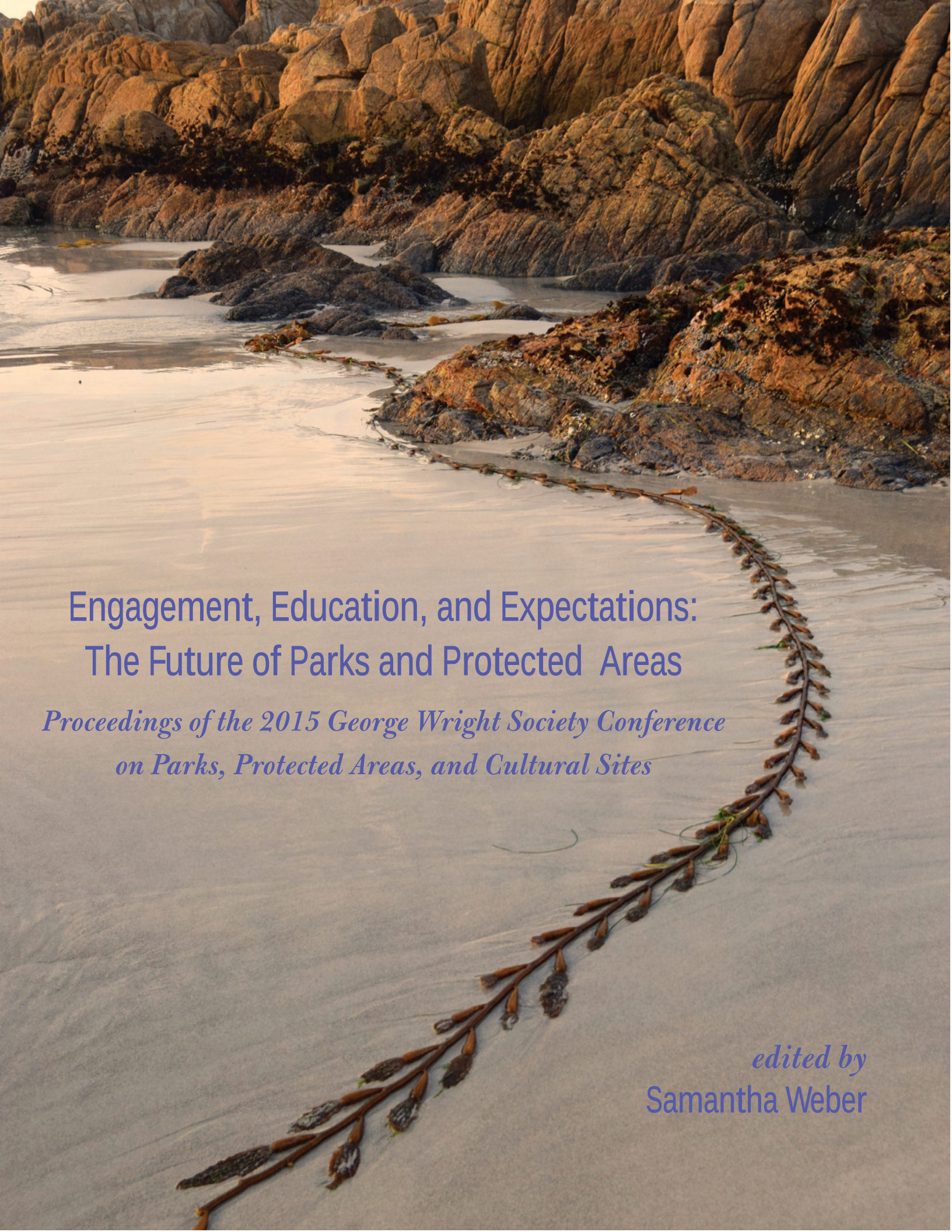

Engagement, Education, and Expectations: The Future of Parks and Protected Areas

Proceedings of the 2015 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites

edited by

Samantha Weber


GWS2015
ENGAGEMENT, EDUCATION & EXPECTATIONS
THE FUTURE OF PARKS & PROTECTED AREAS
OAKLAND, CALIF.

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On the cover
Asilomar State Beach, California, part of Asilomar Marine Reserve. Photo by Samantha Weber.

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Organized by Nina S. Roberts; edited by Nina S. Roberts and Samantha Weber

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Introduction and Acknowledgments

David Harmon, George Wright Society, PO Box 65, Hancock, MI 49930-0065; dharmon@georgewright.org

The George Wright Society Conference on Parks, Protected Areas, and Cultural Sites has been held regularly for over 30 years. In 2015, for the first time in our history, we brought the meeting to the San Francisco Bay Area—the boyhood home of our namesake, George Melendez Wright. GWS2015 took place March 29–April 3 in downtown Oakland, and was the eighteenth in this series of conferences whose origins date back to 1976. That year saw the first US National Park Service science conference, and another followed in 1979. Beginning in 1982, the GWS became the organizer and primary sponsor of the conferences, expanding them to include all fields in natural and cultural resources—not just science—and all kinds of parks, protected areas, and cultural sites—not just U.S. national parks. The GWS biennial has become the USA's largest interdisciplinary conference in the field. It is the only such conference to actively seek participation from across the entire spectrum of disciplines and activities that are necessary for successful protected area management.

I am pleased to say that, in terms of attendance, GWS2015 rebounded nicely from the unique challenges that affected the previous meeting. GWS2013 had been significantly affected by mandatory budget cuts and U.S. federal travel restrictions that went into place just days before the start of the conference. Happily, none of that was in play this time, and we returned to our usual mix of public agency employees, tribal members, professionals from the for-profit and nonprofit sectors, professors and students, and independent conservation practitioners.

Having mentioned our namesake, here are a few words about him for those who are not familiar already. George Melendez Wright was the first scientist to work for the U.S. National Park Service. He was active in the late 1920s and early 1930s. He founded the agency's scientific programs in a short but effective career that was ended by a tragic automobile accident. Known for his keen ecological insights and winning personality, Wright was a strong proponent of putting "resources first" in parks and fought for ecological integrity in protected natural areas. More than this, as a Hispanic American he respected the value of cultural diversity, and understood the importance of marshaling natural and cultural resource disciplines in concert to achieve park management goals. Today, the GWS's work advances Wright's visionary principles.

In bringing these biennial meetings off the George Wright Society is always in the debt of a capable conference steering committee, co-chaired this time by Melia Lane-Kamahele and Jer-

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ry Mitchell, The other committee members were Matthew Browning, David Graber, David Parsons, Ryan Sharp, Chris Spence, Jenn Thomsen, and Lynn Wilson. The members of the GWS Board of Directors are Nathalie Gagnon, president; Jerry Mitchell, vice president; Ryan Sharp, treasurer; David Parsons, secretary; and David Graber, Barrett Kennedy, Armando Quintero, Chris Spence, Jan van Wagtendonk, and Lynn Wilson, at-large members. Matthew Browning was the graduate student representative to the Board at the time of the conference, succeeded later in 2015 by Gina Depper.

Our principal organizational sponsor was once again the U.S. National Park Service, and we were grateful to have VHB, Hitachi Consulting, and the Santa Ynez Band of Chumash Indians as conference supporters. Special appreciation goes to several people who were instrumental in helping obtain sponsorships for GWS2015. From the National Park Service: Ray Sauvajot, Stephanie Toothman, and Julia Washburn. From the Santa Ynez Band of Chumash Indians: Freddie Romero and Veronica Sandoval. From VHB: Rosemary Morris. From Hitachi Consulting: Francis Priznar. Thanks one and all!

We also thank the members of our Indigenous Involvement Working Group for their many hours of discussion and planning of activities to engage Indigenous people at GWS2015: Nathalie Gagnon and Melia Lane-Kamahele (co-chairs), Freddie Romero, and Angela Mooney D'Arcy. Once again Fawn YoungBear-Tibbetts curated the Indigenous Film Night. The GWS also thanks Timia Thompson for coordinating on-site activities related to the George Melendez Wright Student Travel Scholarships. Last but not least, we thank Samantha Weber for once more bringing her editorial talents to the service of these proceedings.

The next conference will be held April 2–7, 2017, in Norfolk, Virginia.

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Monitoring Landbirds in National Parks: Understanding Populations, Migratory Connectivity, and Climate Change

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Abstract

Identifying the proximate causes of avian population change is important in developing effective conservation goals and strategies. To address this need, in 1989 The Institute for Bird Populations (IBP) created the Monitoring Avian Productivity and Survivorship (MAPS) Program to measure and monitor the demographics of North America's landbirds. The national park system has been an integral partner in this program: 83 MAPS stations have operated in 36 national park sites, with an additional 563 stations on other public lands. Overall the program has collected more than two million capture records from over 1,300 stations in nearly every state and Canadian Province. Demographic monitoring provides insight into the life history stages at which population change is taking place. MAPS data from parks and protected areas have also contributed to recent studies of avian response to climate change and migratory connectivity. Both areas of study will likely continue to be important elements of conservation planning inside and outside of national parks throughout the coming decades.

Introduction

Twenty-five years ago, during the Yosemite Centennial Symposium on the University of California, Berkeley campus, IBP described the results from the first season of a new kind of avian monitoring program (DeSante 1990). The fledgling initiative, MAPS, was intended to examine the key demographic parameters ("vital rates") that regulate bird populations and to identify, where possible, the factors responsible for species declines. The program began with sixteen stations spread across several regions of the USA and, the following year, initiated a long and fruitful relationship with the National Park Service (NPS), with the first station on NPS land established in Yosemite National Park (Table 1).

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Table 1. Units of the National Park Service with past or current MAPS Stations	
Acadia National Park	Kobuk Valley National Park
Amistad National Recreation Area	Lake Mead National Recreation Area
Big Thicket National Preserve	Lassen Volcanic National Park
Cabrillo National Monument	Mammoth Cave National Park
Cape Cod National Seashore	Mesa Verde National Park
Capital Reef National Park	New River Gorge National River
Chiricahua National Monument	Noatak National Preserve
Congaree National Park	Oregon Caves National Monument
Coronado National Monument	Organ Pipe Cactus National Monument
Denali National Park	Point Reyes National Seashore
Devils Postpile National Monument	Redwood National Park
Fort Bowie National Historic Site	Sequoia National Park
Gateway National Recreation Area	Shenandoah National Park
Grand Teton National Park	Tumacacori National Historical Park
Grant-Kohrs Ranch National Historic Site	Valles Caldera National Preserve
Great Smoky Mountains National Park	Vicksburg National Historical Park
Indiana Dunes National Lakeshore	Yosemite National Park
Kings Canyon National Park	

A quarter of a century later, MAPS is a thriving network of bird monitoring stations that has comprised more than 1,300 stations (about 350 of which operate per year) in nearly every U.S. state and Canadian province. Although IBP administers the program and operates some stations, the vast majority of stations are staffed and supported by a wide variety of by federal, state, and other agencies or volunteers, and staff from non-governmental organizations. MAPS data have been used to further avian conservation efforts in many ways, and the program has helped train hundreds of cooperators, from professional ecologists to volunteers and interns, in the concepts and methods of bird banding, demographic monitoring, and conservation.

MAPS uses a standardized protocol with a system of fine-mesh mist-nets operated at fixed locations to capture birds during the summer nesting season. A typical station is comprised of 10 nets spread over 20 hectares. MAPS operators band the birds and collect information on their age, sex, body condition, and reproductive status. Captured birds are given a lightweight, numbered aluminum leg band and released unharmed. Birds that are subsequently recaptured provide especially valuable information on survival rates.

Why monitor birds?

Birds are important components of the environment, providing ecosystem services such as pollination, seed dispersal, and insect and rodent control. Birds are also useful indicators of environmental change. Before the "canary in the coal mine" was a cliché, miners really did use canaries, goldfinches, and other species to detect toxic gases such as carbon monoxide, carbon dioxide, or methane before they reached levels that were fatal to humans (see, for example, Burrell and Seibert 1916). Bird population declines in the 1960s and 1970s, such as peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*), provided some of the first indications of the dangers of DDE, DDT, and other environmental contaminants. Today, birds are being used in many areas of research to monitor the local and global effects of habitat loss, drought, and climate change (Both et al. 2004; Tingley et al. 2012).

Relative to other taxa, several factors make birds excellent barometers of ecosystem integrity:

- Abundance: birds are relatively diverse and common, and present in nearly every ecosystem in the world, from arid deserts to humid tropical forests and frigid arctic and Antarctic regions.
- Observability: birds are often brightly colored, highly visible, vocal, and usually diurnal, which makes detecting, identifying, and tallying them easier than many other types of animals.
- Rapid metabolism and high trophic position: many bird species, being secondary consumers (i.e., they eat other animals, including other birds, rodents, or insects) may bio-accumulate compounds, including toxins, that are present in the organisms they eat. This was the case with DDE and DDT for many birds of prey.
- Broad appeal to the public: this aspect of the potential utility of birds to scientific inquiry should not be underestimated. Citizen science programs such as the National Audubon Society Christmas Bird Count (which has been operating since 1900), the Breeding Bird Survey (BBS), and e-bird (www.ebird.org) tap into the great love of the public for birds with much success. Every year, tens of millions of records are submitted to these long-term datasets by volunteers and professionals. There are few similar programs for other types of animals, and certainly none as widespread and long-lasting.

Recently, bird populations and their distribution, habitat, and diet have been shown to be effective barometers of climate change and habitat alteration (Gregory and Strien 2010).

What is gained from demographic monitoring?

The MAPS program utilizes demographic monitoring, which uses capture and recapture data from a population to estimate or index key demographic parameters (often referred to as "vital rates") such as productivity, survivorship, and recruitment. These vital rates are the proximate causes of population change. Once vital rates are understood, researchers can link proximate causes of population change to ultimate ones, such as habitat loss, weather, or climate to make more informed conservation and management decisions.

MAPS and the NPS

Strengths of MAPS data include the length of data collection (some stations have been continuously operating for more than 25 years); the breadth of the program, which has operated in nearly every state and Canadian Province; the continental standardization of procedures and protocols; and the size of the dataset which exceeds two million avian capture records. MAPS has operated stations in 36 units of the NPS where the program has captured more than 240,000 individual birds of 335 species. IBP researchers and independent MAPS operators have published nearly 100 peer-reviewed and other papers and technical reports using data collected exclusively or partially at national parks.

At the scale of the individual national park, Yosemite National Park provides an example of how MAPS can help park managers fulfill important monitoring, management, and outreach goals. Yosemite's MAPS stations, which have been running continuously since 1990, documented the local extirpation of a California state-endangered species, the willow flycatcher (*Empidonax trailii*) as a breeding species in the park, providing important information for understanding the species' decline across the Sierra Nevada region (Siegel, Wilkerson, and DeSante 2008) and stimulating possible restoration efforts within the park and elsewhere in the region. Other products of Yosemite's MAPS program have included documenting range-wide longevity records

for several species of wild birds (Rowan et al. 2014), assessing long-term population trends and demographics for dozens of bird species within the park, and a current effort to understand the effects of annual weather variation and climate change in the park on productivity of nesting songbirds. The program has also yielded a hugely popular and successful outreach program involving the training of young ornithologists and on-site interpretive bird banding demonstrations that provide visitors, youth, and park staff opportunities to experience "science in action."

At larger spatial scales, MAPS stations in the national parks contribute data to regional and continent-wide efforts to better understand landbird ecology and inform scientifically sound conservation efforts. Understanding migratory connectivity—identifying where, within a species' overall wintering range, a particular breeding population actually spends the winter—has been a major challenge, impeding bird conservation efforts. Data and feather samples from MAPS stations in Denali National Park, Yosemite National Park, Mount Lassen National Park, Sequoia and Kings Canyon National Parks, and Point Reyes National Seashore (in addition to several National Wildlife Refuges and National Forests) contributed to two recent studies that pioneered the integration of genetic and stable-isotope data (Rundell at al. 2013) and the use of high-resolution genetic markers (Ruegg et al. 2014) to identify genetically distinct groups of a migratory bird, the Wilson's warbler (*Cardellina pusilla*), and to link its breeding and wintering populations (Figure 1).

MAPS data from the national parks have also contributed greatly to ongoing efforts by IBP researchers to analyze the vital rates of more than 150 species from data gathered during the first fifteen years of the MAPS Program. In many cases these analyses yielded information regarding the demographic causes of population declines, and thus indicated whether conservation efforts would best be focused on the breeding or non-breeding grounds, or both. Several interesting patterns have emerged from these analyses. First, low survival of adult and first-year birds is often as or more important than low productivity in driving observed population declines, a pattern that highlights the importance of conserving migratory birds' wintering grounds and migration routes. Second, conditions on wintering grounds and migration routes affect survival rates and can even affect birds' reproductive output the following summer. This is known as a "carry-over effect" (Norris et al. 2004). Many of the results from previous avian demographic studies are already publicly available, and can help national park managers and researchers see the results of their participation in the larger MAPS Program.

Another important aspect of MAPS in national parks is that, with the exception of fire management, there is relatively little intentional alteration of the landscape by park policies. Compared to national forests, Bureau of Land Management landholdings, and Department of Defense, national parks are relatively pristine areas that can serve as controls for monitoring demographic rates of landbirds and comparing those rates to the rates on other federal areas that are being more intensively managed, for example, for timber production, livestock grazing, or military training. National parks can be very important for understanding the effects of these actions.

The MAPS Program provides an efficient, cost-effective, collaborative, and scientifically-rigorous basis for decision-making that can inform bird conservation and land management in national parks and elsewhere across North America. MAPS is a powerful tool for identifying factors that drive bird populations, and providing insight into where and when in the annual life-cycle conservation efforts are likely to be most effective. In addition, MAPS enables national park managers and scientists to understand how global forces such as climate change and habitat loss contribute to avian population change, and what can be done to reverse declines.

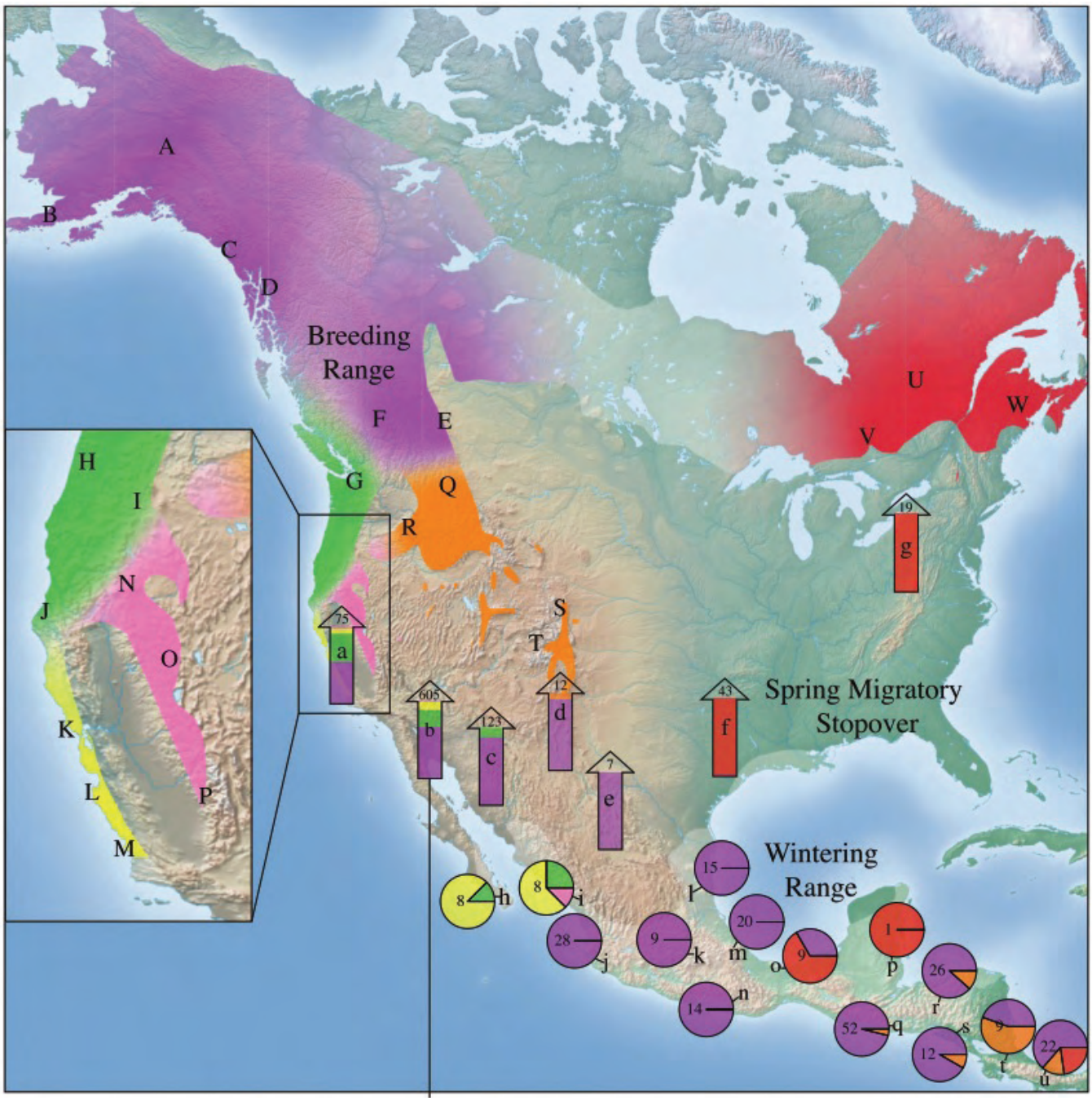

Figure 1. IBP scientists and colleagues from several disciplines recently showed how high-resolution genetic markers can be used to identify distinct groups of Wilson's warbler and assess regional drivers of demographic trends. The figure shows distinct subpopulations (different colors) and migratory routes and timetables of spring migration. The MAPS and MoSI Programs, including MAPS stations from at least six national park units, played a critical role by providing coordinated sample collection at many geographically diverse sites. This promising use of new genetic techniques may revolutionize our understanding of migratory connectivity (figure courtesy of Kristen Ruegg et al. 2014).

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3

Communities of Practice Beyond Our Borders: Building an International Program at Yosemite National Park

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Introduction

At nearly 100 years old, the National Park Service (NPS) is a mature organization with tremendous expertise and experience protecting and managing natural and cultural resources. In the first 100 years, our efforts focused on building a park system and honing management skills. As we look toward our second century, we recognize that not only do we have much to share, we have much to learn about the protection of natural and cultural landscapes around the world. Participating in the global conservation community through an international program is Yosemite's attempt to do just that.

The Call to Action, a nationwide initiative outlining the future of the NPS, identified themes important to maintaining the agency's relevancy and continued adaptation to contemporary challenges. A Call to Action identified adopting a landscape-scale approach to planning and partnerships, because many of the emerging challenges we face involve processes that originate outside the boundaries of our parks. Climate change is the paramount example and clearly calls for large-scale planning and coordination with parks and other protected areas in order to maintain biodiversity and healthy ecosystems. Working with the international conservation community through sister park relationships and technical exchanges builds a foundation for these larger levels of collaboration and problem solving.

