native to Europe, but has become invasive in forested regions throughout the United States. Garlic mustard is a concern because of its ability to invade high quality forests, form dense populations, and decrease abundance of native species. The evaluation of potential biocontrol agents may result in the availability of *Ceutorhynchus* weevils for biocontrol. Accurate and well-designed monitoring is essential to provide data as to the success of the biocontrol agents and the status of the ecosystem.

Monitoring data can be used to determine if the target species has been reduced and if the native species are returning. Two years of garlic mustard monitoring data from 12 sites has provided information about garlic mustard population dynamics, a characterization of the plant communities associated with garlic mustard, and a documentation of the low levels of herbivory currently found on garlic mustard in Minnesota.

Creating a Model for Long-term Protected Area Management Capacity Building in Southern Mexico (#**25**)

George Wallace, Associate Professor, Colorado State University, Fort Collins, CO
Ryan Finchum, Assistant Director, Center for Protected Areas Management and Training, Department of Natural Resource Recreation and Tourism, Colorado State University, Fort Collins, CO
Peter Newman, Assistant Professor, Department of Natural Resource Recreation and Tourism, Center for Protected Areas Management and Training, Colorado State University, Fort Collins, CO
Rosa Maria Vidal, Assistant Director, PRONATURA, San Cristobal de Las Casas, Chiapas, Mexico
Jorge Macias, Professor, Colegio de la Frontera Sur (ECOSUR), San Cristobal de Las Casas, Chiapas, Mexico

This poster will present a new model for long term protected areas management capacity building in Southern Mexico. This project is part of the US–MEXICO TIES initiative conducted by Colorado State University's (CSU) Center for Protected Area Management and Training(CPMAT) in the Warner College of Natural Resources and Department of Natural Resource Recreation and Tourism. Through this program CSU has created an institutional partnership with Mexico' Colegio de La Frontera Sur, (ECOSUR). The purpose of the grant is to strengthen Mexico's capacity to improve the management of protected areas. Results of this three year project will include the development of a masters level training program (both degree and non-degree) in protected area management at ECOSUR and the development of a Center of Excellence for training protected area managers that would be attached to ECOSUR and serve all of Southern Mexico. Project partners include: CONANP, the principal federal protected area management agency in Mexico, PRONATURA, the largest conservation NGO in Mexico, IHNE the most active agency working with state protected areas, TNC, WWF, CI and the municipality of San Cristobal that is beginning to develop a local government natural areas program.

The "New" NPS Water Resources Planning Program (#**03**)

Don Weeks, Hydrologist, National Park Service, Water Resources Division, Denver, Colorado
David Vana-Miller, Hydrologist, National Park Service, Water Resources Division, Denver, Colorado

The development of Park Planning Program Standards in 2004 and draft Director's Order 2.1 (Resource Stewardship Strategy) was the impetus to revise the NPS Water Resources Division's Planning Program. Our program now offers two very different, but valuable planning products in place of our older products (Water Resources Scoping Reports and Water Resources Management Plans). The Water Resources Foundation Report is designed to address the water resource aspects of the general management planning process and in particular a park's Foundation Report. The Water Resources Stewardship Report is designed specifically to address the water resource needs in a park's Resource Stewardship Strategy. We further delineate these "new" planning products, place into context our program's products with those of other programs (e.g. the Watershed Condition Assessment Program), and present a big-picture view of the our program and other Natural Resource Program Center programs and how they relate to the NPS planning paradigm.

The International Ranger Federation: Protecting the Protectors (#**89; exh**)

Meg Weesner, Chief, Science and Resources Management, Saguaro National Park, Tucson, AZ

For fourteen years, the International Ranger Federation has fostered professional development and communication among rangers in parks and protected areas all over the world. Three charter ranger associations—from England, Scotland and the United States—formed this federation to encourage rangers in every country to form a ranger association and join the International Ranger Federation. Forty countries are now represented with member associations. The federation meets every three years and held its Fifth World Congress in Scotland in June 2006. A major focus of the group is the role and needs of field-level staff in ensuring that protected areas are more than just lines on a map.

