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Recent Advances in Pollution Prevention and Detection, Monitoring, and Climate Change Response

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There are many different challenges that national parks face when it comes to the surrounding bodies of water or the small creeks that flow throughout these protected lands. This session, Marine Ecology, was focused on presenting six different case studies on the effects of climate change, pollution, and monitoring of species in an aquatic environment. The following information is relevant to people of all aspects of life and gives great insight to those who wish to pursue careers related to the NPS. It also provides guidance to those already involved with the NPS and how to handle similar issues within the park.

Samantha Ladewig spoke on "Quantification of Microplastics in Southeastern Coastal and Marine Parks." Microplastics have become a large concern for our national parks. These small-scale plastics, which are also toxic, are being ingested by both land and sea animals. This increases the risk of these toxic pollutants to be carried on shore. The study took multiple samples of sand from a wide range of sites to actually see the amount of microplastics on our beaches and determine what actions should be taken by park management. Twenty percent of these plastics, considered offshore debris, put humans at risk of contamination from accidentally consuming seafood that had originally consumed microplastics. Eighty percent is considered onshore debris, which is caused by the effects of urbanization and large rivers or ocean currents bringing in local wastewater. The study concluded that microplastics of different quantities had made their way onto the national parks shoreline all across the southeastern coast.

Stephen Whitaker and Pete Raimondi talked about "Rocky Intertidal Monitoring at Channel Islands National Park Responds to Challenges of the Twenty-first Century." The monitoring program at Channel Islands, which began in 1982, is designed to detect the effects of climate change, disease, and introduced species. Originally, it had focused on threats to the intertidal due to harvesting, trampling, chemical spills, and rock overturning. These studies help determine management of species protection and marine protected areas. This study also sought feedback on revising protocol for sampling techniques to better address the needs of these areas.

Sheila McKenna presented a talk on "Monitoring Data Applied to Mitigating a Corallivore Outbreak in the National Park of American Samoa." The National Park of American Samoa is experiencing an extreme outbreak of *Acanthaster Planci,* more commonly known as the Crown

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of Thorns starfish. This starfish can consume up to sixty five square feet of coral reef each year. Using ArcGIS and data that had been recorded over the past six years, the park was able to determine what areas of coral reefs received priority attention. The starfish were then euthanized to help bring down populations. Some people questioned whether or not we should interfere or let a natural outbreak take its course.

Steven Fradkin and William Baccus wrote a paper on "Trends in Intertidal pH on the Open Coast of Washington State: Implications for Ocean Acidification." Beginning in 2010, Olympic National Park set up multi-probe data sondes near intertidal zones on the outskirts of the park to monitor the pH of the ocean throughout the year. The data was relatively consistent, with high variability during summer months and a stable winter season.

Tahzay Jones presented a paper on "Japanese Tsunami Debris Response Efforts and Impacts in National Parks." On March 11, 2011, Japan experienced one of the worst earthquakes to ever hit East Asia. The 9.0-magnitude quake triggered tsunami waves that reached heights of 133 feet. This caused mass amounts of debris and invasive species to wash upon the west coast of North America. In response, the NPS has held coastal cleanups, monitoring of species, and community education.

Lewis Sharman gave a talk entitled, "The Ocean is Different: Coastal Variability and Limits to Climate Change Detection in Glacier Bay, Alaska." There are 22 stations throughout southeastern Alaska that observe trends through different seasons. There is a strong spatial gradient and plenty of annual variability. Temperature varies a lot, along with some salinity anomalies. It is difficult to detect trends over time due to the fact that the ocean is largely buffered. Although little change is detected, it was determined that slow change is better than fast and gives us time to respond and adapt. Monitoring will continue regardless of insufficient results.