At Yosemite National Park, we recognize our responsibility as one of the oldest and most complex parks in the United States. Yosemite's status and capacity provide both an opportunity and an obligation to share the park's extensive experience. The idea of national parks—federally owned land set aside to protect natural and cultural resources—was born with the Yosemite Grant 150 years ago. Since that time, the park idea has spread around the world and in the process created a world-wide conservation community. Yosemite is part of that community and shares a mission and a commitment to preserve natural and cultural resources for the future.

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International Affairs program overview

Although Yosemite had several sister parks and annually plays host to as many as 50 visiting delegations from all over the world, it was not until 2013 that Yosemite established an International Affairs (IA) program. This paper outlines how we built the program, identifies a number of its key elements, and discusses how the program benefits Yosemite and its staff. It also briefly touches on why the park values participation in the global conservation community.

Yosemite's 2020 Strategic Vision identifies the development of an international affairs program as a priority action to help achieve the park's goal of being a leadership and learning campus for the NPS. This goal launched a two-year effort to establish a sister park on each continent, increase participation in international technical exchanges, and promote the international visibility of the NPS.

Foundational elements of the International Affairs work group. The IA program was formed through the collaboration of Yosemite staff and others from the Yosemite community, including staff from the park's concessioner, our nonprofit partner the Yosemite Conservancy, the University of California at Merced, and several retired employees. These individuals were recruited through "all comers welcomed" meeting notices in the park's electronic newsletter. Involvement in the program is a collateral duty, which results in a high level of commitment from those who participate.

Many of the working group participants have long-standing connections to other countries through personal travel, family ties, and work or academic experience. This diversity quickly became one of the program's biggest assets by providing personal contacts and on-the-ground knowledge of sister park candidates.

Initial discussions at the meetings quickly made it apparent that the IA program needed a guidance document to establish the dimensions of the program and to identify short and long term goals. To fulfill this need, the team developed a charter, which helps focus and guide the program's projects. It also provides a mechanism and guide for other park staff to understand what the group is responsible for, how it relates to park management, and the program's strategic goals. Other guidance documents developed by the group include an evaluation form for sister park nominees, a work plan, and a travel directive. All of these documents make up the program's foundation.

Program components. The International Affairs Program is comprised of three components: formal sister parks, technical exchanges, and visiting delegation hosting. Although each component can have separate activities, it is important to note that each element relates to the others. For example, hosting visiting delegations has led to interest in sister park arrangements and technical exchanges. In one instance, hosting a World Heritage Fellow from Jordan led to a technical exchange, which, in turn, is developing into a longer-term sister park relationship.

Sister parks. The sister park program currently includes four officially designated sister parks: Huangshan and Jiuzhaigou national parks in China, Torres del Paine National Park in Chile, and Berchtesgaden National Park in Germany. Each park has an official arrangement signed by participating park superintendents (or the equivalent), which establishes a mutual commitment to share knowledge and collaborate in areas of common interest. Typically, the agreements have a three- to five-year term. Once the sister park arrangement is in place, representatives from both parks jointly develop an action plan which outlines the kinds of projects the parks plan to work on together. The action plans also describe the terms and frequency of staff exchanges.

Several sister park arrangements are currently in the last stages of preparation. These include Wadi Rum in Jordan, famed for its climbing and a park with which Yosemite has had a technical exchange; Parks Nepal, which will make Yosemite sister to three Nepalese national parks, Sagarmatha, Langtang, and Chitwan; Ngorongoro Crater Conservation Area in Tanzania; and

Lake Hovsgol National Park in Mongolia. Sister park relationships between Yosemite and Mount Aspiring National Park in New Zealand and Cumbres de Monterrey in Mexico are in more preliminary stages of development, but with a 2016 goal for completion.

Keys to success and lessons learned

Although Yosemite's IA program is still in its early stages, a number of key lessons have emerged that can be used to inform IA programs elsewhere. For example, prior to the establishment of the IA workgroup, sister park relationships often went dormant when key staff left Yosemite. In order to establish sustainable relationships, even after employee turnover, the IA program remains inclusive to all interested staff and encourages multiple Yosemite liaisons for each sister park. Additionally, park arrangements, contacts, and action plans are available to the entire IA team. Other key components include staff commitment (at all levels), partnerships, and program funding.

Commitment from senior management and staff. Yosemite's Executive Leadership Team (ELT) not only recognized, but embraced the idea that Yosemite is part of a larger, global community of parks and protected areas that are working to preserve the world's natural and cultural resources. The strategic decision to increase the park's role in international conservation through developing a robust IA program underlies all of the subsequent IA program efforts.

Staff commitment is also important. By making participation open to staff from all career levels and divisions—from first-time seasonals to long-term NPS veterans, from Facilities to Resource Management and Science divisions—the IA work group has attracted people with international expertise and high levels of personal interest. The IA meetings are well-attended and the work of managing the program is shared readily among participants.

In addition, as with other relationships, it takes time to build the mutual understanding and trust necessary to develop useful, collaborative projects with sister parks. A sustained commitment from senior management and the IA team are essential to building long-term, mutually beneficial relationships with sister parks, as well as conducting useful technical exchanges, and improving the park's capacity to accommodate visiting delegations.

Partnerships. Partnerships have played an important role in Yosemite's effort to build international relationships. We work closely with members of the NPS International Affairs Office in Washington, DC. They provide key advice on the diplomatic and geopolitical issues. The Washington office also provides important connections to senior staff at parks in other countries, guidance for managing official international arrangements, travel requirements, and advice on coordination with other federal agencies, including the U.S. State Department and the U.S. Agency for International Development.

Yosemite's IA also team works closely with UC Merced staff on our international relationships. The Yosemite Leadership Program (a park leadership/management program on campus) recently assisted with identifying a candidate sister park in Mexico. Additionally, Yosemite is also working with Global Parks and the Mongol Ecology Center, among other nonprofit groups. External organizations can provide resources, in-country contacts and expertise to round out what already exists in Yosemite.

Funding. One of the most significant challenges to the program is obtaining sufficient funding to support travel and hosting expenses. Solidifying relationships with sister parks inevitably requires in-person exchanges, which can hinge on the availability of funds. A grant from the Yosemite Conservancy, the park's official philanthropic partner, provided critical funds support travel to Germany, Tanzania, China, and Nepal to finalize sister parks agreements in those countries and identify on-the-ground collaborative projects. While the IA work group will continue to seek grant money from the Conservancy and other donors, it is also important to recognize that selection of sister parks (or parks for technical exchanges) may be done strategically to take

advantage of funding from other official U.S. sources. For example, the U.S. State Department has funded some of Yosemite's exchanges with Torres del Paine as part of a larger agreement to provide technical assistance to Chile.

It is important to mention that technology offers a means to reduce some of the need for travel. Yosemite's park liaisons have been able to utilize Skype, Facebook, video training and conferencing, and telephone calls as means of on-going contact with representatives in our sister parks. Although not a substitute for face-to-face meetings, these modes of communication are important ways to augment travel and can facilitate effective dialogue.

Conclusion

As one of the world's most widely recognized national parks—and the very place where the idea of the "national park" was born—staff at Yosemite recognize and embrace a sense of responsibility and opportunity to collaborate on park management and conservation around the globe. With its large staff and on an unusually large range of management issues, Yosemite is well-positioned to share its experience with other parks.

The IA program serves as a cross-cutting initiative that addresses several other park-specific goals outlined in the *Strategic Vision*, such as developing leadership skills among staff, fostering workplace enrichment, encouraging innovation, and building quality partnerships. These are positive outcomes for individual staff, Yosemite as whole, and the National Park Service itself.

We also recognize that today's world is smaller and more connected than ever. In an era of tight budgets and close scrutiny of government agencies, working with parks in other countries in a "community of practice" leverages our existing resources and expands our capacity to carry out our mission.

Seeking connections to other parks and protected areas (in order to share expertise, collaborate on solutions, and to devise innovative strategies) to address today's conservation issues is necessary in a world of boundary-crossing challenges, such as climate change and landscape connectivity. Forming international partnerships through sister parks and technical exchanges can leverage our efforts to better understand and manage natural resources.

4

How People Learn Science: Taking a Whole-Life Perspective

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The nature of science learning is changing worldwide as individuals have unprecedented access to science education opportunities from cradle to grave, 24-7, through an ever-growing network of educational opportunities beyond schooling, including visits to national parks and preserves, libraries, museums, zoos, aquariums and science centers; access to diverse broadcast media, such as television, podcasts or film; participation in organized youth programs, such as 4H, after-school or summer camps; adult programs, like Road Scholar or hobby groups; and, increasingly, a vast array of digital media, such as games, the internet and social networks (Falk and Dierking, 2010; NSB 2015; Pew 2013). In recent decades, dependence on broadcast and print media for science information has declined precipitously, while use of digital tools has grown exponentially (NSB 2015). Regardless of what resource people use, though, a hallmark of this revolution in science learning has increasingly become a learner-centered rather than an institution-centered phenomenon. This change has not been fully understood or embraced by either the educational establishment or the general public.

School-first paradigm

The scientific research and education communities have long had a goal of advancing the public's understanding of science. The vast majority of the rhetoric, resources and research on this issue in recent years have revolved around the failure of U.S. school-aged children to excel at mathematics and science, particularly as compared with children in other countries. Most policy solutions for this problem involve improving the practices and escalating the investment in schooling, particularly during the pre-college years. This emphasis is based on the widely held assumption that children do most of their learning in school and that therefore the best route to long-term public understanding of science is through successful formal schooling. This "school-first" paradigm is so pervasive that few scientists, educators, policymakers or members of the public question it, even when the facts increasingly don't seem to support it.

Take, for example, the performance by U.S. school-aged children on international tests, like the quadrennial Trends in International Mathematics and Science Study (TIMSS) and the biannual Programme for International Student Assessment (PISA). For more than two decades,

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U.S. elementary-aged children perform as well as or better than most children in the world, but the performance of older U.S. children has been mediocre at best. On the most recent TIMSS science exam, U.S. fourth graders were out-performed by only one country in the world, Korea, while U.S. eighth graders were right in the middle of the pack of the 43 participating countries. By 12th grade, U.S. students were among the worst in the world, out-performing only students from Cyprus and South Africa (TIMSS 2012). On the PISA test, U.S. eighth graders also performed middling, ranking 20th out of the 34 participating countries (PISA 2012). These results create problems for the "school-first paradigm" for two reasons.

First, why is it that the USA performs so well in the early grades but then declines so percipitously in later grades? Most in the U.S. science learning community agree that the quality of school science education in America is better at the secondary level than at the preschool and elementary levels. Recent statistics show that only about four percent of U.S. school teachers of kindergarten through second grade (K–2) have undergraduate majors in science or science education and many have taken no college-level science courses at all (Fulp 2002). However, the quality of science instruction at that level is almost a moot point since it so rarely occurs. Indicative of the situation nationwide, a study of California elementary schools found that 80% of K–5th grade multiple-subject teachers who are responsible for teaching science in their classrooms reported spend 60 minutes or less per week on science; 16% of teachers reported spending no time at all on science (Dorph et al. 2011). And with increasing emphasis on math and reading high-stakes testing, the time spent on science in the elementary grades continues to decline. Consistent science instruction in U.S. schools only begins at the middle school level when every student takes at least one or two science courses, usually taught by individuals with some science background. Thus, the only time when U.S. children do well internationally is during the time when effectively no science instruction occurs in school.

The second interesting challenge to the school-first paradigm comes from another set of international comparisons, but this of adults rather than youth. Over the same twenty year period, U.S. adults have consistently outperformed their international counterparts on science literacy measures, including adults from South Korea and Japan, as well as Western European nations such as Germany and the U.K. In the most recent assessments, U.S. adults were out-performed by only one country, Sweden (NSB 2015). Although there is still considerable room for improvement in Americans' understanding of science, our consistent success on these international measures of science literacy is worth taking note of. In particular, if schooling is the primary causative factor affecting how well the public understands science, it is difficult to explain the sudden reversal in fortunes of U.S. performance after the cessation of schooling.

The truth is, these U-shaped results cannot be adequately explained if we assume that schooling alone is responsible for Americans' science learning. We cannot fully explain why young children do well or why the science literacy of the U.S. general public suddenly rebounds after high school. Of course all of these tests, both for school-aged children and adults, are flawed, measuring relative performance based upon a set of standardized questions. For better or worse, these are the tests on which international comparisons are made and they do provide a consistent, if flawed, frame of reference. Accordingly, we should at least consider other possible explanations, including the fact that the U.S. has the most extensive informal science learning infrastructure in the world (Falk and Dierking 2010; NSB 2015).

Free-choice science learning

A 2009 report by the National Research Council documents the importance of lifelong sources of learning and describes a range of evidence demonstrating that even everyday experiences, such as a walk in the park, contribute to people's knowledge and interest in science and the environment,

as do visits to settings such as national parks, science centers, and botanical gardens. Even more common is the science people learn while engaged in efforts to satisfy their own personal need to know. Sometimes the need is a situational and fleeting curiosity. Other times learning is deep and extended, as when individuals learn science to support pursuits such as gardening, cooking, auto repair, birding or star gazing. This kind of learning, called free-choice learning, describes the learning people do every day throughout their lives not because they have to but because they want to. Free-choice learning is non-linear and self-directed and occurs when individuals have primary responsibility for determining the what, when, where, how, why and with whom of learning. Although the term free-choice learning does not define the *where* of learning, currently most free-choice learning occurs outside of the formal education system.

Evidence for the importance of free-choice science learning comes from many sources, but some of the best documented relate to public learning from experiences at science centers. For example, decades of research at the at the California Science Center in Los Angeles have shown that roughly two-thirds of Los Angeles residents have visited the science center since it was renovated in 1998, including residents of all races and ethnicities, neighborhoods, incomes, and education levels. A series of random telephone surveys in Los Angeles have shown that a large majority of these former visitors, in fact 95%, self-reported that the experience increased their understanding of science and technology, as well as piqued their interest in science and prompted further inquiries after the visit (Falk and Needham 2011). Consistent with these findings, and even more definitive, are data from a recent international investigation of the role of science centers on public understanding of science. Results from a random sampling of 11,881 residents of 17 communities with active science centers in 13 countries, revealed that individuals who visited science centers had significantly greater science understanding, greater interest and curiosity, more participation in free-choice science leisure activities, and were more likely to identify themselves as science-capable than did individuals who did not visit. Results from a random sampling of 11,881 residents of 17 communities with active science centers in 13 countries revealed that individuals who visited science centers had significantly greater science understanding, greater interest and curiosity, more participation in free-choice science leisure activities, and were more likely to identify themselves as science-capable than did individuals who did not visit science centers. Even when potential self-selection biases such as household income, education level and prior interest were taken into consideration, the roughly half of the population of these communities who visited science centers evidenced significantly higher science knowledge and understanding than did the half of the population who did not visit (Falk et al., forthcoming).

Considerable attention has been focused lately on the role of out-of-school experiences in supporting children and youth science learning. Data from a variety of sources is accumulating to show that participation in after-school youth programs such as 4-H, Girls, Inc. and Boys and Girls Clubs significantly enhance a range of key educational outcomes, including interest and engagement in science-related learning, as well as success in school (NRC 2015). Although the number of young people enrolled in afterschool and summer programs has skyrocketed over the last decade, with currently one in five children participating in such programs, supply is not meeting the demand, particularly in terms of science programing, with only one-third of the national need being met by existing programs. This reality reflects the growing disparity in access to quality, free-choice experiences highlighted by the now classic research showing that much of the current "performance gap" between high and low income youth can be attributed to summer experiences, or more accurately lack of summer experiences, rather than in-school opportunities (cf. Alexander, Entwisle and Olson 2007).

Historically, the majority of attention paid to free-choice science learning has been focused on short-term experiences, like visiting a science museum, zoo, or aquarium, or watching a science

television show such as NOVA. Although these science learning experiences are important contributors to the public's science literacy, they represent only the most conspicuous part of the free-choice science learning landscape. Equally important, but much less discussed and studied, are education situations that support long-term, more in-depth opportunities for science learning. A wide range of adolescents and adults are engaged in leisure-time activities that involve science, including model rocketry, raising ornamental fish, gardening, rock collecting, birding, scuba diving and star gazing; hobbyists such as these often possess deep specialized knowledge of science and invest considerable amounts of time and money in equipment, travel, education and training to refine their craft. Research conducted by Berendsen (2005) showed that amateur astronomy club members lacking college-level astronomy training generally knew more basic astronomy, than did undergraduate astronomy majors. Equally important are the many events in life, often highly personal, which demand increased understanding of science "right-now." For example, when an individual is diagnosed with leukemia or heart disease, that person and their loved ones invest large amounts of time researching websites and medical reports to learn as much as possible about the particular disease. Similar behaviors arise when an environmental crisis such as a toxic spill or the imposition of water rationing occur. With an increasingly accessible internet, opportunities to become informed about such issues are easy and common (Pew 2013).

Investigations of everyday science literacy have yielded other interesting data. For example, a series of studies by Canadian science education researcher Roth and colleagues (e.g., Roth and Van Eijck 2010) found that members of an activist group working on the environmental revitalization of a local creek and its watershed acted and learned using knowledge derived from a wide variety of resources, virtually none of which required or drew from school-based sources. The research reinforced that much of what is learned in school actually relates more to learning *for school*, as opposed to learning *for life*.

Finally, there is a small but compelling set of data that is beginning to emerge showing that the public also gathers in-depth science knowledge outside of school. For example, research by my colleague Mark Needham and I (2013) found that when multiple sources of science learning were considered together, free-choice learning experiences represented the single greatest contributors to adult science knowledge; childhood free-choice learning experiences also significantly contributed to adult science knowledge, as did work experiences (as well as gender, income, race, or ethnicity). Schooling was also significant but it ranked at the bottom of sources of adult science knowledge.

Conclusions

There is a revolution afoot! We are witnessing a tectonic shift in how, when, where and even why people learn. Just as the information revolution dramatically transformed our nation, this learning revolution too is changing the way the people live and compete in the twenty-first century. Learning today is 24-7, continuous and on-demand. Whether aged 5 or 95, learners seek educational experiences from a myriad of sources while at home, on weekends and even while on vacation. For the past 100 years we've come to believe that the words "*learning*," "*education*" and "*school*" were synonymous—today public education doesn't just happen at school. Today's learners spend only a fraction of their lives in a classroom. In fact, research indicates the achievement gap is less a factor of disparities in classroom learning than inequities in access to enriching experiences in the out-of-school time space. Most learning is *free-choice*, driven by an individual's needs, interests and access to learning opportunities.

Schools remain important components of the new science education ecosystem, but increasingly important are informal educational institutions and resources such as libraries, museums and national parks. In order to successfully fulfill their role as public science educators, insti-

tutions such as national parks must not only seek to understand what and how people learn in the twenty-first century but also why. As free-choice learning increasingly becomes the dominant form of learning, all educational institutions need to place greater emphasis on the needs and interests of learners rather than just what people "need to know." They also need to increasingly see themselves as just one part of a complex ecology involving multiple players and modalities (Falk and Needham 2013; NRC 2015). These are the challenges and opportunities the National Park Service faces in its second century as it increasingly asserts its role as one of America's key public educators.

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5

Nature-based Recreation and Latino Engagement in Boulder County, Colorado: Moving Towards Increased Social Equity

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Introduction

Communities always have challenges, but as the demographic shift in the USA continues towards a minority majority (Caucasian population less than 50%), the need for communities to be inclusive of all its citizens is becoming greater. Latino (ethnic category of people who self-identify as Hispanic or Latino) populations are growing, and local government agencies need to increase their ability to work with and serve this community. More specifically, local nature-based open-space park agencies need to be cognizant of this change and work towards increasing Latino use in their parks to ensure long term support of their programs and land base.

Background

Boulder County has many progressive local governments, which, through various smart growth policies, have helped create an overall prosperous community that values the environment, economic vitality, and social equity. Boulder County local governments understand the value of their policies relating to having dedicated public open-space to assist in land use development and the need to concentrate growth in existing municipalities. Acquired public open-space lands can also provide direct recreational benefits for its citizens utilizing these nature-based parks.

Nature-based outdoor recreation in the USA is predominantly a Caucasian activity. Boulder County is no different. One local example of this is Boulder County Parks and Open Space where a 2010 visitor study showed Latino use at three percent when the U.S. census information showed the Latino population at 14% in Boulder County (Boulder County Parks and Open Space 2010; U.S. Census Bureau 2010). If a segment of the population is not accessing the open-space resource proportionally, then there needs to be some effort by the government agency to reach out and be more inclusive.

Research question: How can Boulder County nature-based open-space park agencies engage the Latino community to better understand their nature-based recreational needs and desires?

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Methodology

This research seeks, through interviewing park and non-park agencies, to broaden understanding of the local government's engagement of Latino community members in relation to nature-based recreation. It examines agency practices of inclusion for nature-based park and open-space recreation in Boulder County. These in-depth interviews are qualitative. The research was designed to find ways to assist agencies in engaging the Latino community. The study tried to learn the degree to which the agency has strategies for engaging the Latino community; what agency data exist on Latino community park use and agency perceptions of Latino interest in and access to recreation; and whether current methods being utilized contribute to increased Latino community park access and use. This research is exploratory. It seeks to obtain new knowledge on possible ways to respond to Latino preferences for nature-based recreation in Boulder County.

I decided to interview park and non-park people that were directly engaging Latino populations or had positions in an agency that had the potential to be engaging the Latino population in Boulder or nearby counties. Park interviewees were from nature-based agencies. I looked at non-park positions to see if additional insights could be gained in understanding engagement methods from agencies that probably had been doing engagement longer than most open-space park agencies. Each category of respondents had nine interviewees. The interviews were semi-structured as an informal conversation about what they do to be inclusive, with the intent to build on the positive aspects of what they are doing.

The interviews averaged about 45 minutes in length and were digitally recorded. Responses were considered to be individual opinions and not agency positions. The responses were analyzed for common themes by using the Community Capitals Framework. The framework uses capitals (resources invested to create new resources over a long time horizon) working together to create sustainable communities that have healthy ecosystems, vital economies and social inclusion. The capitals considered included natural, cultural, social, human, political, financial, and built (Flora and Flora 2008).

Results

I coded interview comments into the capitals related to three main areas of engagement and facility preference: what works, what hasn't worked, and what we should do more of if we had the resources. Deciding on the appropriate capital to list the comment was challenging. The Community Capitals Framework is about the relationship among all the capitals, and it can be hard to show the interconnectedness of the capitals in analysis. Tables 1–3 are an abbreviated summary of research responses with the capital utilized, and associated number of responses.

Discussion

Interviewees mentioned multiple times that engaging the Latino community is "hard." The success stories are related to the agency's ability to connect with the Latino community. Increased knowledge (human capital) of park opportunities by Spanish speakers is very much needed, but feeling welcomed, understood, and heard requires agencies to be focused on growing other capitals (cultural, social, and political). Built capital will be committed in a more inclusive fashion as agencies have a greater understanding of the needs of the Latino community. Lastly, in terms of parks, natural capital plays a critical role in providing the venue for contact and park use to occur in the first place.