National Park Service Research Learning Centers: Connecting Scientists with Parks and Science with People (#75; first in a set of six posters on NPS Research Learning Centers)

Leigh Welling, National Coordinator, NPS Research Learning Centers, West Glacier, MT
Jai Tatum, Visual Information Specialist, NPS Natural Resources Program Center, Fort Collins, CO

As part of the Natural Resource Challenge, Research Learning Centers (RLCs) help attract scientists, educators, private citizens, and funds toward new knowledge for parks. RLCs are creatively meeting the needs of managers, citizens, and partners for quality information about park resources by initiating, supporting, and implementing a wide range of research projects. They also provide bunk space, camp sites, laboratory and office space, access to park data, and other amenities that enable researchers to make maximum use of their time and funds. Educational programs use multiple approaches for communicating scientific results and engaging learners from all age groups in hands-on research activities. Partners include universities, schools, non-profit organizations, community groups, federal, state, and tribal agencies and a range of NPS programs. This poster provides a general overview of RLCs and an introduction to four follow-on posters that describe in more detail RLC goals and how they are being met.

Alliances for Science (#80; sixth in a set of six posters on NPS Research Learning Centers)

Leigh Welling, National Coordinator, NPS Research Learning Centers, West Glacier, MT
Rob Daley, Data Stewardship Coordinator, NPS Greater Yellowstone Network, Montana State University, Bozeman, MT
Margaret Beer, Data Manager, National Park Service Inventory and Monitoring Program, Fort Collins, CO
Angela Evenden, Research Coordinator, Great Basin Cooperative Ecosystem Studies Unit, National Park Service, Reno, NV

The Natural Resource Challenge was established in 1999 as a multi-year and multi-program initiative to increase science-informed resource management within the National Park Service (NPS). Many of the programs established under the Challenge have begun to collaborate in innovative ways that increase value and enhance the overall effectiveness of individual programs and the broader initiative of the Challenge. The added value and benefits of collaboration include reduced costs, increased efficiency and leveraging of funds to individual programs; shared expertise and resources among programs; increased and more effective communication with park managers, regional offices, and the public; increased data for decision-making, and new synergies and projects not individually possible. The relationships among three existing Challenge programs (Inventory and Monitoring Networks, Research Learning Centers, and Cooperative Ecosystem Studies Units) will be demonstrated graphically and examples of added value through collaboration will be given.

Interactive Exhibit Detailing Air Quality Issues at Sequoia and Kings Canyon National Parks (#36, cd)

Julie Winchester, Media Specialist, Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University, Fort Collins, CO
Annie Esperanza, Air Resource Specialist, Sequoia–Kings Canyon National Parks, Three Rivers, CA
Malinee Crapsey, Interpretive Specialist, Sequoia–Kings Canyon National Parks, Three Rivers, CA
Jenny Matsumoto, Park Ranger, Sequoia–Kings Canyon National Parks, Three Rivers, CA
Jeff Lemke, Graphic Design, CIRA, Colorado State University, Fort Collins, CO
Shawn Winchester, Animation and Graphic Design, Art Escapes, Mesa, AZ

This presentation will focus on a case study learning scenario that seeks to engage imagination and emotions in order to foster motivation and behavior changes in national park visitors. Of the many challenges facing developers of visitor center exhibits, usability and engagement rank high. The Sequoia Kings Canyon project uses a virtual environment to develop an understanding of air quality effects on park resources without focusing on fact memorization. Content chosen is relative to the park and surrounding areas and makes extensive use of rich media (graphics, animation, and video). An interactive user interface encourages random exploration of topics and activities that challenge the user to test their knowledge of energy conservation practices, are features designed to capture the attention of visitors that span a wide range of age and education levels. Visitors are encouraged to take their awareness of air quality issues into the out-of-doors environment and look for visual evidence of the problem.

Beaver Research and Monitoring in Voyageurs National Park, Minnesota (#01)

Steve Windels, Terrestrial Ecologist, Voyageurs National Park, International Falls, Minnesota

Beavers are an important natural component of Voyageurs National Park (VOYA), with some of the highest densities ever recorded in North America. Beaver are well documented as drivers of environmental change in temperate ecosystems and provide an important link in terrestrial food chains. Beavers also have special cultural significance to VOYA as they were the main furbearer targeted by the Voyageurs and other early settlers to the region. This poster presents an overview of past and present beaver monitoring and research in Voyageurs National Park, focusing primarily on three areas currently under study: 1) beavers as ecological indicators of effects of artificial water level management on large lake systems, 2) population dynamics of beavers in a boreal system, and 3) landscape-scale changes associated with beaver behavior and population dynamics. Preliminary results from data collected in 2006 will also be highlighted.