Social capital is required. Nature-based agencies have not had great connections with Latino populations. Most of agencies' partners have been from recreation and environmental groups that are predominately Caucasian. As one respondent stated, there is not a representative group for picnickers. Relationship-based partnerships can increase the connection between open-space

What Worked Summary Responses	Capital	Frequency
Collaborations/Partnerships	Social	16
Education and Outreach Focus	Human	7
Bilingual Skills in Some Positions	Human	4
Spanish Materials and/or Translation	Human	4
Communication/timing approach difference (requires extra effort)	Cultural	9
Family Oriented	Cultural	6
Provide Incentivizes (reduce barriers)	Cultural	4
Mission Based and Actively Working Toward Inclusion Through Social Engagement	Political	7
Accommodate Easy Family Access With Infrastructure like Tables/Shade/Restrooms to accommodate Large Groups	Natural/Built	8
Water Sites for Parks	Natural/Built	6
Fishing	Natural/Built	4

Table 1. What worked, summary responses.

What Hasn't Worked Summary Responses	Capital	Frequency
Need Partnerships/Trust	Social	3
Latino Community Does Not Engage or Understand Standard Anglo Methods of Outreach	Cultural	9

Table 2. What hasn't worked, summary responses.

park agencies and Latino populations. Forming relationships needs to be understood as a long-term effort. An agency cannot just find a representative Latino to be involved in a specific planning project. The connection has to be deeper.

A wide range of human capital strategies were suggested by respondents. This shows an agency has to do more than just provide Spanish materials to reach Spanish-speaking populations. It is more than just providing information to educate; staff skills and knowledge also have to be grown so that appropriate interaction can take place. Many open-space park agencies have education and outreach programs, so it is necessary to consider what changes can occur in their current programming that could better inform the Latino population.

Another respondent stated, "The family is the base of everything." This cultural insight may be understood at one level by a park agency, but the implications may not be easy to grasp. Open-space park agencies' staff members are primarily Caucasian, born and raised in the United States, where nature-based recreation is largely thought of as done in solitude or in small groups. A family orientation drastically alters that perspective, and it overflows into other agency norms that could be problematic for a population that is family-oriented, such as, public planning meetings held at night, programs that cannot accommodate a broad age-range of participants, and park facilities that are not really designed for families (long narrow trails as an example). Latino culture, such as art and history, could also be utilized as a way to reach out to this group.

Strong governance is a term that is used more in understanding an ideal relationship between a government and the people it serves. Political capital, and the understanding by the local government

Should do More of Summary Responses	Capital	Frequency
Collaborations/Partnerships	Social	19
Build and Have Cultural Compentant Staff	Human	8
Education and Outreach Focus	Human	4
Spanish Materials and/or Translation Ability	Human	4
Family Oriented	Cultural	3
Engage Through Community Cultural Celebrations, Art, and Latino history	Cultural	3
Program/Facilities Interesting to Latino Community and Agency Has Commitment Towards Inclusiveness	Cultural	2
Mission Based and Actively Working Toward Inclusion Through Social Engagement	Political	17
Program/Facilities Interesting to Latino Community and Agency Has Commitment Towards Inclusiveness	Political	3
Boards Are Representative of the Community	Political	3
Larger Group Areas That Have Higher Use Can Have Impacts on Other Users, and Increase in Maintenance and Resource Concerns	Financial	3
Accommodate Easy Family Access With Infrastructure like Tables/Shade/Restrooms to accommodate Large Groups	Natural/Built	8

Table 3. What agencies should do more of, summary responses.

authority that it needs to be more inclusive, has a profound effect on what can be accomplished toward being more inclusive. While participants stated that no policies existed that specifically aimed toward Latino populations, an agency's mission, and its leaders perspective can strongly influence how an agency strives to be inclusive. Most nature-based agencies in Boulder County have advisory boards. Having more diverse boards could assist in making inclusiveness a greater focus for nature-based park agencies.

Built and natural capital are highly correlated in nature-based park agencies. Built facilities provide the access to the sought-after natural environment. Latino populations in Boulder County seem to be drawn towards water-based, shaded, family-oriented facilities. Exploring more opportunities related to these types of facilities could increase use by Latino populations.

Creating more family-oriented facilities has financial implications for agencies. As with all management decisions, there are costs associated with implementation. It will be a change for agencies that currently don't have many facilities desired by the Latino population. Financial constraints are probably not going to be the overriding issue in terms of a local Boulder County park agency deciding to provide more Latino friendly facilities. Deciding to provide more of these facilities is really related to changing the culture of an agency, encouraging it to step beyond what it is currently doing to engage a segment of the population it is not currently reaching sufficiently.

Success will be about the interplay of all these capitals. Local Boulder County open-space agencies vary widely in their commitment to being inclusive of the Latino population. Engage-

ment efforts, if undertaken, are relatively recent. The agency's ability to improve will require interaction across all of the capitals. One example is the ability to create trust between an agency and the Latino community. Human capital is needed to build staff's ability to communicate with Latinos, and the Latino community will need to have a better knowledge of open-space recreation opportunities. Social capital will need to be utilized in forming partnerships and relationships with Latino-trusted groups and people.

These efforts need to be ongoing and long term. Political Capital is needed along with Social and Human Capital. It requires a continued effort and commitment of resources to obtain greater inclusiveness, which does require a political commitment to make sure it is happening.

Moving towards inclusiveness: Develop a plan

Open-space agencies should develop an inclusiveness plan that outlines goals, and strategies for reaching those goals. A plan will set the course towards being more inclusive, and will keep the need to be proactive in this area highlighted for the agency. Such a plan must be reviewed by agency departmental leadership, advisory boards, and elected officials. The plan should consider the following:

- Engagement is different. Outline strategies to use in planning and agency programs. You have to go to Latinos, build programs slowly, and find areas of interest to the Latino community. An accompanying marketing approach may incorporate such things as flyers at places where Latinos are, being aware of the timing of events, and determination of whether there is a need to provide incentives for attending.
- Build relationships/partnerships with existing groups and individuals that can bridge between them and your agency.
- Increase staff skills related to engagement. Designate staff members who are going to lead this effort in your organization. Look at ways that all staff can learn and be encouraged to develop skills in talking and engaging with Latinos. Assess if there are ways to make sure encounters by staff in parks are less formal with Latinos (not just rangers talking about rule violations). Having informal conversations will create a connection to the Latino community. Look at ways to increase hiring opportunities for Latinos in your organization.
- Provide Spanish materials. Create and have available brochures about your organization that are more than just a straight translation of English documents. During planning efforts, provide translated documents online and at public meetings.
- Increase knowledge and awareness of parks. Have a different marketing approach. Focus on providing information related to your parks that are more family oriented or have water nearby.
- Look at using community events, local Latino history, and art as areas for engagement. Utilize community events for feedback on planning that would be of interest to the Latino community. Look at ways that Latino history and art can be used to connect with the Latino population.
- Programs and facilities offered by the agency need to be interesting to the Latino community. Latinos have an appreciation of the outdoors, so look at ways to encourage the use of the more passive recreation oriented open-space facilities. Possible ways to do this would include wider shorter trails near trailheads that have family oriented picnic facilities.
- Agency leadership that is focused on being more inclusive and making sure that agency staff, programs, and facilities meet the needs of Latinos better. This can take place at

many levels: agency planning actively seeks input of the Latino community, education and outreach programs are designed for families and are offered in Spanish, and when new facility options are considered that the agency make them more family or large group oriented.

- Education and outreach agency programs actively work at targeting the Latino population. This should be done with partnerships so the agency can develop the skills and trust needed to engage the Latino community. Programs should be available for the whole family, which requires being able to work with and accommodate both children and adults at the same time.
- Family oriented facilities located near water need to be developed or enhanced. The Latino population enjoys nature-based opportunities, so open-space agencies need to look at shaded stream corridors and pond areas that can be developed to meet their needs.

Creating an engagement plan and moving towards increased engagement of the Latino community would be following direction given by various operating comprehensive plans (Boulder County municipalities and Boulder County as an agency) that highlight a desire to be socially equitable. These high-level planning documents do not provide direct goals in how to meet this desired state, but creation of a inclusiveness engagement plan that is supported by an open-space agency will move an agency closer to the goal of being more socially equitable.

Conclusion

This study is consistent with current literature and best-practices knowledge available on engagement and nature-based recreation preferences for diverse communities. Overall, open-space park agencies need to look at greater inclusiveness in a holistic approach. Boulder County has had a strong environmental and preservation focus in the past, but needs to move towards a more sustainable future that also addresses social equity in a greater way. Local governments can be more proactive in their approach by demanding that their agencies or departments are actively engaging all of their citizens. An inclusiveness engagement plan created and being acted upon by their open-space park agency would be one way to bring them a step closer to having social equity for all of their residents.

Other considerations

Most of the open-space park agency employees interviewed did not have use numbers broken down by demographics. Agencies need to look at increasing their capacity to understand who their users are and what they are doing. This information can assist decision makers in understanding the need, and will also show progress that is made over time.

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6

Engaging Visitors in a Landscape's Stories

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How do you engage visitors in the multiple stories embedded in a landscape? And how do you tell these stories in a way that honors the landscape and the communities whose stories are told? A day-capper session at the 2015 George Wright Society Conference explored these questions, using, as a springboard for discussion, a reader's theater performance of "We Have A Story To Tell." This 20-minute play (see below) examines the Accokeek Foundation's efforts to highlight the history and culture of the Piscataway people at Piscataway Park, a national park located on the Maryland shore of the Potomac River, directly across from George Washington's Mount Vernon.

For the Accokeek Foundation, the challenge of interpreting the multiple layers of Piscataway Park's story is rooted in many factors, including the organization's founding, preserving the view from Mount Vernon, interpreting colonial history in a predominately African American county with an important slavery story to tell, and its relationship with the Piscataway people who finally gained state recognition in 2012. Written by Lisa Hayes, the play is based on transcripts of conferences, meetings, and interviews, as well as planning documents and conversations that she has been a part of since 2007.

Lisa Hayes is currently President and CEO of the Accokeek Foundation, a non-profit organization that stewards 200 acres of Piscataway Park through a cooperative agreement with the National Park Service. She describes herself as an actress and playwright who went back to school, got a PhD in American Studies, and now finds herself on a new kind of storytelling journey—engaging people in the stories of the special landscape that makes up Piscataway Park.

We have a story to tell

Actor A

Not everybody gets to be born in the land that owns them.

Actor B

Not everybody gets to be born in the land that owns them. Sometimes you end up there.

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Actor C
You're really blessed if you end up in a place and realize...

Actor D
This is my place.

Actor A
This is not where I was born, but it is my homeland.

Actor B
Then you become responsible for it.

Actor C
And it becomes responsible for you.

Actor D
And then you understand.

All
We have a story to tell you.

Actor A
The Accokeek Foundation at Piscataway Park...

Actor B
It's a complicated story.

Actor A
Connects people to history, agriculture, and nature.

Actor C
That we need to tell.

Actor D
But how do we tell it?

All
How do we tell the story of a landscape?

Actor A
Congresswoman Frances Bolton of Ohio buys a 500 acre Maryland farm to protect it from development and preserve the view from George Washington's Mount Vernon directly across the Potomac River.

Actor B
She donates the land for the creation of the Accokeek Foundation in 1957, a non profit incorporated to...

Actor C
"Preserve, protect and foster, for scientific, educational or charitable use and study for the benefit of the people of the nation,"

Actor D
"The historic sites and relics, trees, plants and wild life rapidly disappearing from an area of great natural beauty along the Maryland shore of the historic Potomac River."

Actor A
The Foundation donates the first parcel of land for the creation of a national park. Dedicated in 1968, Piscataway Park is the product of a public private partnership still held up as a model for land conservation. Through easements, deeds, and cooperative agreements, the park totals nearly 5000 acres, of which the Accokeek Foundation stewards 200.

Actor B
This landscape tells the story of land conservation and preservation.

Actor A
This land was part of the tobacco culture of the region, a culture that began in colonial Maryland and that is demonstrated at the Foundation's National Colonial Farm.

Actor C
This landscape tells the story of colonial agriculture.

Actor A
The Foundation establishes an eight-acre organic vegetable farm in the park, the Ecosystem Farm, to demonstrate modern sustainable agriculture.

Actor D
This landscape tells the story of sustainable agriculture.

Actor C
The Foundation was telling all of these stories, but one really important story was not being told…

Actor B
The significance of this landscape to the Piscataway people.

Actor A
When Captain John Smith explored the Chesapeake region in the early 1600s, the Piscataway nation stretched from modern-day DC through what became Southern Maryland. The center of its government was a Piscataway town called Moyaone, which sat on land now encompassed by Piscataway Park. Agriculture was an important part of Piscataway life, with fields devoted to the three sister crops of corn, squash, and beans.

Actor B
Within a few decades, the Piscataway people were gone from this particular land on the Potomac River. Warring tribes from the north, and British colonists with the destructive forces of their

livestock and diseases, contributed to this exodus. Piscataway Indians moved on to Pennsylvania, New Jersey, New York. And many settled in communities in Southern Maryland, where their descendants still live today.

Actor C
In 2008 the Foundation convened a colloquium that brought together representatives of the three bands of Piscataway Indians, scholars of indigenous history in the Chesapeake region, and interpretive staff from area museums to grapple with how the Accokeek Foundation might interpret Piscataway history and culture at Piscataway Park.

Actor A
Welcome to Heart of the Piscataway World, a scholarly colloquium. Four hundred years ago marked the beginning of extremely dire changes on this landscape for all people, and particularly the native people of this land. I think we are at the beginning of another cycle. We are here to develop a deeper understanding of what this ancient and modern land is about, the way it has changed, the survival that's happened here. With my grandfather being buried just down the road, and our ancestors being there, it's not just a scholarly conversation.

Actor B
Our history has us moving from place to place, searching for a place to settle in peace. I am proud to say that my great grandfather was able to procure some land that was directly across the street from what is now known as Cedarville State Park. Many of my ancestors actually lived in what is now Cedarville State Park.

Actor C
My dear grandfather was born in 1875, and at the age of fifteen he was a sharecropper about a quarter mile from St. Ignatius Church in Chapel Point. He farmed that land for a long time. I grew up in Washington but every summer I would go to one family farm or another. Shucking the corn, hanging tobacco, spearing tobacco.

Actor D
My question is—what period of time do we interpret? Do we focus on the past? What part of the past? Or the present?

Actor A
I would just point out that there were four hundred generations of history here before John Smith ever sailed up this river. If we look at the face of a clock as 12,000 years, then John Smith arrived at 11:30 pm. A lot of history preceded him.

Actor B
I find we're stuck in the 1600s. We have an annual festival and one year we tried to discuss contemporary Native issues. People weren't interested. They said, "We're here to have fun and watch the Indians dance." I look around this room and say, "Can you see us, outside of a leather dress with fringe? Can you see us, outside of wearing feathers? Do you see us as humans going through regular day-to-day struggles?"

Actor D
There is a very strong tendency, to put it bluntly, of white people having history and Native people

having culture. You see it all the time, in books, on museum walls: "Native culture on the eve of contact."

Actor C
All of the brochures about historical sites on the East coast talk about history beginning when Europeans arrived. There's no acknowledgement of Indians. There is a beautiful history here of native people who had crops and lands and religions and societies. But these stories aren't told.

Actor B
Every Indian in this room has been approached by people and asked, "Are you real? Are you a real Indian?" We are stuck in the ethnographic moment of contact, sometime between 1607 and 1700 and it's very difficult to get out of that diorama.

Actor A
How much weight do we give the past versus the present? Does it get equal airtime? Do you talk about what was here 10,000 years ago, then 400 years ago, and then—bam! Here we are today. Those last 400 years were really difficult.

Actor B
Piscataway people survived and that's worth celebrating. There were a lot of neighboring tribes that didn't survive. There is no longer a Choptank tribe, no Patuxent.

Actor C
I heard that it wasn't until 1917 that the Native American birth rate caught up with the death rate.

Actor B
That ties right into this land. The need to respect that soil and the ancestors.

Actor D
The tribes that are supposedly extinct, all it really means is that their tribal entities are extinct as tribal entities. They no longer exist as a defined people, they don't have a descendant community that's identified as such. But that doesn't mean that the people are gone, or that the bloodlines are gone. They aren't. Tribes grouped together and one name was kept. Among the Piscataway there are probably bloodlines that are Wicomoco and Patuxent and all the other groups that were in this immediate vicinity as well. That's an important thing to say.

Actor A
Yesterday a group of us visited the burial grounds. Everyone was telling their story and why this place was important to them. Whether you're a visitor, or a non-Native who lived on the land, or a Native person on that land, the stories really resonated. We celebrated the spirit of this place

Actor C
It seems to me that this whole idea of divorcing man from nature is what creates such a sense of alienation in Western culture and why people come seeking solace in natural places. So we need to talk about the value of Native culture in seeing yourself as a part of the rest of the natural world.

Actor A
If visitors don't feel something, they're not really going to want to pay attention, it's just going to

seem abstract and boring. People need to find personal meaning.

Actor D
The values that are central to Piscataway culture—community, generosity, respect, reciprocity, taking care of the earth—these are universal.

Actor A
Let's get down to specifics. Right now at the Colonial Farm and the Ecosystem farm, you learn through the colonial lens. So what's the Native lens? What beyond the broader concepts make it important to even mention a distinctive experience? What can Piscataway understandings contribute?

Actor B
It's not just taking care of the land that's stewardship; it's that the land is taking care of you. That's the Native understanding. I think it's profoundly different.

Actor C
I think we need to talk about the concept of time. We talk about time in a linear way. The colonial farm is the past, the ecosystem farm is the present. In Native communities we think about time in a circular way. We talk about the seven generations and how we're responsible for what's coming ahead. We don't look at things as past, present, future—we look at them as all of those things at once.

Actor D
How do we convey these different sensibilities? I've always said that two people can walk shoulder by shoulder through exactly the same environment and be passing through entirely different landscapes.

Actor D
What if we simply put a picture frame up outside—the landscape is the picture—and give it different labels, each from a different point of view.

Actor B
Homeland.

Actor C
Landscape.

Actor A
Invasive species.

Actor D
We talk a lot about the idea of "place." A hundred years ago, that's what the word "environment" meant.

Actor B
Land and place and landscape. This is where I feel that if we hadn't lost our language, we would have better terminology.

Actor C
Some things are beyond words anyway. That's why all peoples have ceremonies and art. You go beyond words. You enact.

Actor A
Maybe we don't need a permanent exhibit. Maybe you just do different things, a different thing every season, or a different thing every year, or a different kind of programming that you can change that will make this place a lot more interesting and give people a reason to come back over and over.

Actor B
Wherever you go in the schools, you look on the walls and you see George, you see Thomas, you see Sojourner. Native kids don't see anything to validate their history. Nothing. Except between those bookends, the first pumpkin and the last piece of turkey. It's embarrassing. Native kids need to have the opportunity to go somewhere and see their culture looking back at them. That would be priceless.

Actor D
This is an amazing site that tells the story of how peoples lived here for thousands of years, and then were dispersed from their homeland. And yet the people survived, this place survived.

Actor C
The stories underscore two of Accokeek's themes: one being the relevance of the past to the present, and two being the need for land stewardship and preservation. What would have happened if this place had been dug up and paved over for a housing development?

Actor A
Stewardship is more than preserving and caring for the land. It's about nurturing a spirit of connectedness.

Actor D
It's about honoring our responsibilities to mother Earth.

Actor B
It's about respect, respect for the cycles of life, for the creators' gifts, and for each other.

Actor C
There's a lot that can be told here and the stories are right before us.

Actor A
Not everybody gets to be born in the land that owns them.

Actor B
Sometimes you end up there.

Actor C
You're really blessed if you end up in a place and realize...

Actor D
This is my place.

Actor A
This is not where I was born, but it is my homeland.

Actor B
Then you become responsible for it.

Actor C
And it becomes responsible for you.

Actor D
And then you understand.

Actor A
How would *you* tell the story?

Curtain

7

NPS Benefits Sharing: A Revolutionary Concept for Parks

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To say that the revolutionary invention of the polymerase chain reaction (PCR), as refined and used today, is a legacy of *Thermus aquaticus* (the extremophile bacterium that Thomas Brock collected from Yellowstone National Park in the 1960s), is no exaggeration. To say that the revolutionary concept of National Park Service (NPS) benefits sharing is also a legacy of *Thermos aquaticus*, likewise, is no exaggeration. PCR has been described as one of the most important new scientific technologies of the twentieth century. That makes it revolutionary. But what is NPS benefits sharing and what makes it revolutionary? Further, how does each relate to a microbe from Yellowstone National Park? The stories are fascinating.

What's the PCR story?

In 1966, Thomas Brock, a microbiologist at Indiana University, was studying microorganisms living in Yellowstone National Park's thermal pools. He named one of the organisms, a bacterium that he discovered in a sample from a thermal pool, *Thermus aquaticus*. This microorganism lives and thrives in water so hot that it would kill an ordinary plant or animal. Dr. Brock learned how to grow *Thermus aquaticus* in the laboratory and deposited a living sample at the American Type Culture Collection (a repository maintaining living cultures of microorganisms) for safekeeping and distribution to other researchers, upon request.

In 1985, Cetus Corporation, a biotechnology company, was working on developing a new way to duplicate genetic material to facilitate genetic studies; individual molecules of DNA are too small to study effectively. The key to working with DNA was to replicate the DNA molecules in order to get enough to study. A scientist at Cetus, Dr. Kary Mullis, had previously invented a way to duplicate DNA, for which he received a Nobel Prize. This new process was called the polymerase chain reaction (PCR). But, PCR required high temperatures, which destroyed the polymerase enzymes in the method being used at the time, requiring laboratory technicians to tediously add fresh enzymes throughout the PCR process.

Then, Dr. Mullis's colleagues at Cetus added an enzyme to PCR that had the unusual ability to keep working at high temperatures. Using a previously published process, they isolated that enzyme, Taq polymerase, from the Yellowstone *Thermus aquaticus*, which they had gotten from the American Type Culture Collection. PCR using Taq polymerase was so effective that a whole

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new scientific field has flourished as scientists finally had a convenient way to study DNA. Dr. Brock's academic work in Yellowstone had a practical application that he never imagined during his studies 25 years previously.

Today, the DNA copying process, made practical because of a series of studies using a Yellowstone microorganism, is widely used. Taq polymerase has led to the uses of DNA that are so familiar today, from matching DNA in criminal investigations, to medical diagnoses or cures, bioremediation of toxic wastes, and research into the basic building blocks of life.[1] The commercial uses of PCR are part of a multi-billion dollar industry.

What's the NPS benefits-sharing story?

For NPS, benefits sharing occurs when NPS receives monetary or other benefits from a discovery or invention with a commercial application resulting from research originating under an NPS scientific research and collecting permit, or other permit or authorization. If benefits sharing had been in place at the time of the refinement of the PCR invention using Taq polymerase, NPS would likely be sharing directly in the benefits from the PCR revolution. Instead, the PCR revolution drew attention to the possibilities for benefits sharing in parks. But, as with most revolutionary concepts, there were multiple forces at work.

In 1997, NPS (Yellowstone National Park) entered into a cooperative research and development agreement (CRADA) with the biotechnology firm Diversa Corporation. In 1998, Congress enacted the National Parks Omnibus Management Act (NPOMA), which authorizes the secretary of the interior to "enter into negotiations with the research community and private industry for equitable, efficient benefits-sharing arrangements" (54 USC 100705(d)).

In response to a legal challenge (Edmonds Institute v. Babbitt, 93 F. Supp. 2d 63 (D.D.C. 2000)), a federal court upheld the NPS-Diversa CRADA but required NPS to complete a National Environmental Policy Act (NEPA) analysis of the CRADA. Accordingly, NPS prepared a final environmental impact statement (FEIS) and, in March 2010, issued a record of decision (ROD) to implement benefits sharing servicewide.[2]

In 2013, the NPS director issued the benefits-sharing policy (Director's Order #77-10), and in 2014 the NPS Benefits-Sharing Handbook became available (see www.nps.gov/applications/npspolicy/DOrders.cfm). The overall basis for NPS negotiating benefits sharing is the NPS role in preserving and providing access to research sites and the opportunity to collect, study, and use the resources therein. This NPS contribution often represents decades of work. In some cases, NPS also makes available research data, conclusions, or other assistance that informs and supports the research permittee's, or other authorized researcher's, efforts. In other words, the U.S. government has a compensable interest in the research results (compensable interest is a legal share in physical or intellectual property that is entitled to compensation when others use that share of the property).[3]

NPS policy provides that the parks will be the beneficiaries, but policy also limits how the parks may use the benefits. Parks may use benefits to improve conservation and protection of park resources and strengthen the scientific capacity of NPS scientists through collaboration with other governmental and non-governmental researchers. Parks must document and annually report use of monetary and non-monetary benefits.

What obligates researchers to share benefits?

The scientific research and collecting permit, loan agreements and other agreements that authorize the use of (and track) collected specimens and progeny and unmodified derivatives of collected specimens, museum specimens, or living collection specimens, contain terms and conditions that obligate the signatories to discuss and, as appropriate, develop agreements to share or decline

benefits with NPS. These terms and conditions provide that the:

- Permittee, borrower, user, or recipient (henceforth "researcher") agrees not to use the collected specimens, museum specimens, progeny, unmodified derivatives, or research results for commercial purposes without first entering into an agreement to share benefits or an agreement wherein NPS declines to share benefits.
- Researcher agrees not to provide the collected specimens, museum specimens, or their progeny and unmodified derivatives to third parties without prior written NPS authorization.
- Sale or commercial use of natural products, such as collected specimens, is prohibited (36 CFR 2.1).
- NPS may seek specific remedies in the event terms and conditions are not met.[4]

Although NPS issues scientific research and collecting permits for scientific or educational purposes only, scientific research may result in a patentable product or process that has commercial value. For example, a researcher authorized to study frog chemical defenses might discover a toxin that has medicinal value, and develop and patent a way to synthesize the toxin.

The onus of responsibility is on the authorized researcher to notify NPS of a potential commercial application. Then NPS evaluates the potential commercial application and decides whether to negotiate benefits sharing or decline benefits sharing. The park research coordinator is generally aware of the progress of permitted research and the curator is aware of research with collections. Because these individuals maintain contact with the researchers, the researchers are likely to notify these park employees of potential commercial applications. These employees, in turn, notify the park benefits-sharing coordinator, who must have no responsibility for issuing permits or other authorizations in order to avoid conflict of interest.

A "firewall" must exist between granting permits and authorizations, and negotiating and managing benefits sharing. Considerations to issue research permits and other authorizations must be kept separate from decisions regarding benefits sharing. The superintendent must not consider past or potential benefits while making a decision to issue a permit.[5]

When considering potential benefits, NPS may negotiate with the party that proposes commercialization for monetary or non-monetary benefits (or both). The benefits are then documented in a benefits-sharing agreement that both parties sign.

Monetary benefits would be payments that derive from the development and commercialization process, such as up-front payments, annual maintenance payments, performance-based payments, or milestone payments (payments that occur at a defined stage of research and development).[6]

Non-monetary benefits include the sharing of knowledge, research relationships, and providing training, supplies and equipment, or special services. Examples of non-monetary benefits include the following: a company that made an invention based on toxins from ants agrees to participate in the park's ongoing inventory of insects for six years; a company agrees to train park staff in some molecular biology techniques; and a company agrees to give the park DNA extraction kits and DNA "primers."[7]

NPS makes a decision on a case-by-case basis whether to seek benefits. NPS would seek to share benefits when the potential benefits would have value to NPS and the general public. NPS would decline to share when potential benefits would not create value for NPS and general public. When, after careful consideration, the park decides to decline benefits sharing, the park must draft a letter of agreement, or other agreement, to be signed by the parties wherein the park declines to share in benefits and states any other terms and conditions that may apply. Parks may decline

benefits sharing based on technical or economic reasons, not on an opinion as to whether the commercial activity should occur.[8]

NPS does not require a benefits-sharing agreement when the park superintendent determines that commercial use of research results is primarily educational and would benefit the general public, for example, through scholarly journals, textbooks, field guides, and museum exhibits.[9]

The act (NPOMA) authorizing NPS to negotiate benefits sharing does not specify the mechanism or process to use in sharing benefits. NPS looks to other existing authorities to enter into agreements and receive and retain monetary and non-monetary benefits. Benefits-sharing agreements are between parks and entities other than individuals; are made public, except for confidential information protected by law; and do not authorize any research activities in parks or any activities that require an NPS permit, loan agreement, or other authorization. Generally, benefits-sharing agreements qualify for NEPA categorical exclusion. All NPS agreements are reviewed by the Department of the Interior, Office of the Solicitor.

The NPS benefits-sharing agreement types and authorities are as follows:

- CRADA: the Federal Technology Transfer Act (FTTA) authorizes parks designated as federal labs to enter into CRADAs, manage federal lab inventions and intellectual property, and retain revenue and other benefits received from federal and non-federal parties. NPS may also provide non-monetary benefits to the other party (15 USC 3710). Note: a federal lab is a "facility owned … or otherwise used by a Federal agency," a "substantial purpose of which is the performance of research."
- General agreements: NPS policy, Director's Order (DO) #20: Agreements, available at www.nps.gov/policy/DOrders/DOrder20.html, authorizes parks to receive non-monetary benefits. Non-federal parties may provide monetary benefits to the U.S. Treasury.
- Cooperative agreements: under the provisions of 54 USC 101702, parks may use a cooperative agreement for benefits sharing when NPS receives from or provides to a cooperator a monetary benefit (money or property, services with an assigned monetary value, or anything else of monetary value) and has substantial involvement in the project, which must have a public purpose. Cooperators may include educational institutions and state and local governments that may provide monetary or non-monetary benefits.[10]

To make payments, the other party to the agreement uses the pay.gov system to make electronic payments to NPS using the automated clearing house (ACH) system, a credit card, or PayPal. All standard NPS accounting and procurement procedures apply to receipt and expenditure of funds. The FTTA requires that funds be obligated within two fiscal years from the end of the year when the federal agency received the funds. Funds must be spent to enhance resource protection or to offset costs of administering benefits sharing.[11]

Parks annually report to NPS headquarters on new and current benefits-sharing agreements and monetary and non-monetary benefits received. In addition, parks that are federal laboratories must report on patents, licenses, and inventions as required by the FTTA. In accordance with the FTTA (15 USC 3710c(a)(1)(A)(i)), when an NPS federal laboratory receives royalties or other payments from the licensing and assignment of inventions under CRADAs, the NPS unit pays the first $2,000 each year, and thereafter at least 15 percent of the royalties or other payments, other than payments of patent costs as delineated by a license or assignment agreement, to the inventor or co-inventors, if the inventor's or co-inventor's rights are assigned to the USA.[12]

How does NPS benefits-sharing compare to the global perspective on access and benefits sharing?

NPS benefits-sharing is generally consistent with the Bonn Guidelines on Access to Genetic Re-

sources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization, which were adopted in 2002 by the parties to the United Nations Convention on Biological Diversity (CBD). These voluntary guidelines identify general steps that may be established, in appropriate circumstances, for obtaining access to genetic (non-human) resources, seeking prior informed consent of providers, and determining the basis for benefit-sharing. The United States is not a party to the convention or its protocols (for further information see www.cbd.int/abs/bonn/).

In addition, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) is an international agreement under the CBD adopted in 2010. It entered into force on October 12, 2014. The United States is not a signatory to the Nagoya Protocol, but NPS participated in the Nagoya discussions. Many countries' rules are evolving regarding access to, and use of, genetic resources. Countries' domestic regimes implementing the Nagoya Protocol and the CBD may seek to impose restrictions on research, use, or resulting commercialization with respect to genetic resources in those countries (see www.cbd.int/abs/about/ for further information).[13]

What does the future hold for NPS benefits sharing?

Although in 2014 NPS issued over 3,100 scientific research and collecting permits, had over 5,300 active permits, entered into 250 new loan agreements, and had 850 active loan agreements designated for research or object conservation, only one park reported that researchers identified potential commercial applications for their research results. In the two reported cases, the park signed letters of agreement declining benefits sharing.

The revolutionary concept of NPS benefits sharing will, necessarily, be slow to materialize in practice. Researchers rarely have discoveries that lead to potential commercial applications. Most research results contribute to science or education and have no commercial application. Nevertheless, we know from the story of *Thermus aquaticus* that significant commercial applications can happen. NPS now has the authority and the tools to move forward with benefits sharing when the opportunity arises.

Endnotes

1. NPS [National Park Service], "What Kinds of Research Can Lead to Benefits Sharing?" (www.nature.nps.gov/benefitssharing/research.cfm.).
2. NPS, *NPS Benefits-Sharing Handbook* (Washington, DC: NPS, 2014), Section 1.2.
3. Ibid., Section 1.1 and glossary.
4. Ibid., Section 4.2.
5. Ibid., Section 13.1.
6. Ibid., Table 7.
7. Ibid., Table 9.
8. Ibid., Section 6.5.
9. Ibid., Section 1.6.
10. Ibid., Section 6.0.
11. Ibid., Sections 8.0 and 9.0.
12. Ibid., Section 7.5.
13. Ibid., Section 12.1.

8

Competing Demands: Managing Cultural, Natural, Recreation, and Historic Resources in Fort Ward Park

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Meaningful and sacred space

Fort Ward Park is a complicated asset for the city of Alexandria, VA. Every square foot of Fort Ward Park is in demand—for historic interpretation and preservation, for recreation and as one of the largest urban forests in the city. Rich in historical and natural resources, the 36.5-acre portion of the 43.46-acre park that was acquired to preserve and reconstruct the Civil War fort is fraying. The park is heavily used as a citywide and regional passive recreation destination for birding, walking, and picnicking, for commemorative Civil War events, and for recent interpretation of the African American community that once made their home on the site (Figure 1).

Fort Ward Park has a complicated history. From its possible use as farmland or pasture in the middle 1800s, the site became a Civil War-era military stronghold established as part of the Defenses of Washington that ringed the Union capital of Washington, DC, Fort Ward is the fifth largest of the 164 earthen fortifications that comprised the system, including 68 enclosed forts and 93 fortified field artillery positions. The African American community, "The Fort" community, grew up around the earthen fortification during the war. When the fort was abandoned, many families remained at the site and worked at nearby institutions such as the Virginia Theological Seminary and Episcopal High School. Physical evidence of the former community includes archaeological sites, burial sites, plantings, and road traces.

Acquisition of the site by the City of Alexandria began in the 1950s as the construction of Interstate 395 (Shirley Highway) began making this land valuable for future development. Fort Ward Park was created to both preserve the earthworks and reconstruct a portion of the fort for the upcoming Civil War Centennial, as well as establish a public park and open space.[1] Park features include late nineteenth century and early twentieth century African American historical

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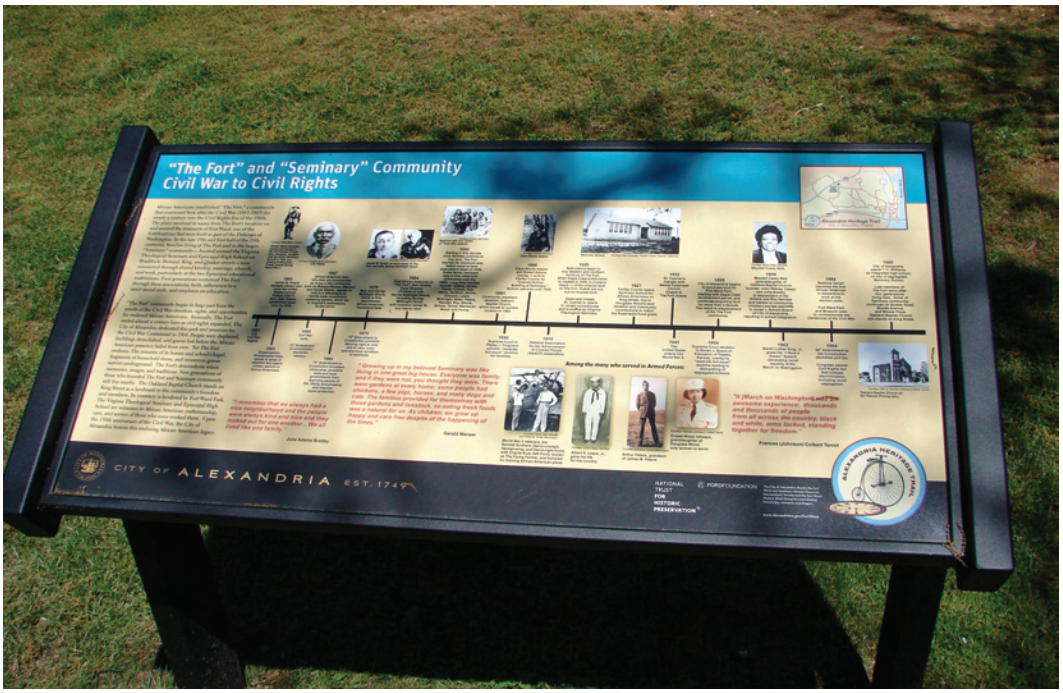

Figure 1. "The Fort" community, recent installation of interpretive panel at Fort Ward Park.

sites, approximately 90–95% of the earthworks of the Civil War fort and associated features like the outlying battery and rifle trench (Figure 2), a Civil War Museum, and an amphitheater, picnic areas, a playground, a dog exercise area and a 0.6 mile long marked walking loop.

Seven years of conflict and controversy

Around 2007, the park and its use, future, ownership and management became highly controversial within parts of the community. Community and neighbors' concerns were originally brought to the city's attention because of perceived overuse—loud gatherings with amplified music, parking issues, and trash. Fort Ward's immediate neighbors objected to the city's gradual transformation of the park's eastern edge into a maintenance yard for the park department.

At the same time, attention was refocused on the history of the African American community that inhabited the site following the Civil War until the 1960s, when the park was established. Prior to the city's acquisition of the site, members of "The Fort" community buried family members on residential property or in a church-owned cemetery near the park site. Most of the gravesites were no longer visible in the park. Families remembered visiting gravesites, but few markers remained outside of a church cemetery that is surrounded on three sides by park property. Although marked and visible, the church cemetery grounds were experiencing erosion and storm water damage. Finding the locations of the gravesites within the park required research, as documentation was incomplete. Even when noted in an archival record, the available information did not always square with a family's oral history. Barbara Franco, a consultant team member, counseled us to realize that personal narrative offers the opportunity to gain a wider and more nuanced understanding of our world and the people who inhabit it, not always found in traditional sources. Doing so also requires us to understand and consider "distinctions between facts and meaning, issues of voice and multiple perspective."[2]

The City of Alexandria is known nationally for embracing archaeology.[3] Initial work at Fort Ward focused on the Northwest Bastion of the fort in the 1960s. In 1991, historical research and archaeological investigations identified evidence for the Civil War barracks east of the fortification, and post-War African American homes, including artifacts and landscaping. Since 2010,

Figure 2. Compacted and eroding soil due to the Civil War rifle trench's use as an informal footpath; note the stump left in place to avoid ground disturbance of the resource.

a series of archaeological investigations has taken place at the park. The work has focused on finding unmarked graves, testing the efficacy of ground-penetrating radar in finding graves at Fort Ward, and finding other potentially significant resources throughout the park.

While these archaeological investigations were underway, the city, recognizing the undocumented resources on the site, appropriately deferred much of their ground-disturbing maintenance activities in the park. No trees were planted after 2010, even when powerful storms raked the site and damaged much of the urban forest. Damaged trees were cut at knee height. No stumps were ground or removed. Erosion continued along road edges, gravesites in the privately owned church cemetery, and in recreation areas. Storm water and erosion repair to the stream channel and rifle trench was on hold. The biggest challenge to park management and natural resource maintenance was ground-disturbing activities. No work could be done until areas within the park were identified by their cultural resource significance. Future interpretation and museum expansion improvements were also on hold.

The city of Alexandria's Office of Historic Alexandria (OHA) and the city archaeologist compiled resource maps and archaeological documentation into a ground-disturbance map that, in conjunction with an updated memorandum of understanding (MOU), serves as the linchpin of the management plan. The ground-disturbing activities map defines areas within the park, and their tolerance for ground disturbance. The one-third of the park that includes the core area of the Civil War fort, and known African American burial sites, prohibits ground disturbing activities, except for the placement of formal interpretive elements (with prior archaeological review and investigation by OHA). Another area of the park where it is suspected that additional resources may be discovered allows for ground disturbance only with further review by OHA (Figure 3). The last area, approximately one-third of the park, allows for minimal ground disturbing activities—aeration, stump grinding, tree planting and soft path construction. With the acceptance of the management plan by the city council, site work, restoration, and ongoing maintenance could begin again in specific areas of the park.

Park management issues were not solely related to ground disturbance. Two different entities maintained the park grounds; contracted labor and park operations staff. Contracted labor cared

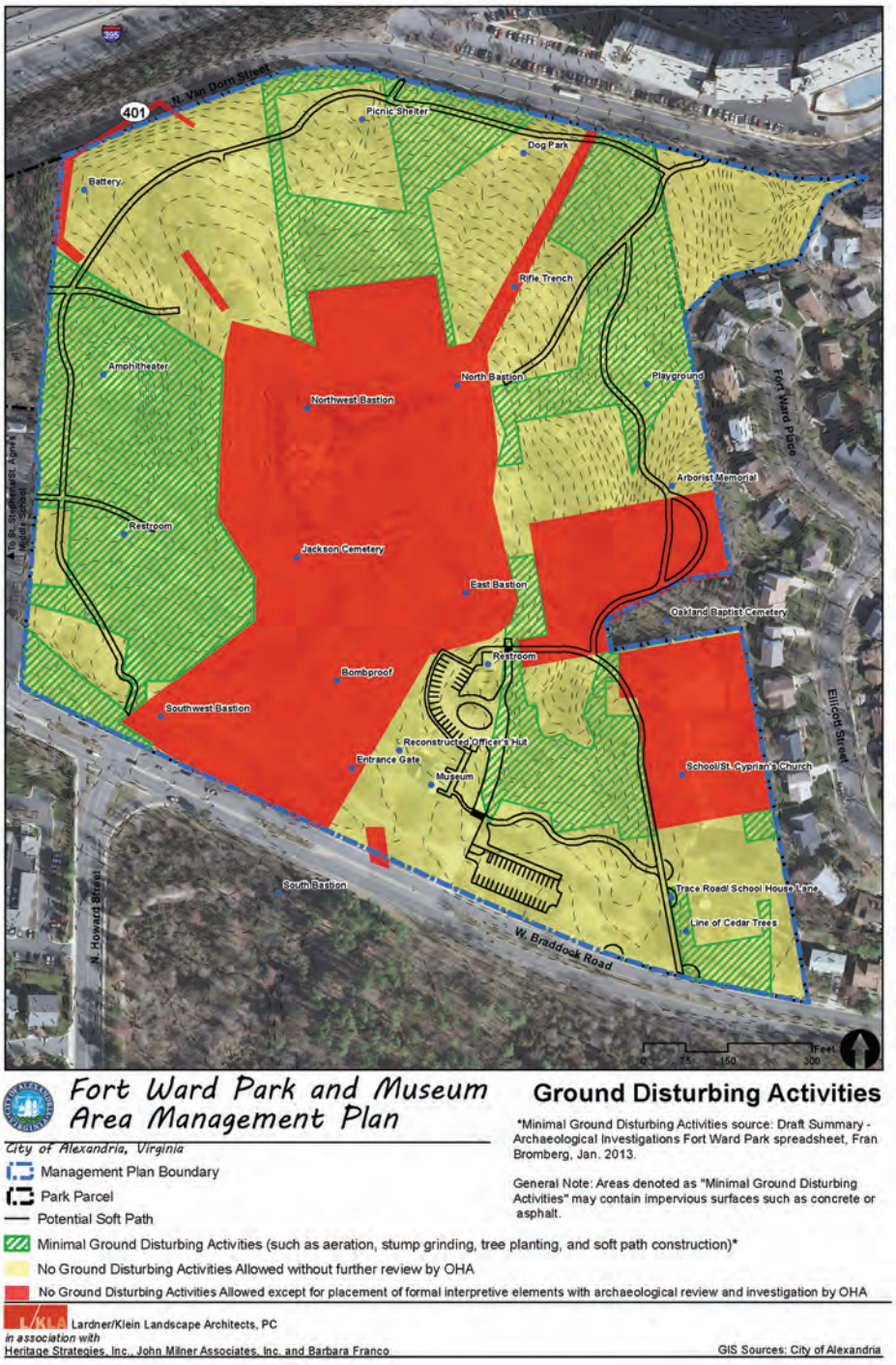

Figure 3. Fort Ward Park cultural resource protection levels: ground disturbing allowances.

for the Civil War fort area due to the fragility of the earthworks, while city park staff maintained the rest of the park that included much of the former "Fort" community. The difference in maintenance practices was apparent, and it confused park visitors. Had the city forgotten to mow? Was the Civil War fort more important than other areas of the park? The casual visitor didn't understand when they saw one area of the park (the Civil War resources) receiving a higher level of maintenance than other areas.

The park is also complicated by its management structure. In a city populated by 150,000 residents, four city departments are involved in the management and administration of the park: the Department of Recreation, Parks and Cultural Activities; Office of Historic Alexandria; the

Department of Transportation and Environmental Services; and General Services. A memorandum of understanding between departments is in place and is revisited annually.

The management plan development effort was also complicated by a series of parallel studies, each intended to influence the plan contents. One study addressed storm water issues, as many of the gravesites and parklands were eroding, and the stream channel was being damaged. Separately, a history of "The Fort" community and the African American families who lived on the site was underway.

Framework for collaborative work

During this process, the city council appointed a stakeholder advisory group, representing a number of interested parties.[4] The stakeholder group presented reports to the city council in 2011 and 2012. The second submission identified issues facing the park, and proposed a number of recommendations to address them. Chapters focused on history and culture, recreational use, environmental and natural resources, park operations, planning, development and promotion, Civil War resources, African American cemeteries and burial sites, African American structures and other resources, cultural resources related to the museum and its collections, and programs and management recommendations for the environmental resources at Fort Ward. At this point, the city reached the conclusion that a professional consultant team was needed to help the city develop a park management plan.