Jamestown: Helping to Define a Legacy (#02)

Tricia Wingard, Project Manager, Vanasse Hangen Brustlin, Inc., Williamsburg, VA
Scott Smizik, Environmental Planner, Vanasse Hangen Brustlin, Inc., Williamsburg, VA
Nancy Barker, Environmental Services Manager, Vanasse Hangen Brustlin, Inc., Williamsburg, VA
Dawn Frost, Preservation Planner, Vanasse Hangen Brustlin, Inc., Williamsburg, VA

Upgrading visitor experiences and facilities at the site of the first permanent English settlement of North America, Jamestown, required a visionary team who could detail possibilities, navigate regulations, assess environmental resources, and strategically execute plans. Hired by the Association for the Preservation of Virginia Antiquities and the National Park Service (NPS), Vanasse Hangen Brustlin, Inc. (VHB) worked closely with Carlton Abbott & Partners (CAP) to first produce a Development Concept Plan/Environmental Impact Statement (DCP/EIS) evaluating alternative strategies. VHB and CAP facilitated this process and successfully coordinated the large, interdisciplinary team to complete the necessary compliance. VHB's work continued through full design of the visitor center; archaerium; collections storage and parking; comfort/hospitality and interpretive venue facilities; and enhanced multi-modal transportation options. Throughout the development process, VHB provided survey, design, engineering, and construction oversight and monitoring in preparation for this year's 400th anniversary.

A Survey of Whitebark Pines at Rim Village, Crater Lake National Park, Oregon (#81; exh)

Carrie Wittmer, Assistant Professor, Oregon Institute of Technology, Chiloquin, OR

Whitebark pine, a high-elevation conifer, is threatened by white pine blister rust, insect infestations, and fire suppression. Increasingly, land managers are concerned about possible extirpation or extinction of whitebark pines. Because whitebark pines are considered keystone species for subalpine ecosystems, the loss of these important trees may also cause population declines for other high elevation species. The whitebark pines at the Historic Rim Village at Crater Lake National Park in Oregon commonly frame visitors' photos and are an important part of both the scenic and historic value of the area. The whitebark pines along the promenade trail at Rim Village were surveyed in July of 2006. The results demonstrated that approximately 20% of the whitebark pines at Rim Village are infected by blister rust. Continued monitoring, disease-resistant seed collection and propagation, and fire management can hopefully save the whitebark pines in the park for the enjoyment of future generations.

Integrating Science into Fire and Fuels Management: Influences to Success (#50)

Vita Wright, Research Application Program Leader, Aldo Leopold Wilderness Research Institute, Missoula, MT

Research results are often delivered on an ad hoc basis without really understanding influences to when agency managers use them. Attempting to understand individual and organizational capacities to apply science, I am studying influences to whether and when research is used from the perspective of potential research users. Incorporating input gathered during a day-capper session at the 2005 GWS Conference, I conducted in-depth interviews with 32 fire specialists and decision makers in the NPS and USFS. This paper presents interview responses on the role of research, limits of science, individual decision processes, history with and perceptions of science and scientists, organizational cultures regarding science and innovation, communi-

cation networks, and public influences to the use of fire science. With an increased understanding of these influences, research communicators will be able to more effectively tailor their efforts to share scientific products with agency fire and fuels managers.

Yearling Bighorn Sheep Movement from Badlands National Park: Occasional Sally or Dispersal? (#**42**)

Teresa Zimmerman, Ph.D. Student, South Dakota State University, Brookings, SD
Jonathan A. Jenks, Department of Wildlife and Fisheries Sciences, South Dakota State University, Brookings, SD
John T. Kanta, South Dakota Department of Game, Fish and Parks, Rapid City, SD
Robert W. Klaver, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD
David M. Leslie, Jr., U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Department of Zoology, Oklahoma State University, Stillwater, OK
Eddie Childers, Badlands National Park, National Park Service, Interior, SD

Bighorn sheep are highly gregarious, transmitting home range movements from older to younger generations, which appears to be a mechanism to minimize dispersal of juveniles. Yearlings generally adopt the home range of their maternal band, but between the ages of one and two may follow a ram to another area to join a different ewe band. Bighorn sheep were extirpated from the great Badlands National Park ecosystem by 1924 but were reintroduced in 1964. An augmentation of 23 bighorns followed in 2004. On 5 June 2006, 6 yearlings, representing the first generation offspring, moved from Badlands to central South Dakota and Nebraska. We determined that this 340 km movement represents that longest ever reported for bighorn sheep. We hypothesized that this movement was due to an absence of non-pregnant sub-adults, anestrous ewes, and rams in the subpopulation.