Consultant team members struggled to identify a methodology, or model to emulate, to address the complex issues facing the park. Part of the challenge was the size and ownership of the park, a locality. Another was the number of complex and overlapping issues to address related to cultural, natural and recreational resources in a synthetic process. A literature search[5] produced several suitable models, portions of which contributed to the approach and methodology used to develop the Fort Ward plan.

The city had never developed a management plan for any of its parks. Rather than the more traditional, diagram-style master plans, the Fort Ward Management Plan provides a framework for decision-making. Plan goals include the following:

- provide strategic guidance for improved park management and operations;
- identify sustainable practice strategies for use, protection and monitoring of changes;
- balance management of natural, cultural and recreational resources, earthwork fort, archaeological resources, interments, "The Fort" community, and park features;
- identify potential enhancement opportunities to protect and interpret African American cultural resources and burial sites by developing a "We're Still Here" trail, and recognizing and demarcating graves and cemeteries;
- upgrade park facilities and recreation infrastructure, public accessibility, and add new plantings;
- redirect and reduce impact of storm water runoff; and
- provide appropriate management zones and related best practices for routine park maintenance and operations.

It is a technical plan, with metrics to measure the success of the implementation of best practices through monitoring; it is a picture book with single page "how to" guides for implementing the plan's many action items; and it is a blueprint for identifying city budget priorities.

Iterative public process

The audience was expanded beyond the stakeholder advisory group through a series of listening

sessions in the park, a web-based survey, and several open houses. All materials were posted on the city's web site, going back to the project's origin in 2007. The process for the development of the management plan was iterative and open.

Lessons learned

What did we learn? We learned less about cutting-edge techniques or methodologies and more about basic human interaction. Success is all about the people, about gaining trust and being fair. Trust does not come easily when generations of distrust must be overcome. Working with a stakeholder group, while very helpful, has its own challenges. Interest-group representatives do not always reflect the feelings of the group they are representing. Leadership, at the city-level and within the stakeholder group, is essential to progress. Strong committee chairs make a difference. What should we have done differently? One activity would be to have invested in more one-on-one interactions.

Keeping the everyday park user engaged is challenging. By removing the five-acre athletic field portion of the park from the plan, organized sports leagues did not dominate the planning process. As heavy users of the park, their voice was not heard. Similarly, the many users of the passive recreation features of the park, seeing no threat to their activities, were primarily silent. Better engagement of the everyday user would have helped to balance the planning discussions and decision-making process.

The plan development process was a good reminder of how one person's facts are not necessarily another's facts. Better definitions and recognition of this fact would have helped to establish a more open and trusting decision-making process.

Digital communication is not universally embraced, even in 2015. The city's attempt to be green and paperless, although well intentioned, is problematic for open decision-making. The management plan material was complex and challenging for some readers to use solely as a digital document. People were unable or unwilling to print a document that employed color on their home ink jet printer, devoting multiple cartridges to a draft plan document. Others were unfamiliar with attachments and downloading.

Moving forward

Today the plan is moving forward. After years of collaborative work, strong disagreements and responsive changes, the Fort Ward Park and Museum Area Management Plan achieved unanimous support from the Alexandria City Council in January 2015.

The city council has budgeted $1,300,000 in their ten-year capital improvements plan to implement the park plan's first priority actions. Two hundred thousand dollars of that amount is budgeted for fiscal year 2016 to develop an interpretive plan that tells the story of the park and its heritage, locally, regionally and nationally.[6] The combination of park resources and their complexity make for a rich telling of the site's story from the Civil War to civil rights.

However, all has not been resolved in such a complex project. More work must be done to gain the full trust of all members. An Ad Hoc Implementation Monitoring Group is being established by the city council and will include one city council member. This action will ensure that many eyes remain on the park and its management activities.

Endnotes

1. Fort Ward Park was listed on the National Register of Historic Places in 1982.
2. Barbara Franco, "Public History as a Calling Opening Academic Convocation, September 5, 2012," *Seminary Ridge Review* (Gettysburg, PA: Lutheran Theological Seminary at Gettysburg, Spring 2013), Volume 15, Number 2.

3. The City of Alexandria established the Alexandria Archaeological Commission in 1975, the first such group in America. The City has full- and part-time archaeologists on staff, operates a field camp for middle school students, a museum and a lab both open to the public.
4. Members included nearby neighborhood associations: Seminary Civic Association; Seminary Hill Association; Parks and Recreation Commission, Environmental Policy Commission, Historic Alexandria Resources Commission; Fort Ward/Seminary African American Descendants Society; Oakland Baptist Church; and citizens at large and a citizen living within one mile of the park.
5. Washington State Parks, "Rasar State Park Management Plan" (July 12, 1997), http://parks.state.wa.us/340/Rasar.
6. U.S. Forest Service, Rocky Mountain Research Station, "Wildland Fire in Ecosystems, Effects of Fire on Cultural Resources and Archaeology", General Technical Report RMRS-GTR-42 (May 2012), Volume 3.

9

Managing Wildlife and Human Behavior to Address Human–Wildlife Interactions

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National Park Service (NPS) Management Policies (2006) state that the NPS will preserve animals' natural behaviors, and may manage recreational activities that impact park resources. This paper documents a workshop that engaged participants in applying theory to practice, to understand and manage changes in animal and human behavior that may negatively affect wildlife and human health and safety. Session leaders first presented a case study at Redwood National Park that used targeted biological and sociological studies to reduce negative impacts of visitor behavior on the marbled murrelet *(Brachyramphus marmoratus)*, an endangered seabird. We then provided an overview of key principles and foundational concepts of animal behavior and human behavior that can be used to develop management strategies to affect the behavior of animals and people in parks. Our ultimate goal is to synthesize information and recommendations to reduce risks to people and animals and improve management and consistency across the NPS.

Killer potato chips: Adaptive management and visitor behavior change to conserve an endangered seabird

At Redwood National and State Parks, adaptive management principles have been utilized to conserve the endangered marbled murrelet, seabirds which nest in old-growth forest. Marbled murrelets spend much of the year feeding in waters along the Pacific northwest coast. Their nesting behavior was essentially unknown until the 1970s when a nest was discovered high in a redwood tree. It is now known that the majority of California's marbled murrelets nest within Redwood Na-

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tional and State Parks (RNSP). In general, logging is a major threat to this species. However, protected areas such as RNSP have experienced unexplained marbled murrelet population declines.

Recently, park-permitted research using nest cameras revealed high rates of nest predation by corvids (members of the crow family), primarily Steller's jays *(Cyancitta stelleri*; Marzluff and Erik Neatherlin 2006). In addition, elevated Steller's jay densities, and subsequent elevated rates of predation on marbled murrelets, were shown to occur near high-use visitor areas (e.g., campgrounds and picnic areas) because of supplemental food supplied by park visitors (Marzluff and Erik Neatherlin 2006). An increasingly intensive corvid management program that uses visitor education, wildlife-proofing campground infrastructure, and conditioned taste aversion (CTA) has significantly changed over the past seven years, based on feedback from biological and sociological monitoring data as well as numerous targeted scientific studies.

When supplemental feeding of corvids was first identified as the largest threat to the breeding population of marbled murrelets at the park, natural resource managers worked with interpretation staff to develop materials that explained the importance of marbled murrelets, threats of predation from jays and crows, and how people could help by keeping a clean campsite. Nest predation continued, and alternate approaches were sought. The park funded social scientists from Humboldt State University to study people's behavior with respect to food and corvids. They surveyed park visitors, observed visitor behavior, and analyzed the content of interpretive materials.

Research revealed that most supplemental feeding was accidental rather than intentional, that is, from crumbs left on picnic tables, or food scraps in drains where dishes were washed (Ward, et al. 2011). Visitor attitudes were aligned with messages promoting the importance of protecting murrelets and refraining from feeding corvids. However, interpretive messages were too complex and did not include specific targeted behaviors; visitors were not sure what they were supposed to do. Based on this research, we realized we needed "regulatory messaging," which neither interpreters nor wildlife biologists are typically trained to produce.

As a result, the park adopted a new strategy that incorporated key concepts: don't bury the lead, tell people what to do, model the behavior you want to see, and make your messages consistent and ubiquitous. Because the most important behaviors were properly storing food and disposing of garbage, including crumbs, we developed a specific targeted message, "Keep it Crumb Clean," with a logo that illustrated the desired outcome (Figure 1). To make it easier for people to comply, the park provided food storage lockers and wildlife-resistant trash cans. We also installed covers on the drains. The logo and message are repeated on the park website, in newsletters, and in a video that visitors must watch before they can reserve a campsite (https://www.youtube.com/watch?v=8DUcA75bkiA). Visitors who do not comply with these actions are fined. People are also given stickers to wear to show that "I'm Crumb Clean," reminding themselves and others to follow through with their commitment.

To measure the effectiveness of the new strategy, the presence of Steller's jays near campgrounds, picnic areas, and control areas have been monitored. Numbers of jays near campgrounds are starting to decline, although effects are not yet statistically significant.

The park also has been conducting experiments with CTA, a technique that teaches an animal to associate illness with a specific food (Gabriel and Golightly 2011). Steller's jays were exposed to murrelet-colored and sized chicken eggs treated with carbachol, an emetic. In laboratory tests, CTA resulted in aversion to murrelet-mimic eggs that remained constant over eight weeks. In field trials, corvid attacks on murrelets were significantly reduced, indicating that CTA may be an efficient emergency management technique to improve murrelet productivity, used in concert with human behavior modification campaigns.

Figure 1. Keep It Crumb Clean logo. The core message adopted by Redwoods National and State Parks tells people what to do, is easy to remember, and shows the desired behavioral norm.

Managing human-wildlife interactions: Principles of animal behavior change and learning

Parks and protected areas often change the dynamic between people and wildlife. Animals may learn to approach people in search of food, or simply refuse to move when people approach. Managers are concerned about encounters that bring potential risks to both people and wildlife. The field of animal behavior provides crucial insights that can improve management. For example, two terms often used interchangeably, habituation and food conditioning, are actually very different learning processes. Animals that are habituated stop responding to people, whereas positively-conditioned animals seek out rewards from people, usually food (Hopkins et al. 2010; Figure 2).

To help park staff diagnose and manage effects on wildlife from interacting with people, we applied animal behavior principles to a series of steps that parallel established methods used to modify human behavior. For each of these steps, we also developed diagnostic questions and corresponding principles.

Step 1: Select behaviors. First ask whether the behavior you seek to affect is habituation or conditioning. Because food conditioning is associated with a reward, it is very difficult to use management to "unlearn" that behavior. Also, ask whether the behavior is a symptom of a systematic problem. For example, if animals have access to unsecured food, removing one food-conditioned animal will not resolve the underlying issue; other animals are likely to become food-conditioned in the future. From a management perspective, allowing this situation to persist would not be good conservation or stewardship. Key principles associated with this step include the following: have a plan before you act; be proactive, don't wait until an animal is food-conditioned to take action; and consider any parallel actions that must be taken to manage human behavior that is at the root of the problem.

Step 2: Identify attractants and deterrents. Identifying attractants and deterrents is closely related to step one. Because behaviors are responses to stimuli, it is important to ask "what is the

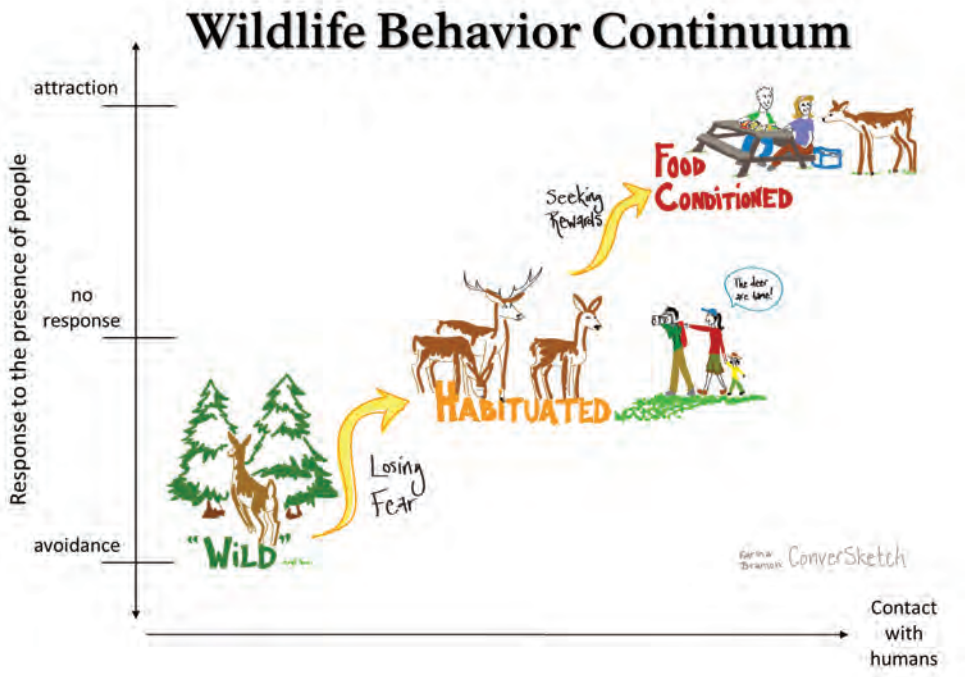

Figure 2. Wildlife behavior continuum. In the absence of active management, animals in parks may change their behavior from what we think of as a "wild" response (avoiding people). Habituation occurs when an animal is repeatedly exposed to a stimulus with neutral consequences and eventually stops responding to that stimulus, e.g., when an animal loses its fear of people. Conversely, conditioning occurs when the animal's response to a stimulus becomes more frequent or intense due to a reward or punishment associated with the stimulus (Hopkins et al. 2010). Food-conditioned animals are attracted to people because they have learned to associate people with food. Aversive conditioning is sometimes used as a management tool to teach animals to associate people or human spaces with negative consequences, regaining a "wild" avoidance response.

stimulus of interest?" Is it presence of people or presence of an attractant associated with people? Deterrents should be related to the stimulus of interest. Animals can form an association between taste and nausea and between sounds and pain, but have difficulty learning to associate pain with taste or sound with nausea (Garcia et al. 1974). This is why aversive conditioning using rubber bullets or bean bags typically will not affect food conditioning; animals may learn to avoid an area (or more likely, to avoid the people in white trucks and green and grey uniforms), but not to avoid human food. CTA can only teach an animal to avoid a specific food, it is not generalizable to other foods or the source of a specific food (e.g., a picnic area). Using CTA for all human foods (e.g., hot dogs, potato chips, sandwiches) is not practical, or safe for the animals. In addition, it is important to consider an individual animal's temperament. Individual animals may be more bold or shy compared to the average disposition in that animal population (Réale et al. 2007), based on their history of exposure to the stimulus, or any social learning they have undergone (e.g., cubs learning from their mothers to rely on human food). Principles associated with this step are matching the management action to the stimulus, and striving to identify the individuals involved in any interaction.

Step 3: Develop strategy. Management actions directed towards animals include CTA (which has limited applications in parks), hazing (aversive conditioning), capture and translocation, and lethal removal. Many of these result in high costs to the animals, may be logistically and socially challenging, and likely do not address the underlying causes of the problem. However, there

may be situations where managing the animal is necessary. In developing a strategy, consider the relative exposure of the animal to management actions versus visitor behavior. Can management actions have enough of a presence to counteract the volume of accidental or intentional visitor actions? Another crucial question is the degree to which human safety is at risk. How important is it to manage the animal immediately? Principles of this step include the following: consider the management context and individual animal's history; translocation or removal (including lethal removal) may be appropriate in certain cases, but must be carefully evaluated.

Steps 4 & 5: Pilot, implement, evaluate. Before putting your management actions into place, determine how you will evaluate whether your management actions are successful. Does your pilot strategy effectively reduce the undesired behavior, or the negative interactions resulting from that behavior? If so, implement more broadly and continue to evaluate. The key principle for these steps is this: good data help managers make good management decisions.

Managing human-wildlife interactions: Principles of human behavior change and learning

In 1943, Aldo Leopold remarked, "the real problem of wildlife management is not how we shall handle [wildlife] … the real problem is one of human management" (quoted in Kellert 1997). Fortunately, a significant amount of work in the fields of social psychology, communication, and human dimensions of natural resources can help managers approach human behavior management logically and effectively.

One approach that lends itself particularly well to managing human behavior is social marketing. Social marketing adapts principles used to entice people to purchase products and directs them at encouraging positive behaviors. Social marketing campaigns emphasize understanding what impedes and motivates a target audience to act in a certain way. Public health campaigns such as smoking cessation and heart disease prevention have been common applications of social marketing. Community-based social marketing (CBSM) focuses on initiatives delivered at the community level to foster sustainable environmental behaviors (McKenzie-Mohr 2011). Examples of community-based social marketing include recycling and composting campaigns, and adoption of water and energy saving practices. The CBSM approach has great potential for managing human behavior in parks. The same steps outlined in the previous section and used in the CBSM approach can be applied.

Step 1: Select behaviors. Consider which audiences are relevant to target and what behaviors you want to promote. To be effective, the selected behaviors need to produce the desired outcome or end-state. For example, you may want visitors to keep a clean campsite. However, keeping a clean campsite can include many different behaviors. Visitors need to collect trash from around the campsite, locate and open wildlife-resistant trash cans, put the trash in, and secure the lid. If they do each one of these behaviors, but do not secure the lid, you haven't reached the desired outcome—just a nice buffet for the bears. In this scenario securing the lid is the desired end-state behavior.

Step 2: Uncover barriers and benefits. The goal with this step is to remove as many barriers to the behavior and increase the perceived benefits. Barriers to a particular behavior maybe internal to an individual—lack of knowledge or motivation, or non-supportive attitudes. Barriers may also be external—without accessible wildlife-resistant trashcans, visitors may find it more convenient to leave their trash than to bring it home with them. Identifying barriers and benefits to the desired behaviors is key to developing a successful campaign. This allows you to carefully target your approach. Literature reviews and observations are two ways to gain a greater understanding of what is motivating and impeding visitor behavior.

Step 3: Develop strategies. The strategies you employ are determined by the behaviors you wish to affect and the identified barriers and benefits. Some activities that have been used effec-

tively in parks to manage behavior include commitments, prompts, and norms.

People who have committed to a small behavior change are more likely to agree to a larger request (McKenzie-Mohr, 2011). People have a strong desire to appear consistent to others. Commitments alter how people perceive themselves and subsequently behave. Point Reyes National Seashore implemented this strategy by alerting visitors to pet restrictions in plover habitats (Adams, et al, 2006). Visitors can make a small verbal commitment to keeping their pets out of plover habitat. They can make that commitment more visible and durable by accepting a leash that says "I love walking on leash at Point Reyes."

Prompts are visual or auditory aids that remind us to carry out an activity that we might forget. To use prompts effectively, they need to be noticeable and in close proximity to where the behavior needs to occur (e.g., signs on picnic tables reminding visitors to keep a clean site), and focus on positive actions so that people feel good about participating.

Norms are guides for how society behaves; we walk on the right side going up and down stairs, we shake hands with our right hand, we talk quietly before a movie starts. Cialdini (2003) studied the use of norms at Petrified Forest National Park. He found that when messages specified how to behave, visitors were less likely to remove petrified wood.

Step 4 & 5: Pilot, implement, evaluate. Test out your strategies to ensure you chose the most effective strategies and implemented them properly. If everything is going smoothly, implement and evaluate. For human behavior, it is important to recognize when the human behavior metric is an intermediate step towards something else, like resource protection. To measure the effectiveness of your behavior change campaign, you need to measure human behavior (which can be difficult), but to measure whether human behavior was the right target, you need to measure resource response.

Discussion

Managing human-wildlife interactions in parks often focuses on managing wildlife to reduce risks to people. Yet, many of the drivers of those interactions are caused by human behavior. By highlighting mechanisms of animal and human behavioral changes, we illustrate the importance of integrating "regulatory messaging" as a core management activity. We hope that the frameworks we provide help managers proactively develop integrative strategies that protect wildlife, and provide safe wildlife viewing opportunities in parks.

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10

Stories are Resources, Too: Embracing Broader Narratives to Build Parks' Personal and Public Relevance

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Without stories, what we know about natural and cultural resources is meaningless. In fact, without stories, we'd know little about either. For it's from and through stories that we construct and transmit meaning. Thus, to preserve parks and other places of natural and cultural heritage—indeed, to protect humanity as well as plants and wildlife—we in the conservation movement, and the National Park Service (NPS) more specifically, need to change how we think about stories and the power of stories. They're no less foundational to our engagement with and understanding of the world and one another than air, water, and wildlife, or buildings, landscapes, and archeological sites. Indeed, as retired NPS Deputy Director Mickey Fearn (2014) claimed in his closing panel remarks at the Co-Creating Narratives in Public Spaces symposium, stories are the NPS's most important resources.

How could that be? Because stories shape people's perception of and engagement with others and the natural world. They create our individual and collective identities. Stories also make it possible for people to care. Take, for example, Mary Oliver's poem "The Sea Mouse" (1994, 41). In it, the narrator, strolling along a stormy beach, discovers an ugly worm-like creature nearing death. Rather than wander passed with an averted glance, the narrator picks up and studies the sea mouse. What her poem, a form of story, achieves—moving readers to feel empathy for a repulsive being—confirms that, regardless of form, stories have power.

Story can change one's thinking. Mary's poem alters readers' perceptions. She makes them care for this little-known sea mouse most would find revolting (Oliver 1994). If we, too, hope to change people's thinking about parks, nature, and place; if we hope to inspire individuals to pause and see as well as care for what's in front of them, we need more empathetic moments like Mary creates. We need many such moments. And that's the power and potential of story. It's why story matters. Here, I'll outline the values stories offer and how the conservation moment and NPS can strengthen their storytelling capacities.

What I'm claiming isn't of value only to the NPS. I work for the agency; it's the context I'm most familiar with. Story is universal, however, and the importance and values of story and how to

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build storytelling capacity—these ideas and recommendations can be transferred to and applied by public and private parks and conservation organizations from the local to global levels. They're equally relevant for individuals, organizations, and governments *opposed* to parks and protected areas. This is another reason why story's importance and power in communicating our messages needs to be recognized.

People have to care first. That's what "The Sea Mouse" accomplishes. Mary's poem describes where the sea mouse is found and what it looks like. It describes the conditions in which the animal lives and dies (Oliver 1994, 41–42). None of that convinces readers to care, however. Readers come to care because Mary creates an experience and opportunity to empathize with the sea mouse. Through the poem's speaker, moreover, readers experience the narrator's discovery, compassion, and sadness. They're invited to feel. That invoked feeling is but one reason why stories are such vital and powerful resources.

Like archeological artifacts and DNA, stories *are* resources. Like artifacts, they're evidence of human values and relationships among one another, places, plants, and animals. Although similarities may exist among different cultures' stories, as in their artifacts, those stories are unique products created in response to specific environmental conditions. And that makes stories analogous to DNA: they can be sequenced to reveal their origins and evolution in place through time. In other words, as we've known since we were children creating and repeating stories around campfires or community center chair circles, stories change with each new telling. Like modifications in cellular structure, those changes can be traced back through history to identify not only their most probable time and place of origin but also the environmental factor(s) causing their emergence.

Stories are more than evidence, however. Without stories, we couldn't discover and understand or imagine those earlier artifacts, environmental conditions, and cultures. We couldn't empathize with other people and beings. It's through story—and only through story—that we individually and collectively correlate artifacts and DNA modifications with their sources. It's only through story that we can understand and communicate the relationships among changing environmental circumstances, tool development, and those artifacts' subsequent effects on environmental conditions and human development. Does it matter which came first? One affects the other in a continuous cycle: each artifact shapes people's relationships with place, which in turn shapes the artifacts people produce to interact with place and one another. The cycle is perpetual. Story helps us understand those relationships.

Stories also express and transmit people's values. Why do we protect Yellowstone, the Grand Canyon, and Independence Hall? Why do we protect wilderness? Because we value those places, conditions, and the heritage they signify. Because they're central to our individual and national identity. Why is that? Because each became formative of and associated with values codified and passed on in stories celebrating America's war for independence and Manifest Destiny. "Story—sacred and profane—is perhaps the main cohering force in human life," Jonathan Gottschall writes in *The Storytelling Animal: How Stories Make Us Human* (2012). "A society is composed of fractious people with different personalities, goals, and agendas. What connects us beyond our kinship ties? Story. . . . Story is the counterforce to social disorder, the tendency of things to fall apart. Story is the center without which the rest cannot hold" (Gottschall 2012, 138). Without a unifying story, America couldn't have become and remained a nation. The places where the nation's stories developed didn't, however, define America's values; they represented them. They still do. It's the stories, though, that instill and maintain those values. It's stories that can also challenge and transform them. And that's the significance and promise of parks and what they preserve: history, history's evidence, and stories of the possibility of change for the better and benefit of everyone.

But in the nation's parks, the value and power of story are diminished or muted by barriers, only some of which I can mention and inadequately explore: fragmented knowledge; persistent white privilege; aging advocates and visitors; impoverished biodiversity; a changing climate; population growth and related resource consumption; increased urbanization; decreased nature contact; indifference, politics, and disagreement. Of these, as E.O. Wilson suggests in *Consilience: The Unity of Knowledge*, the most harmful might be fragmentation of knowledge since the Enlightenment (1998, 8, 38–40, 182). Fragmentation emerged as a means to better understand and control a world increasingly perceived as a machine. In time, that mechanistic perspective became institutionalized in the structures of governance, work (for example, scientific management and the assembly line), and knowledge production. In universities today, knowledge is siloed, or professionalized, to such an extent that scholars in diverse disciplines explore the same or related questions and make similar or synonymous discoveries yet rarely, if ever, cross paths. These same siloed structures, adopted from the business sector to promote efficiency, define not only NPS organizational structure but also the perspectives of personnel. To create the unity of knowledge, or consilience, Wilson argues for, knowledge needs to be synthesized (1998, 269).

As fragmentation's effects accumulate, competition for finite and sometimes scarce life-sustaining resources accelerates, straining social cohesion. With respect to parks and protected areas, persistent white privilege, aging advocates and visitors, and youths' decreasing nature-connection reinforce fragmentation. Continued professional specialization isn't the best remedy for these effects in a changing climate and increasing global population and urbanization. The solution begins with the synthesis Wilson argues for. And story, a form of synthesis, is crucial for unity. As a means of protecting parks and other areas, however, story's value has gone unrecognized or underappreciated. That needs to change.

Joseph S. Nye, Jr. (2011), a former dean of Harvard University's Kennedy School of Government, argues that power as traditionally conceived in the geopolitical context is no longer limited to two sources: military force and economic strength. That traditional understanding of geopolitical power's origins had expanded by the early 2000s to include a third source: story. In the past, possession of the largest and strongest military or economy, or both, had secured geopolitical power. That's not the case today, Nye (2011) argues; the nations or non-nation-state actors with the most compelling stories win people's commitment and conviction, their hearts and minds. And with commitment, the theory goes, people can resist and triumph over military and economic might.

How does this relate to parks and protected places? Nye's paradigm is analogically equivalent to the NPS's traditional sources of power and influence: workforce, budget, and story. With its stagnant or shrinking workforce and budget, equivalents to military strength and economy, story becomes the single source of power the NPS has the potential to develop and exercise to promote parks' public relevance. It's the agency's single source of power for growing public support for parks and the American ideals they identify, define, and signify.

But at present, NPS narratives are overwhelmed by the stories others manufacture for the popular media and advertising. Those narratives commodify America's past, places, and ideals to serve their creators' ends: selling products like Jeeps, or garnering support for business or special interests. If NPS storytelling doesn't challenge these marketing vehicles, if it doesn't win people's hearts and minds and engender their passionate backing, it's not the nation's parks alone that could be at risk. Without adequate and powerful NPS storytelling, America itself and the ideals it represents could be in jeopardy.

Telling stories is about more than identity and power, though. Today, it's about survival, and not just the survival of parks. It's about humanity's survival. "A culture creates its present and therefore its future through the stories its people tell, the stories they believe, and the stories that

underlie their actions. The more consistent a culture's core stories are with biological and physical reality," the biologist Carl N. McDaniel writes in *Wisdom for a Livable Planet*, "the more likely its people are to live in a way compatible with ecological rules and thereby persist" (2005, 228).

Because they synthesize diverse ways of knowing and knowledge, stories are key to achieving this outcome. NPS stories can not only challenge advertisers in the marketplace of identities and ideals, but also strengthen the public's awareness of the nation's parks, lands, principles, and potential. Stories can define what it means to be a citizen, steward, and an American. They can win people's promotional support and advocacy for parks, preservation, and ecological sustainability. Research has shown that stories are accepted and believed more than scientific facts and claims. Stories circumvent the public's distrust of professionalization. Stories are the primary mode of communication used in the media, where most people get information about science and technology: internet (35%); television (34%); magazines (9%); other print media (9%); and government agencies, family, friends, and colleagues combined (3%; Dahlstrom 2014).

Stories' power is more than people's acceptance of and belief in them. It is, in fact, their power that contributes to people's belief and acceptance. That outcome is realized because stories create a sense of experience and an experience of sense. Stories create and express memorable moments (those, for example, that produce a sense of awe). "The Sea Mouse" introduced readers to and created empathy for an animal most see rarely and would judge revolting (Oliver 1994, 41). Finally, as a result of their resonance—the combined impact of acceptance, belief, and empathy—stories effectively transfer knowledge and promote understanding. "Art [such as stories] makes images of feeling so that feeling is accessible to contemplation and thought," the geographer Yi-Fu Tuan writes in *Space and Place: The Perspective of Experience*. "Thought creates distance and destroys the immediacy of direct experience, yet," he continues, "it is by thoughtful reflection that the elusive moments of the past draw near to us in present reality and gain a measure of permanence" (1997, 148).

So how do we achieve memorable permanence? Learn from narratives of lasting influence, such as Henry David Thoreau's *Walden*, Aldo Leopold's *A Sand County Almanac*, Rachel Carson's *Silent Spring*, and Edward Abbey's *A Desert Solitaire*. More immediately, cultivate cross-training in the arts, sciences, and humanities; personalize the inter-relatedness of people, place, nature, and culture; and nurture the public's participation as storytellers. Lasting results can be amplified by replacing a siloed organization with one that promotes integration and consilience.

The values that cross-training adds to the conservation movement and NPS are many. Artists such as storytellers, including NPS interpreters, have been criticized for their scientific inaccuracies, while scientists have suffered harsh reproach for their inability to communicate with the public. If done successfully, cross-training can improve artists' scientific accuracy and credibility, while strengthening scientists' abilities to communicate to non-specialist audiences. Additionally, cross-training can make artists and scientists aware of their common ground:

- a desire to understand the world they live in,
- a passion for exploration and discovery,
- shared modes of experience (e.g., conception, perception, and sensation),
- reliance on metaphor to understand and interpret experience, and
- dependence on stories or theories (also stories).

Knowing their common ground can make each more receptive to different modes and interpretations of experience, the latter including the hard and soft sciences, humanities, and arts. Increased receptivity can in turn create opportunities for artists and scientists alone and together to

tell more inclusive and relevant stories. Gender, ethnic, racial, and environmental studies, among others, have since the 1960s deconstructed the grand narratives that shaped individual and national identity; though painful for many, these scholarly pursuits have broadened and enriched our nation's understanding of its history and places. Cross-training can help people learn to synthesize this broadened and enriching knowledge into more inclusive and relevant stories that form unifying national identities. Cross-training can help the conservation movement and NPS communicate system-unifying stories that, like wildlife corridors, link and unite places across the country and world into story corridors and ecosystems. Lastly, cross-training can help resource professionals and interpreters tell the same stories to audiences with different moral foundations or motivations for their beliefs and behaviors.

So, what is the take away? More diverse, inclusive, and relevant stories can reveal how and why people think and feel the way they do, can synthesize fragmented knowledge and experience into empathy and personally meaningful understanding, can communicate understanding beyond the human scales (e.g., geography and time), can influence people's emotions, thinking, and behavior, and, most importantly, can help repair the nature-culture chasm, that separation between humanity and the natural world that is a legacy of the Enlightenment, and the chief cause for anthropogenic climate change. If the conservation movement hopes to encourage people to steward the earth and its finite resources, Wilson writes in *Biophilia*'s "The Conservation Ethic," it must join "emotion with the rational analysis of emotion in order to create a deeper and more enduring conservation ethic" (1984, 119). We can achieve this with cross-training and story.

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11

Identifying Important Scenic Views: Where They are and Why They are Important

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In many national parks, monuments and other specially designated areas, visitors anticipate taking in views of iconic landscape features, historic settings and other visible features—things that may be within or beyond park boundaries. Through the law that established the National Park Service (NPS)—its "Organic Act"—and subsequent management policies, NPS is charged with protecting these visual or scenic resources. The first step in protecting them is understanding and describing what the resources are. With the inventory of the resources in hand, parks can then turn to determining why they are important and how they are at risk at risk. Though directed to protect them, NPS has not had a systematic approach to the inventory and evaluation of scenic views. Through the development of a visual resources program, NPS has developed a methodology for this inventory as well as strategies for incorporating protection of scenic views into park planning documents. This paper provides an overview of the inventory methodology, along with a brief background on visual resource management in other agencies, previous NPS efforts at protection of scenery, and some of the landscape changes that threaten important scenic views.

Simply put, visual resources are the physical features of the landscape such the land, water, vegetation and structures. The meaning and value of those features to viewers, such as for their aesthetics, or historic or cultural context, make the resources important to the visual experience. A compilation study of surveys taken at parks from 1998 to 2011 shows that 90 percent of visitors consider scenic views to be extremely important or very important (Kulesza, Le, and Hollenhorst 2013).

The Organic Act states that the purpose of establishing the NPS is to "…conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." With this central mission the NPS has been entrusted with some of the most spectacular and historically significant landscapes throughout the country. Each area in the national park system has special visual characteristics that are often central to the park area's management and visitor experience.

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To meet this mission, individual park units have developed approaches to protecting scenic views that are often part of the reason for establishing the unit in the first place. Blue Ridge Parkway has a sophisticated method for viewshed analysis and works extensively with local communities and land managers to retaining the visual experience of traveling the parkway. Grant-Kohrs Ranch National Historic Site successfully obtained a conservation easement on private land to protect the historic viewshed of the ranch. In these and other cases, while NPS has been successful in protecting important scenic views, each unit had to develop its own methodology to assess the visual resources and communicate their importance to stakeholders and partners.

The concept of visual landscape inventory and evaluation—and subsequent management as a resource—has been in place since the 1970s. The U.S. Forest Service and the Bureau of Land Management (BLM) are the primary agencies that developed visual resource programs for managing the scenic values of the large areas of lands they manage (USFS 1974, 1995; BLM 1976). Other agencies, such as the U.S. Army Corps of Engineers and the Natural Resource Conservation Service, also have their own systems for assessing the value of the visual landscape. In each case, the systems were developed to meet the management needs of their respective agency missions.

Recent years have seen the rapid development of energy facilities, especially utility-scale renewable energy projects and associated electric transmission, adjacent to or crossing parks and national trails. The development of communities is likewise pushing ever closer to NPS-administered lands and waters. These developments are changing sometimes previously undisturbed views from park areas. NPS recognized the need to develop a comprehensive approach for assessing the visual landscape qualities in and near park areas and understanding how best to protect them as a resource for future generations.

The NPS process provides a consistent methodology for the inventory of scenic resources across the NPS to advance protection of important scenic views. It also facilitates working with other agencies and community partners to protect scenic views near park areas, and is a tool that can be used to assess the values of internal park views to inform management and activities within the park.

The NPS process capitalizes on elements of existing visual resource inventory and management systems, but sets forth guiding principles to meet the unique mission of the NPS. Among these principles are that human-influenced landscapes can have as much scenic importance as natural landscapes; NPS scenery often has historic or cultural values in addition to its scenic value; and that evaluations should be made in the context of the park, not compare one park or landscape to another.

Rather than a specific portion of the landscape, the unit of inventory in the NPS process is a view as seen from the visitor perspective. The inventory identifies key information about the view including a description of the visible components of the viewed landscape, its aesthetic values or scenic quality, and the importance of the view to NPS and its visitors. The inventory process leads to the determination of scenic inventory values that are a useful tool for developing protection strategies. The scenic quality and importance values have equal weight in determining the overall inventory value of a view. The sections below briefly describe these two primary components.

Landscape description and scenic quality assessment

The SCP evaluation and planning processes include a field-based description of the visual elements in the viewed landscape, and an assessment of scenic quality of the composition of the elements in the view. The landscape description part of the process records basic data about the viewpoint and observation for future reference updates. The data are descriptive, not evaluative. The scenic quality assessment is conducted as a group discussion and consensus exercise by

the field team that assigns a single scenic quality value for the view. Data collected as part of the landscape description process may include date, viewpoint coordinates, the direction and width of the view, and the names of the evaluating team members. Landscape description data include view type (e.g., panorama, framed, focal); landscape character (e.g., natural, rural, agricultural); and other key descriptive elements of the viewed landscape, such as landforms and land use, as well as prominent forms, lines, colors, and textures.

Scenic quality is the value of the viewed landscape based on its perceived visual attractiveness, as determined by the aesthetic composition of the visual elements. Scenic quality is a primary reason (but not the sole reason) for conserving scenic values in a viewed landscape, as it is well established that high quality scenery attracts NPS visitors and enhances the visitor experience. Assessing scenic quality involves field-based assessments of landscape character integrity, vividness and visual harmony. Each factor is assessed while viewing the landscape from the viewpoint, and the assessment requires that the group evaluate three equally weighted components for each factor. Landscape character integrity indicates the degree of intactness and wholeness of the landscape character identified in the landscape description section. The highest integrity ratings are given to those landscapes which have little or no deviation from the identified landscape character type. Vividness is the degree to which landscape elements are distinctive or striking enough to make a view memorable, such as dominant focal points, or bold forms and colors. Visual harmony is the extent to which there is a pleasing array of visual elements in a landscape, usually as a result of a sense of visual order, compatibility, and completeness between and among the land forms, water forms, vegetation, or built elements visible in the landscape.

View importance

As noted earlier, the unit of inventory in the NPS process is a view consisting of a viewpoint, viewed landscape and the viewers. As part of the process, key descriptive information about the viewpoint and viewed landscape is gathered that helps inform the rating process.

Information collected about the viewpoint identifies whether the location is associated with designated scenic or historic cultural features or locations, such as national scenic or historic trails, designated scenic overlooks, historic properties, cultural landscapes, or other specially designated areas. Similar information about the viewed landscape is identified so that it is clear whether landscape in the view—whether inside or outside the park—includes special features or designations that are important to the park and its visitors.

The view importance rating identifies NPS and visitor values for each of these factors of the view. Similar to the scenic quality rating, the view importance assessment rates three equally weighted factors: viewpoint importance, viewed landscape importance, and viewer concern. Viewpoint importance assesses the extent to which the viewpoint is publicized and managed for visitors, such as development of parking lots, restrooms, or other facilities, and used for interpretive services. Viewed landscape importance assesses the extent to which the elements in the viewed landscape are publicized and used for interpretation. The assessment also evaluates how important special designations, such as wilderness or historic sites, are within the view. Viewer concern indicates the potential level of sensitivity that viewers might express to changes in the view. The evaluation is based on how many visitors take in a view, the duration of a visit and the activities of viewers. The ratings rely primarily on the knowledge and professional judgment of NPS staff, as well as background research that can provide information about publicity in outside media.

The final step in the inventory of a specific view is the determination of the scenic inventory value (SIV). This value combines the scenic quality and view importance ratings into a single measure, and is derived using a matrix (Table 1). The SIV represents a scenic inventory value for

Scenic Inventory Value Matrix						
		View Importance Rating				
		1	2	3	4	5
Scenic Quality	A	VH	VH	VH	H	M
	B	VH	VH	H	M	L
	C	H	H	M	L	L
	D	H	M	L	VL	VL
	E	M	L	VL	VL	VL

Figure 1. Scenic Inventory Value Matrix.

each view relative to other inventoried views. The scenic inventory value is the final value that is recorded for a view and is what will be used for further analysis and interpretation by the park for engaging with stakeholders and partners for protecting scenic views.

The NPS visual resource inventory process presents a systematic approach to identifying the values of scenic views to NPS and its visitors. The process capitalizes on elements of existing visual resource inventory and management systems but is designed specifically for the NPS mission of conserving resources for current and future generations. The inventory is considered in the context of the park, and one landscape is not compared to another. It also recognizes that human-influenced landscapes can be just as important (because of their historic or cultural values) as dramatic scenic views of natural landscapes. The inventory process is one component of an overall visual resource program in the NPS, and will provide valuable information for park planning efforts as well as engagement with stakeholders and partners in the protection of important scenic views.

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12

The Civilian Conservation Corps at Chiricahua National Monument: A Cultural Landscape for Interpretation

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The challenge

National parks and monuments are amalgams of cultural and natural resources. They are places where human history was and still is dependent on natural resources and where those natural resources have been modified by generations of inhabitants. As such, they are cultural landscapes. Under the ongoing protection of the National Park Service (NPS), these cultural landscapes are some of the best preserved representations of our American history and collective experiences.

Park employees must protect these landscapes but must also develop interpretation and educate the visiting public about them.[1] Freeman Tilden recognized the critical importance of communicating that knowledge to others almost 60 years ago. Interpreters are the lynchpin in that communication. In 1957 Tilden wrote in his seminal work, *Interpreting Our Heritage*, "The primary need for interpretation is to inspire a desire to protect and preserve our resources."[2]

Yet, as cultural resource specialists, managers, landscape architects, and historians, we still struggle to translate the unfamiliar concept of a cultural landscape into usable language for park interpreters and for the visiting public. Without that conceptual understanding, cultural landscapes and the component features that comprise those human-derived places remain unrecognized and unknown. It is my belief that understanding a landscape and its associated values comes from close physical exposure to that landscape, combined with a connection to its history and its people. You can't achieve that "aha" moment until you put both together. By learning to "read" our historic landscapes, by engaging people in those landscapes with stories and past experiences, we strengthen bonds between residents and their community, and inspire visitors to become committed to preservation.

From my experience as a landscape historian, I am convinced that teaching through a landscape format is still the best way to educate the public about the integrated resources within and around each park.[3] I have been researching the landscape of Chiricahua National Monument in Southeast Arizona for over a decade. Using the historic, designed landscape in this small and compact park, I will illustrate what interpretation might accomplish with a nationally recognized storyline, such as the Civilian Conservation Corps (CCC), and the hundreds of heritage features present in Chiricahua's landscape.

Chiricahua's cultural landscape

Chiricahua National Monument (CNM) is a small, enclosed area set within one of the basin and

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range mountain systems in Southeastern Arizona. Ranging from 5100 to 7300 feet in elevation, its geological features derive from wind- and water-carved ash depositions from volcanic eruptions 25 million years ago. Within the park boundaries CNM ecosystems extend from high desert grasslands to ponderosa pine forests, and support a highly diverse biota. Two steep canyons converge into a flat valley whose creek is fed by summer monsoon and winter precipitation. That valley with its surrounding environment sustains a cultural landscape significant for a number of historic themes, its archeology, ethnography, and historic design.

Chiricahua's landscape is an enormous onion, deep with overlying and interwoven layers of history. Bonita Canyon holds evidence of Archaic period settlement and was an important component of the Chiricahua Apache homelands. The Buffalo Soldiers' tenth cavalry occupied the valley during the Indian Wars. Two families claimed homesteads in the canyon for farming and cattle ranching. The landscape has since supported a Forest Service ranger station, an early Arizona guest ranch, a CCC campsite and its constructed park facilities, and, finally, 80 years of NPS stewardship.

Hidden in recesses beyond Bonita Canyon, at the heart of CNM is a mind-boggling landscape, a phantasmagorical collection of spires and pinnacles that remained undiscovered until the early 1920s. It is this landscape around which the monument was established.

Ed Riggs, stockman and owner of Faraway guest ranch, was an inveterate explorer and tinkerer. He climbed over and dove deeply into the geological landscape of CNM in early 1920s. Riggs led early tours into the heart of that wilderness, and was instrumental in generating the public enthusiasm necessary to establish the monument. Ed cut the first horse trails, and later became the trail foreman at the CCC camp. He knew that landscape more intimately than any man.

But landscape needed more than one man to open it up. The Great Depression with all of its associated misery created that opportunity. The CCC work program was a signature program of President Roosevelt's New Deal—the largest social experiment, designed to lift the country out of the Great Depression. The CCC hired unemployed young men, taught them skills and a work ethic, and, with respect to park lands, developed recreational facilities across the country (Figure 1). In Arizona, because of New Deal work programs like the CCC, the 1930s saw more coordinated federal and state-led development than at any other decade in the history of the state.[4]

Figure 1. Civilian Conservation Corps enrollees were unemployed, young men aged 17 to 25. Working under experienced foremen, they gained valuable trade skills and a work ethic. In this image, these enrollees display an evident pride in their abilities as they enlarge Chiricahua's original two-room ranger station into a more efficient interpretation center, administrative building, and museum in 1937.

The role of CCC and the NPS

While CCC enrollees provided the labor to construct the park elements, NPS employees developed master plans to guide the design and layout of each park. NPS engineers, landscape architects, planners, and naturalists were responsible for overseeing construction at over 1,000 municipal, county, state and national parks across the country.[5] Almost every park and monument in Arizona extant in the 1930s had major development created by CCC enrollees and NPS engineers. Even today, more than 75% of parks in the southwest still support CCC historic resources.[6] The ubiquity of those historic resources and landscapes throughout our federal parks gives weight to the importance of their identification and interpretation to the public.

The CCC camp NM2A at Chiricahua existed for six years between 1934 and 1940. In that short span of time, enrollees and the foremen who directed them built an entire recreational site and associated NPS management district, including 17 miles of trails, eight miles of reconstructed roadway, a campground, administrative center, and housing and maintenance facilities. Chiricahua's landscape is dense with CCC accomplishments; there are few places in the park where visitors will not experience a constructed feature of that era.

The NPS design of roads, trails, and buildings was directly influenced by issues of topography, aspect, geology, vegetation, and other natural resources, such as stone for building. Development was laid out according principles of naturalistic landscape design and rustic architecture. Related structures were clustered together to minimize impact on the land, and the trail and roadway systems were linked to coordinate circulation patterns.

Natural resource planning was organized jointly with Coronado National Forest. A fifth, and northernmost, in a series of fire lookouts along the Chiricahua Mountain Range was constructed on Sugarloaf Mountain to complete the visual coverage for fire spotting and prevention. A primitively constructed road was finished when the CCC enrollees arrived in 1934. The road needed much improvement, including better drainage, slope stabilization, blasting back overhanging ledges, and rebuilding culverts.

Chiricahua supports 16 CCC buildings—most within a short walking distance of prime visitor locations. CCC buildings are low structures, showing few external straight lines or right angles. All were assembled from locally quarried rhyolite stone cut with hand tools in order to blend more effectively with the natural environment. The sloped walls suggest structures emerging from soil. Vegetation was carefully retained during construction and later enhanced to provide screening and further embed the buildings visually into landscape (Figure 2).

The numerous trails constructed under the watchful eye of foreman Ed Riggs were specifically designed to meander; at each turn they present a new and dramatic view (Figure 3). Evidence of CCC drill marks and the enrollees' hand work is visible on every trail. This trail system in Chiricahua is unique; it is the only historic designed landscape that has subsequently been designated as part a wilderness—a relationship that only further confirms the inseparability of cultural and natural resources and values.[7]

The layout of trails was intended to educate visitors about Chiricahua's remarkable geological resources, and to give them intimate access to those features. Today's visitors become viscerally and emotionally attached to those formations. In many locations within the park, hikers can walk among and touch enormous spires on both sides of the trail. Yet those same visitors receive little information about the planning or construction that created these trails, Chiricahua's other structures, or their connection to national historic events.

Interpreting a CCC landscape

It is not my purpose in this paper to critique interpretation at this park in particular; CNM is a small park and now labors under continuing personnel and funding cutbacks. Rather, I wish to

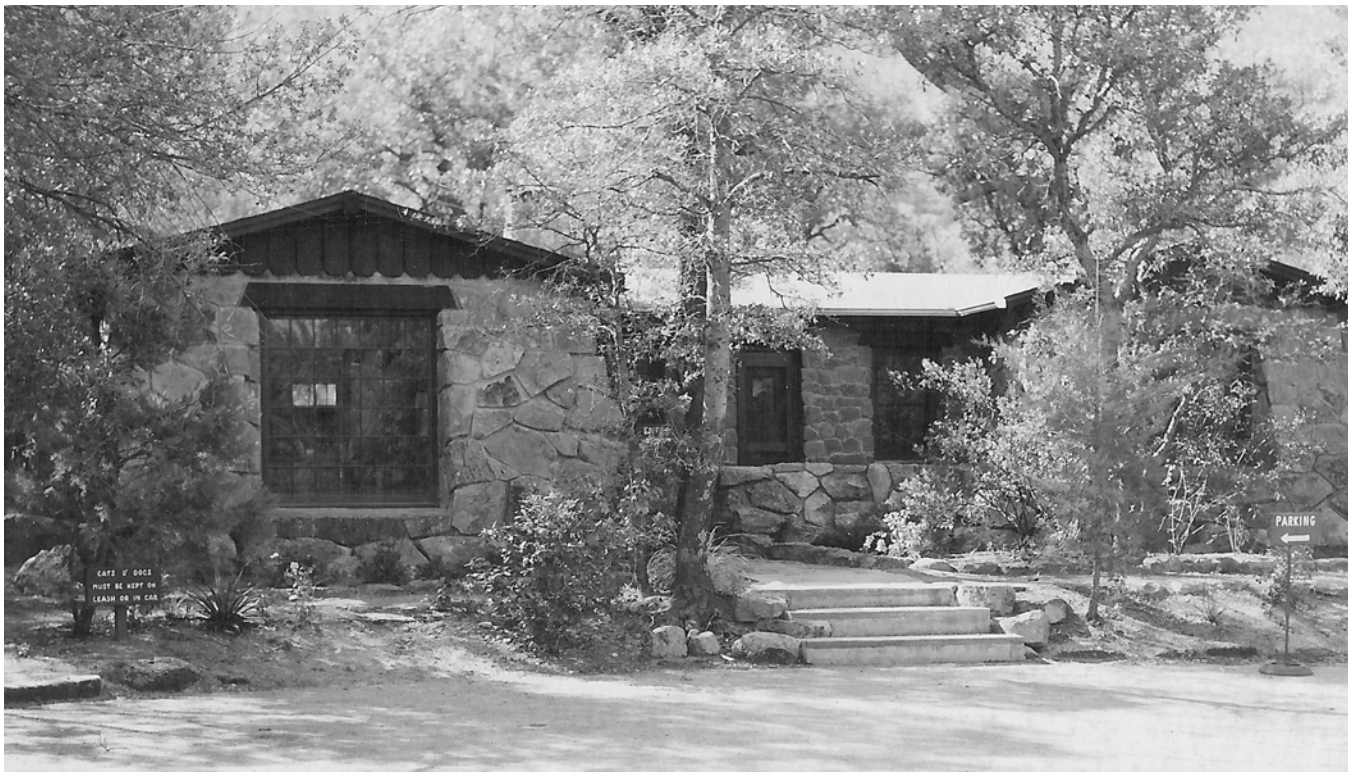

Figure 2. Chiricahua's administration building and museum were constructed by CCC enrollees using carefully quarried stone and assembled following NPS design principles of rustic architecture. Hundreds of visitors walk past this building to enter the Mission 66 visitor center addition yet there is no interpretation about its origins.

Figure 3. After close encounters with stone pinnacles, the historic designed and CCC-constructed Echo Canyon Trail offers a hiker a refreshing long-distance view of weather-carved columns, Lower Rhyolite Canyon, and the grazing lands of the Sulphur Springs Valley beyond.

use this opportunity to suggest what might be accomplished in interpretation by park units that still contain CCC designed landscapes, and to encourage park employees and visitors to think in terms of landscape imbued with history and defined by imprints of earlier generations.

An informal survey of some southwestern parks yielded useful examples of interpretation of the CCC and park history at a landscape scale. In 2007, Grand Canyon National Park funded a year-long project to plumb its own archives for the history of the CCC and its early development. With that information, park historians produced a remarkable exhibit that now travels to museums throughout the state and shares that story to an even wider audience. A paper pamphlet available at the visitor center, and now a digital version on the park website, directs visitors on a self-guided tour of CCC accomplishments along the rim trail. In addition, the park website offers more detailed historical information, and connections to sources and websites for those interested in exploring the subject in greater depth.

Bandelier National Monument contains a wealth of CCC buildings and structures in the vicinity of the visitor center. Park interpreters have designed a self-guided walking tour of the area, which is downloadable from the park's website. The tour contains photographs of all of the structures, and relates information about the history of the Depression and the CCC, and the construction, historic use, and adaptive reuse of the buildings. A park volunteer gives a fire-side talk about the lives of the enrollees who worked at the park, and the importance of the CCC program in the development of the cultural landscape of Bandelier.[8]

At Petrified Forest National Park the story of the Painted Desert Inn highlights the importance of visitor connection and personal investment in park resources. CCC enrollees reconstructed and expanded the inn in 1938, but it was later abandoned due to severe structural problems. Because of public attachment to the historic structure, Petrified Forest chose not to demolish the building, but restore it instead.[9] In era of declining budgets, we must continue to educate the public on the value of park cultural resources and the ongoing need to preserve them. Chief of Interpretation Sarah Herve affirms that visitors are hungry to learn about the origins of the park and the history of the CCC.[10] The park now showcases the CCC in permanent exhibits at the inn. Park interpreters take visitors along the CCC Blue Forest Trail, and relate the role of the CCC in the early development of Petrified Forest.

Some of the tools listed here can be labor- or time-intensive for park personnel. Yet personal contact with interpreters always creates the most memorable experiences for visitors. Permanent exhibits can be expensive and space-intensive for small visitor centers. Wayside information outside of buildings or at trail heads might provide a useful alternative. Other options might include interpreter podcasts, recordings of oral histories with enrollees, updates about CCC resources on Facebook or Twitter pages, and links to publications of park research, such as administrative histories, cultural landscape reports, or national register nominations, all on the park website. It should be noted that while the three examples above illuminate the role of the CCC and construction of the individual park's features, none cover the contributions of NPS employees who designed those buildings and landscapes and oversaw their development.

Interpretation and park history

A landscape-scale perspective provides a valuable framework with which to interpret natural and cultural resources together. CNM, like most parks, is rich in both. Its cultural history is thoroughly interwoven with—indeed inseparable from—the natural resources. One cannot successfully interpret its history without including the natural resource values that led people to settle in and use that landscape. If one speaks of those natural resources without the accompanying cultural history, the story is thin and one-dimensional.

The accomplishments of CCC enrollees along with NPS designers and engineers are a prime example of that connection. They combined constructed facilities with wilderness resources to develop what we now appreciate as the park experience. The CCC was a "bootstrap" response to a great adversity afflicting our country; that response yielded some of the greatest cultural resources in our national parks. Eighty years later, those constructed landscapes still provide aesthetic, educational, health, and economic benefits to visitors and surrounding communities.

The 80th anniversary of the Historic Sites Act and the 50th anniversary of the National Historic Preservation Act are two reasons to highlight National Register-eligible park resources. Indeed, our upcoming centennial is a time when we should celebrate not only what the parks have to offer but also what they have accomplished in the past, and how they preserve our history for us today. The NPS is the premier repository of American history and heritage; yet it does *not* tell its own story very well.[11] The widespread occurrence of CCC structures, buildings, and landscapes in parks across the country provides interpreters a ready opportunity to communicate the importance of our heritage resource values, their connection to natural resources, and the critical need for their protection and preservation.

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13

Mapping Seeps, Springs, Ponds, and Streams on Santa Rosa Island, CA

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Abstract

In September 2014, during the driest period of the year, park staff and volunteers mapped surface water on Santa Rosa Island by physically walking all 2nd, 3rd, and 4th order streams. Mappers hiked more than 325 kilometers in 19 major basins and 7 lesser basins, and mapped 1,117 water features. These data have broad application across many disciplines, and will provide a baseline for long-term trends in surface water (Turner and Richter 2011), a better understanding of geologic, hydrologic, and biologic interactions (Schmidt, Minor, and Bedford 2015; Minor, Schmidt, and Bedford 2013), and characterize areas for ecological research (Turner and List 2007).

Introduction

Santa Rosa Island (217 km^2 (84 mi^2)), located 50 km southwest of Santa Barbara, California, is the second largest island in Channel Islands National Park (CINP). It is characterized by highly incised canyons, marine terraces, sandy beaches, and three more or less centrally located peaks: Radar Mountain (484 m (1,589 ft)), Soledad Mountain (480 m (1,574 ft)), and Black Mountain (395 m (1298 ft)).

Santa Rosa Island is characterized by cool, wet winters, and warm, dry summers. Fog drip contributes to the hydrologic cycle during summer months (Williams, Burnette, and Clarke 2008). Springs, seeps, pools, and surface water are critical natural resources to Santa Rosa Island, where 95% of annual precipitation occurs between November and April, and precipitation, averaging about 14 inches per year, is highly variable and unpredictable.

Spring discharge, influenced by geologic and topographic features, occurs in response to hydrologic activity of a much larger area, likely influenced by fog input, recovering vegetation, and precipitation. Springs and seeps provide base flow to the island's 20 major creeks, supports valuable riparian habitats for Santa Rosa Island fox (*Urocyon littoralis* ssp. santarosae), birds (Collins 2011), herpetofauna, island residents, and park visitors. The island's creeks are often the location

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of exceptional beauty and may hold cultural significance to Native Americans who occupied the island for more than 12,000 years (Johnson et al. 2000).

The mid-1800s ushered in the ranching era. Non-native ungulates, including cattle, sheep, pigs, deer, and elk, were brought to the island and intensively grazed the island for more than 150 years, negatively impacting native coastal sage scrub, island chaparral, grassland, and scattered oak and pine woodland plant communities. The park removed all non-native grazers between 1993 and 2011 (Lombardo and Faulkner 1999) and recovery of plants and wildlife, including the Santa Rosa Island fox and Torrey pine (*Pinus torreyana* ssp. insularis), is occurring.

With rapid change taking place following removal of all non-native ungulates, there was a need to better characterize Santa Rosa Island's hydrologic attributes. During two weeks in September, 2014, following a historic three-year drought, park staff and volunteers mapped all seeps, springs, ponds, and streams by systematically walking 335 stream km along all 2nd, 3rd, and 4th order steams (Strahler 1957; Fitzpatrick et al. 1998). We chose to physically walk tributaries rather than relying on digital datasets or aerial photos to determine the extent of surface water. Although time-consuming and labor-intensive, this approach resulted in accurate mapping of hydrologic features, and eliminated inaccuracies inherent in digital datasets of different resolutions (Vance-Borland, Burnett, and Clarke 2009). All water features were marked using consumer-grade GPS units. These data have broad application across many disciplines, and will provide a baseline for long-term trends in surface water (Turner and Richter 2011), a better understanding of geologic, hydrologic, and biologic interactions (Schmidt, Minor, and Bedford 2015; Minor, Schmidt, and Bedford 2013), and characterize areas for ecological research (Turner and List 2007).

Methods

In September of 2014, park staff and volunteers systematically mapped all surface water features during the driest time of year to establish baseline hydrologic data (see Turner and Richter 2011). This involved identifying all basins and 1st, 2nd, 3rd, and 4th order streams (Horton 1945); creating a unique identifier for each basin and tributary; and assigning tributaries to teams of two mappers armed with Garmin, camera, radio, paper data sheets, and paper maps to locate and record UTMs for all water features. Basins were given the same name as the major creek draining the basin. Small, adjacent watersheds without a major creek name were given the same name as the neighboring basin followed by a sequential number (e.g., Garanon 1).

Each day began with a morning briefing and stream mapping assignment. Teams were transported by vehicle along single track dirt roads to a point closest to their assigned tributary. The team proceeded to their start point at the beginning of a 2nd order tributary. The team walked the creek bottom and recorded UTMs for each spring, seep, pond, and surface water feature. Ponds were defined as any pool of surface water less than 3 meters in length. Seeps and springs were defined as a point where water clearly emerged from the ground but water remained on the surface for less than 3 meters (10 ft). If surface water was present for 3 meters (10 ft) or more, UTMs were recorded where surface water started and where surface water stopped. Stream width was not a factor in start/stop determinations. In addition to recording UTMs with the Garmin, all data were recorded on paper data sheets. Teams were instructed to record the location of significant cultural finds, specific invasive species populations, significant bird sightings or any other unusual sightings. Significant features were photographed with GPS-enabled cameras.

At the end of each day, team members submitted paper data sheets, Garmin and other equipment to the data manager. The data manager then downloaded and checked the data against hand-recorded data from the paper data sheets, which served as the first level of data quality assessment and quality control.

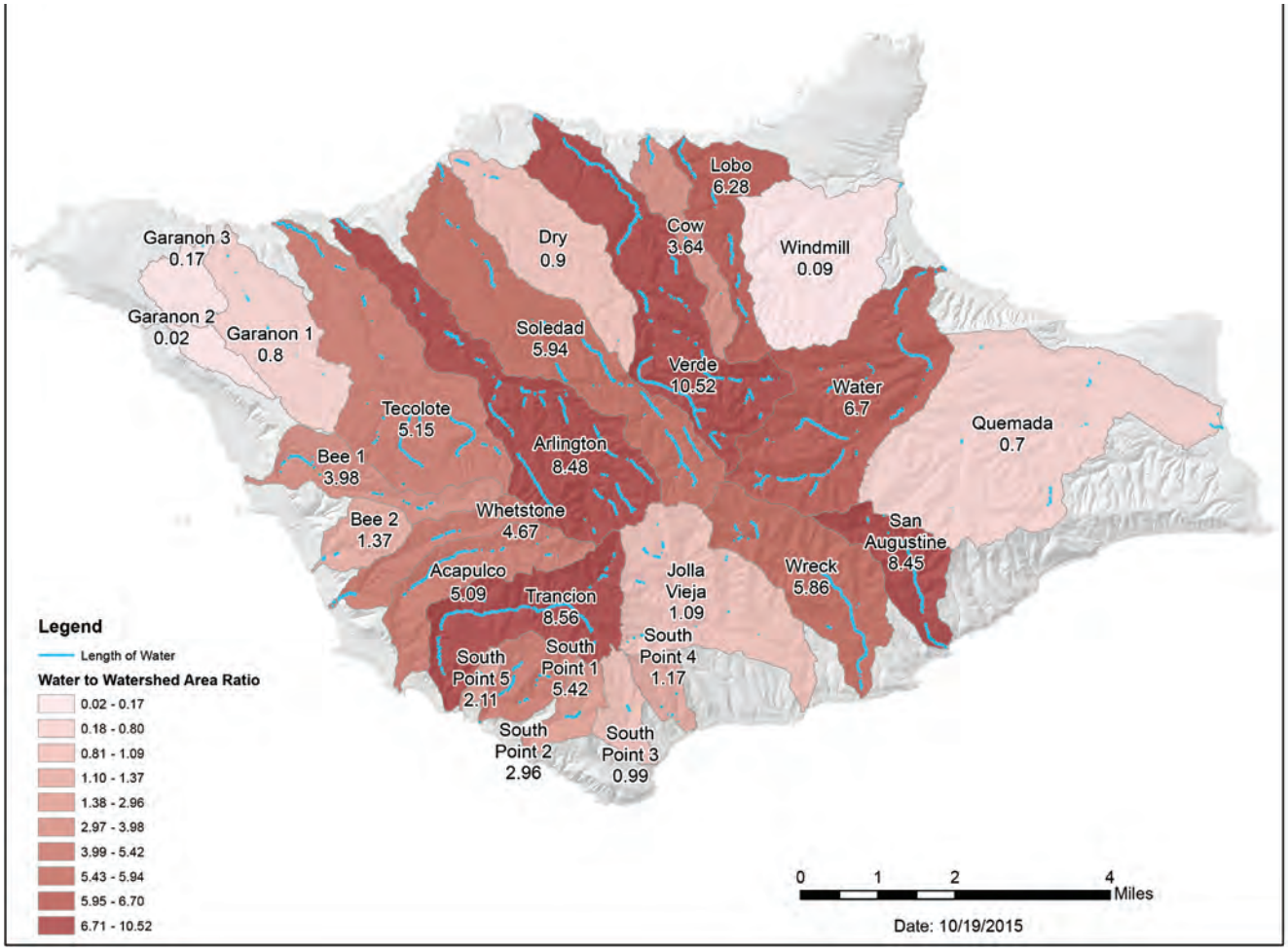
Personal safety and biosecurity (preventing the spread of invasive species) were important components of the project. All teams were instructed in personal risk analysis and the proper use of radios. At the end of the day each team member was responsible for cleaning their equipment, boots, and clothes and emptying their backpack to reduce the risk of unintentionally spreading weed seeds from one canyon to the next.

In order to describe basin characteristics, surface water between stop and start points was categorized as a perennial stream. We assumed surface water was perennial because mapping took place during the driest time of year in an extreme three-year drought. Each basin was characterized further using the following geomorphic descriptors. Drainage area for a specific basin was measured in a horizontal plane, enclosed by a drainage divide (Horton 1945). The cumulative perennial stream length was the sum of the length of all perennial streams within a drainage basin (Horton 1945). Drainage density was the ratio of the cumulative perennial stream length to drainage basin area (Leopold, Wolman, and Miller 1964).

Results

Thirty-one mappers walked 335 stream kilometers in 19 major basins and 7 lesser basins, and mapped 1,117 water features (Figure 1). All named basins on Santa Rosa Island had surface water, except Old Ranch Canyon. Old Ranch Canyon and smaller, unnamed or dry watersheds are dropped from further analysis and discussion.

Figure 1. Santa Rosa Island, CINP, with drainages and drainage densities.



All creeks were intermittent, fed by seeps and springs. The largest spring, San Augustine, emerges at an elevation of 287 m (944 ft) and flows to the ocean, with one short break. Canyons with the greatest cumulative stream length were Verde (12,446 m), Arlington (10,016 m), Water (8,176 m), Soledad (7,286 m), and Trancion (6,299 m; Table 1).

Table 1. Surface water features and basin characterizations in 19 named basins and 7 lesser basins on Santa Rosa Island, Channel Islands National Park (CINP).

Basin	Drainage Area (ha)	Cumulative Stream Length (m)	Drainage Density (m:ha)	Total seeps, springs, ponds
Verde	1183.04	12446	10.52	21
Trancion	735.92	6299	8.56	21
Arlington	1181.61	10016	8.48	58
San Augustine	367.85	3110	8.45	1
Water	1219.63	8176	6.70	27
Lobo	470.34	2953	6.28	6
Soledad	1225.83	7286	5.94	34
Wreck	741.81	4344	5.86	10
South Point 1	248.16	1344	5.42	34
Tecolote	1183.90	6095	5.15	20
Acapulco	474.67	2417	5.09	1
Whetstone	276.10	1289	4.67	27
Bee 1	366.05	1458	3.98	5
Cow	278.77	1014	3.64	5
Garanon 2	136.82	496	3.62	2
South Point 2	168.54	499	2.96	-
South Point 5	48.51	102	2.11	2
Bee 2	198.01	271	1.37	4
South Point 4	134.64	158	1.17	2
Jolla Vieja	930.80	1011	1.09	31
South Point 3	176.42	175	0.99	-
Dry	686.22	616	0.90	16

Verde Canyon, located on the north side of the island, with the 5th largest drainage area, had the greatest drainage density (10.52 (cumulative stream flow:drainage area)), followed by Trancion (8.56), Arlington (8.48), and San Augustine (8.45). Quemada canyon, located on the northeast side of Santa Rosa Island, had the largest basin (1,183.04 ha), and with 1,302 m surface water, had one of the lowest drainage densities (0.70). Windmill canyon, draining adjacent to the historic ranch complex at Beecher's Bay, with only 81 m surface water had the lowest drainage density and was the driest canyon overall.

Discussion

Physically walking all 2nd, 3rd, and 4th order streams was an effective method of obtaining detailed and accurate information about surface water on Santa Rosa Island. Mapping provided several insights that differed from conventional wisdom regarding the island's hydrologic conditions. At the time of data collection, California was experiencing 3 years of extreme drought conditions; yet, every named canyon except Old Ranch Canyon had at least one seep or spring and surface water ranging from shallow (<2 cm) to ankle- or calf-deep riffles.

These data have broad application across many disciplines and will provide a baseline for long-term trends in surface water (Turner and Richter 2011), a better understanding of geologic, hydrologic, and biologic interactions (Schmidt, Minor, and Bedford 2015; Minor, Schmidt, and Bedford 2013), and a characterization of Santa Rosa Island for future ecological research (Turner and List 2007). Cumulative perennial stream length determines the amount of stream habitat within the basin (Fitzpatrick et al. 1998) and is influenced by vegetative cover and geology. With the removal of all non-native ungulates in 2011, vegetation has rapidly changed, after 150 years of intensive grazing, and new occurrences of species native to the Channel Islands have been found. Baseline data from this effort and repeated mapping of key basins will improve our understanding of basic biologic, geologic, and hydrologic processes.

Mappers walking the canyons located priority invasive species, including fennel (*Foeniculum vulgare)* and tamarisk (*Tamarix ramosissima*). The park's invasive species management strategy targets these species for immediate removal. *Helichrysum* spp., a common landscape ornamental and an aggressive weed on nearby Santa Cruz Island, was mapped and treated. Locating and treating these species early in their invasion is critical because, when they invade and expand, they have the potential to alter ecologic processes.

Drainage density represents the amount of stream that drains a basin. Drainage density reflects climate patterns, geology, soils, basin vegetation, and age of stream network, and is perhaps the single most useful index to describe basin processes (Gregory and Walling 1973). Verde, Trancion, Arlington, and San Augustine have the highest drainage density on the island. With abundant surface water and springs, these canyons have the greatest potential for stream habitat recovery following non-native ungulate removal, including recovery of wetland plant and aquatic invertebrate species, in addition to providing surface water for island animals, including the endangered Santa Rosa Island fox and spotted skunk (*Spilogale gracilis*). Drainage density may also have cultural significance. Perennial streams may indicate potentially long-term use by Native Americans. Repeated surface-water mapping will provide data for trend analysis and create an accurate measure of change in biologic and hydrologic resources.

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14

A Tale of Two Heritage Areas: Making Sense of the Past to Shape the Future

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> "We need, if we are to make any sense of the past, both to understand the significance of the physical remains and to place them in a social context.… Such awareness is necessary if the past is to be seen as having any relevance to the present and the future" (Burton 1983, 93).

The heritage area ideal provides the model for community engagement in protected landscapes. This paper compares the heritage preservation approach taken in two regions—the Lackawanna Heritage Valley in Pennsylvania, USA, and the former "HERIAN" project in Wales, UK—both of which are industrial heritage areas.

While traditionally heritage has been associated with castles, cathedrals, and similar examples of high culture, the second half of the twentieth century saw a tremendous expansion of what is considered a heritage resource (Alfrey and Putnam 1992). This has led to recognition of the importance of industrial heritage, which deals specifically with the buildings and artifacts of industry inherited from previous generations.

The greatest number of designated heritage areas is found in European countries where the concept dates back to the 1960s (Frenchman 2004). Within the USA, the heritage area movement is relatively young as it was only in 1984 that the first national heritage area (NHA), the Illinois and Michigan Canal Corridor, was designated. NHAs are nationally distinctive areas that have been shaped by human activity. They are designated because of their importance both physically, and in the traditions that exist within them (NPS 2008). They rely on a cooperative approach to achieve both conservation and economic growth. The nature and size of heritage areas varies, as each project involves areas of different sizes and historical themes, and is managed by partnership bodies that have no control over land use. Designated heritage areas are lived-in landscapes.

HERIAN

In 2003, the HERIAN project was launched with to develop a coordinated approach to heritage development in industrial South Wales. In the Welsh language "HERIAN" means "to challenge" and it is also the acronym for "Heritage in Action." The total area covered by HERIAN was ap-

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proximately 1500 square miles, with a population of 1.8 million, and included some of the richest and poorest communities in Wales (Figure 1). The area is predominantly English speaking, but Welsh is the first language of the majority of the population in the westernmost areas.

South East Wales had been one of the most heavily industrialized areas of Britain and Wales played a leading role in the formative years of the Industrial Revolution. In 1851, the UK census showed for the first time that more people in Wales made their living from industrial labor than from agriculture, suggesting that Wales had become the world's first industrial nation (PLB 2003).

The mid-twentieth century saw a steady decline in heavy industry. Areas that were focused on heavy industries such as coal and steel were particularly hard hit. With the heavy industries gone, South East Wales was left with a legacy of industrial decline but this legacy had also left a rich industrial history and a unique society. Or, as the former First Minister of Wales, Rhodri Morgan described it, "the Taff [River] from Merthyr to Cardiff is the Grand Canyon of the Industrial Revolution" (HERIAN 2003).

The main impetus behind the HERIAN initiative was the recognition in 2000 of the Blaenafon Industrial Landscape as a UNESCO World Heritage Site. This recognition was set against a background of piecemeal development of industrial heritage tourism sites in the region. The Wales Tourist Board commissioned consultants to explore how best to capitalize on the unique heritage of South Wales. The resulting report recommended establishing a partnership for industrial heritage tourism in the South Wales Valleys. In 2003, a senior director from the Wales Tourist Board was approved to oversee the new initiative, and HERIAN was officially launched.

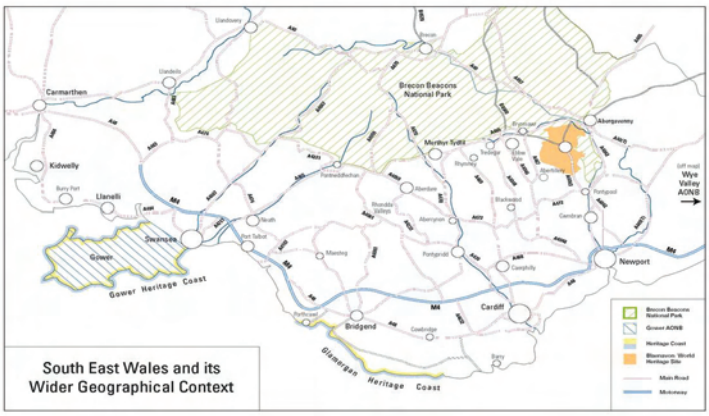

Figure 1. Map of the area covered by the HERIAN heritage initiative in South East Wales.

The original report which established the need for HERIAN recognized that heritage tourism initiatives had been previously tried in Wales and other regions of Britain and had failed. It was therefore stressed that while tourism would be a critical part of the new heritage area, it would not be at the center of it. Any new initiative needed to ensure that industrial heritage was its primary focus, with tourism being one of five intrinsically linked objectives, the others being education, regeneration and economic development, social inclusion, and heritage conservation.

The initiative had a very small management team: a project director and a supporting office administrator. Other freelance consultants were brought in when needed to help coordinate partner activities. To avoid duplication of existing resources or activities, the team primarily acted as facilitators and enablers.

Lackawanna Heritage Valley

In 1991, the Lackawanna Heritage Valley was named the first state heritage park in Pennsylvania (Figure 2). This was followed in 2000 by recognition on a national level. The Lackawanna Heritage Valley NHA stretches for 40 miles, and encompasses the watershed of the Lackawanna River in Wayne, Susquehanna, Lackawanna, and Luzerne counties. Its history mirrors that of many other early industrialized regions throughout the world, including the South Wales valleys. In the early nineteenth century the area was sparsely populated pasture land, but within several years grew to be one of the great industrial districts on the continent. Towards the second half of the twentieth century, the coal industry began its steady decline. As mines closed, many thousands

of jobs were lost, forcing families to leave the area in search of alternative employment. For a number of decades, the population of the region steadily eroded.

The designation of the Lackawanna Heritage Valley was ultimately the culmination of a number of converging initiatives, including the designation in 1986 of the Delaware, Lackawanna and Western rail yard, and its collection of steam locomotives in Scranton, as Steamtown National Historic Site, a unit of the National Park Service (NPS). The preparation of a management plan for Steamtown stimulated local interest in linking together other significant historic resources in the area. The area is managed by a county municipal authority, and the Lackawanna County Commissioners appointed a board of directors. One advantage of this arrangement is that the authority can qualify for certain government funds which are not available to non-profit organizations. The Lackawanna Heritage Valley Authority is involved both directly and indirectly in a range of activities within the region. These initiatives vary from bricks-and-mortar work to programming and special events. In recent years, the development of the Lackawanna River Heritage Trail has been a priority.

Figure 2. Map of the Lackawanna Heritage Valley.

Management plans

Both initiatives are underpinned by comprehensive foundation documents. All national heritage areas in the USA are required to produce a management plan within three years of designation. Therefore, in 2004 the Lackawanna Heritage Valley Management Action Plan and Environmental Impact Statement was published.

One of HERIAN's first actions was to commission a regional interpretive action plan. This document provides guidance and a non-prescriptive strategic framework for future regional and local interpretation and access initiatives. At the time of its publication (March 2003), the plan set out a framework for implementation of projects over the next ten or more years.

Funding

In the 2007–2008 fiscal year, HERIAN's core funding was £143,000 (approximately $236,000). The majority of the core funding was provided by Visit Wales (formerly the Wales Tourist Board). Thirteen local authorities (local government) in South Wales were also partners, alongside the Brecon Beacons National Park, a number of statutory agencies, and a number of voluntary bodies. The financial contributions of the funding partners were relatively small. The strength of this approach was to generate and sustain partnership commitment to the initiative, and combining small amounts of funding into a more substantial pot of money. The major weaknesses with this funding structure were that in many cases no future guarantee of funding could be given, the annual task of chasing small amounts of financial support was time consuming, and the structure also worked against longer-term planning (Visit Wales 2008).

Most national heritage areas have an initial 15-year lifespan, and are funded as part of the budget appropriated for the NPS. As the end of the 15-year period approaches, the heritage area is subject to a review which determines if it should be reauthorized by Congress. The Lackawanna Heritage Valley's initial designating legislation expired in 2012, and what followed was a roller-coaster funding ride as its funding was threatened, subject to Congressional brinkmanship, and often approved at the very last minute. Finally, in December 2014, the Lackawanna Heritage Valley National Heritage Authority was among four national heritage areas reauthorized through 2021 by the U.S. Senate through the National Defense Authorization Act.

Community engagement

Although HERIAN and the Lackawanna Heritage Valley operate in isolation of one another, their goals were remarkably similar, a reflection of their similar legacies of industrial decline and the associated challenges that both regions face. Both strive to improve the visitor experience and use tourism as an economic generator, but at the same time their priority is to make their regions better places for the residents, and that it is only through the achievement of this goal that tourism benefits will accrue.

In the USA, one of the principles of the national heritage areas is that they should be "community centered initiatives that connect local citizens to the preservation and planning process" (NPS 2008). Heritage areas vary considerably both by size and historical theme. The Lackawanna Heritage Valley is one of the smallest, covering an area of 350 square miles with a population of 253,000. In contrast, the largest is the Tennessee Civil War National Heritage Area which covers the entire state of Tennessee, an area of 41,217 square miles with a population of 6.2 million. It is highly questionable whether significant community engagement is possible on such a scale. Indeed, it has been suggested that some regions are too large for meaningful community engagement, and that several heritage areas simply do not want to deal with the challenges that arise by involving citizens in the planning process, and do not have the skills "to deal with the competing interests and criticism that residents often provide" (Daly 2003, 6).

The Lackawanna Heritage Valley Authority seeks to engage residents through festivals, events, and grant funding, and consults "community leaders" regarding future policy. The original management plan evolved from extensive community engagement with hundreds of people attending vision workshops and strategy sessions. In striving to achieve its objectives, HERIAN put communities at the heart of all its activities. It is widely recognized that support from the local population is critical to the success of industrial heritage initiatives, and "to provide both economic and cultural benefits to community, planners need to create an atmosphere in which residents can actively participate in caring for and protecting their industrial heritage, as well as an arena to share their accomplishments" (Xie 2006, 1328).

Figure 3. The Community Interpretation toolkit and associated training takes a community through the entire process of developing their own local interpretation plan (LIP), defining and interpreting their own heritage stories.

The model of community engagement developed by HERIAN was judged to be its key success (Visit Wales 2008). This aspect of HERIAN's work was delivered through a community interpretation toolkit and associated training which gave communities the tools to shape their own narrative and develop their own local interpretation plan (Figure 3). The Green Badge Guides, where local people are trained to tell the story of their heritage and become accredited guides, was also judged to be one of the most effective means of telling the story of industrial south Wales.

Conclusions

As the heritage area movement begins to mature in the USA, evidence is starting to emerge for successful approaches, particularly the use of federal funds to leverage additional funding. It was never the intention of Congress or the NPS to provide national heritage areas with permanent federal funding. However, given the critical role it plays in allowing the areas to leverage other sources of funding, it is doubtful whether they could survive the withdrawal of federal funding. The Lackawanna Heritage Valley provides an example of what can be achieved with long-term planning and seed funding.

Although very similar to the structure in the USA and initiatives throughout Europe, the launch of HERIAN was innovative for Wales. The HERIAN area was four times the size of the Lackawanna Heritage Valley but operated

with fewer staff and a smaller administrative budget. In a survey of partners, carried out by Visit Wales (2008), it was generally accepted that the initiative had been under-resourced. Nevertheless, it was set up on a solid strategic foundation with a realistic expectation that it would take at least ten years for substantive outcomes to be realized. Despite this, HERIAN was never given a chance to fully deliver on its goals, with its funding removed just five years after its launch. HERIAN, as a company, ceased trading at the end of March 2009.

Within the USA, the management authorities that run NHAs gain strength from their independent status, allowing them to forge partnerships with a range of organizations. Similarly, HERIAN's management structure was a major strength but that ultimately became its major weakness. As a cross-cutting body working across institutional remits, it could not find a sponsor to advocate for it. HERIAN was not able to shake off the perception that it was primarily a tourism initiative, which is in part understandable, given that it was tourism development needs that had first inspired its creation. Given this perception, once Visit Wales decided that it was unable to continue funding the initiative, HERIAN no longer had a funding source or a home.

In conclusion, through a review of heritage area literature and the case study comparison of HERIAN and the Lackawanna Heritage Valley, it has been possible to identify certain critical criteria for a heritage area to be truly successful:

- a strong management plan that has been put together through extensive *consultation* and has the support of the local *community*;
- an *independent* management authority or organization;
- a central funding source with guaranteed funding for a minimum of *ten years*;
- the ability of the managing authority to form and sustain *partnerships*; and
- a manageable geographical area that allows for ongoing, *meaningful* community engagement.

Looking past the debate over whether, in the long term, a focus on heritage can revitalize previously neglected regions, there is no doubting the effect initiatives such as HERIAN and the Lackawanna Heritage Valley can have on renewing the civic pride and sense of place within their communities. Many parts of industrial South Wales and Lackawanna County suffered neglect and a lack of investment for many years. This decline cannot be turned around overnight, and if heritage areas are to succeed they must be given the time they need to become established and form both the external and community partnerships that they are so dependent on.

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Restoring the Native Live Oak Forest in 1,000 Acres of Alameda County, California

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The Masonic Home in Union City is a retirement and resident care community that occupies 267 acres in the East Bay Hills (San Francisco Bay area). The land was purchased by the Masons in 1893, and was devoid of native trees and shrubs. The land had been denuded of its oak forest by the early Spaniards (for wood) prior to Mexican independence in 1821. The hillsides were used mainly for cattle grazing by the Mexican rancheros, even after California independence in 1846. That practice continues even today. Prior to the rancheros, the native Ohlone used the oak forest as a source of food (acorns), and the habitat was rich with other birds and mammals for hunting. The origin of the oak forest goes back to 3–4 million years. Fossil evidence suggests that during the Ice Age a large oak savannah occupied this land.

Presently in the state of California there are only 100,000 acres of oak woodland, with 80% of it being privately owned. Coast live oak (*Quercus agrifolia*) woodland is only about 4% of this total (Figure 1). Live oak woodlands in the San Francisco East Bay (Diablo Range) that are under 50 years old are rare. Grazers (cattle) are mainly responsible for the lack of new growth. Much of the hillside in the East Bay has been devoid of nutrients that would promote growth. The natural vegetation successional processes do not occur, so cannot contribute the nitrates and other nutrients that are needed for long-term sustainability.

Solving this problem will require innovative ways to produce enough compost to replace nutrients missing from this ecosystem. Large institutions, like the Masonic Home for the Elderly in Union City, produce between one and two tons of food waste per week. Instead of hauling out this food waste, three non-profits organizations have banned together to look for a solution. This would be the largest project in the San Francisco Bay area that uses food waste to accomplish oak woodland restoration, while training youth in the science behind the project.

The Masonic Home is now using food waste and horse manure to produce compost to improve the native soil to restore native oak forest on 200 acres. This project requires many volunteers. Starting in the fall of 2014, three professors on the nearby Hayward campus of the California State University, East Bay (CSUEB) are leading about 120 of their students each year in providing various services, from caring for native plants at the California Nursery to digging holes at the Masonic Home. Students in an environmental science laboratory course are also collecting

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Figure 1: Coast live oak (*Quercus agrifolia*).

Figure 2. The Earth Flow.

data for a research study. Students in a recreation course are focused on the preparation of plants at the California Nursery.

In California there are many oak management groups, including the University of California's Integrated Hardwood Range Management Program (IHRMP), the California Oak Foundation, the U.S. Forest Service Pacific Southwest Research Station (PSW), the California Department of Forestry and Fire Protection (CAL FIRE), and the California Department of Fish and Wildlife, to name a few. A goal of the current project is to work with these groups so they are aware of what we are doing and to incorporate any best management research that they may offer to our project. These groups can best inform our group on ecology, regeneration, range and livestock relations, development of wildlife habitat corridors, long-term monitoring, and diseases that oak woodlands may be susceptible to. The project is also collecting data to determine the carbon cycle as the grassland is changed into an oak forest. The project is currently funded by CSUEB and project leads have applied to the Environmental Protection Agency for additional funds to recruit and prepare volunteers.

Tri-CED, a local recycling non-profit organization, has been working with the Masons (of the Masonic Home) to reduce their food waste (which totals about 2 tons per week) and keep it onsite. Green Mountain Technologies has developed "The Earth Flow," which is an in-vessel system that converts up to two tons of daily organic waste into compost (Figure 2). Shredded woody, green waste and horse manure will be added to the system so decomposition will produce rich compost ready to be used in restoration. The design incorporates a fully enclosed vessel and odor control system with an inclined auger for mixing, shredding, and discharging the organic waste. The typical process time for the waste to flow through the vessel is 14 to 21 days.

The Math Science Nucleus (MSN), a non-profit organization that incorporates high school and college students to participate in restoration projects, will assist greatly in youth training. The MSN has worked on many local restoration projects over the last 15 years using youth to maintain and in some cases design the restoration. MSN has developed strategies that help educate students on the science behind restoration. For a complete look at those projects, see http://msnucleus.org/watersheds/index.html.

MSN has a contract from the City of Fremont to use the California Nursery Historical Park (the oldest, and at one time the largest, nursery on the Pacific Coast) to grow and maintain plants that will be used in this project (and other projects that MSN coordinates throughout the city). The 20-acre site is also used to teach the youth and volunteers about trees and their requirements (Figure 3). The plants are from local seed, and represent a variety of trees in shrubs found in oak woodland.

In a recent symposium on oak woodland management, scientists outlined some of the knowledge that is still needed to understand and better manage oak woodlands. One thing they pointed out is that oak woodlands often do not respond the way we think they should. The current project is collecting data about the local restoration of the forest. Science-based knowledge that provides better explanations of how oak woodland ecosystems function is especially needed. An important

tool is a continuously updated, statewide geographic information system accessible to local planners and the public. Documenting the types of trees and use of food waste composting and the techniques we use would help other large restoration projects.

An extremely important feature of oaks trees is their canopies; these have a major impact on the local environment. They affect nutrient cycling, seedling establishment and survival, understory species, forage production and growth, organic matter (on and in the soil), and possibly soil texture. Reports of preliminary work indicate that soil texture under a mixed stand of coast live oaks was coarser and higher in organic matter. Other work reported confirms past evidence that nutrient level under oak is several times greater than that of adjacent grassland. Part of the higher nutrient concentration is undoubtedly due to leaf litter.

Figure 3. Youth working on plants at nursery.

Cattle currently graze the land to keep the grass cut to prevent grass fires. We will slowly remove the cattle from the land, or we may decide on developing corridors as the trees mature and cattle can still come on and off the land depending on the surrounding landowners (East Bay Regional Park) which use cattle to graze the area.

The project will coordinate current knowledge and make it easier for the residents of the Masonic Home to understand what is going on and to get them actively engaged. Part of the Restoration project is building a demonstration area open to the residents of the home and eventually to school groups in the community. The professors involved in the project will publish scientific articles and educational material to inform scholars and the public. The current professors of the project are Dr. David Stronck, Dept. of Teacher Education, Dr. Mary Fortune, Department of Hospitality, Recreation and Tourism, and Dr. Michael Massey, Department of Earth and Environmental Science.

Progress will be measured by having in place a data collection protocol for monitoring the site for decades. This project will have benchmarks at 5, 10, 20 and 30 years before there is a full oak forest canopy. CSUEB has established several courses that focus on this project and will provide volunteers for many years. Since the in-vessel technology of composting is relatively new for use in restoration projects, the data collected will help to determine the merit of such technology, and whether it is appropriate for the expense.

CSUEB, in collaboration with MSN, TriCED Recyling, and Masonic Home for the Elderly, is reforesting 200 acres in the East Bay Hills using food waste and other organics. The long-range plan is to use experiences from the current work at the Masonic Home to provide forest restoration on the 200 undeveloped acres of the Hayward campus of CSUEB. Between the undeveloped land on Hayward campus and the undeveloped land at the Masonic Home are Garin Regional Park and Dry Creek Pioneer Regional Park. These parks are almost entirely undeveloped land. The ultimate plan is to cooperate with these Parks in providing a contiguous and continuous oak forest on about 1,000 acres along a hilly ridge from the southern end of Hayward to the northern side of Union City.

Summary

The goals of the project include the following:

- The project will document reforestation techniques for conversion of barren hillside to

live oak woodland community using an in-vessel composter. The project will use an online format for easy updating, including onsite monitoring of the experimental grove. This would include a white paper and process of our findings using food waste. This is important for replication at other sites where there is large amounts of food waste (i.e. schools, nursing homes).

- Faculty of CSUEB will work with oak reforestation experts to help develop strategies for planting and long-term monitoring program of this area. Long-term and short-term projects will be outlined to help direct work at Masonic Home land for 10–20 years. Weed management, reintroduction of native animals, reintroduction of plant understory, how to reduce cattle population, and other considerations will be considered for a successful project. The plan is to provide the knowledge for maintaining this reforestation.
- Courses at the CSUEB now attract students to volunteer at the Masonic Home Oak Woodland Restoration Project. Future plans include recruiting and involving high-school students. Teachers and administrators in the five high schools in Fremont have already indicated their support of and interest in participating in the restoration project. A requirement for graduation from these high schools is to do community service.
- The hands-on experiences will probably inspire many participating students to seek employment in related areas, ranging from growing plants in a nursery to doing scientific research. Work experience using green technologies (e.g., composting) may motivate students to continue their education in environmental science.

Live oak woodlands in the San Francisco East Bay (Diablo Range) that are under 50 years old are rare. Grazers (cattle) are mainly responsible for the lack of new growth. Much of the hillside in the East Bay have been devoid of nutrients that would promote growth. The correct vegetation (successional flora) cannot add the nitrates and other nutrients that are needed for long-term sustainability. Solving this problem requires innovative ways to produce enough compost. Large institutions like the Masonic Home for the Elderly in Union City produce between 1-2 tons of food waste per week. Instead of hauling out this food waste, three nonprofits have banded together to look for a solution.

The cooperating groups of this project include the following:

- The Masonic Home owns 270 acres of land, of which 200 is rented to ranchers for cattle grazing. They also have access to vast amount of manure that has been accumulating on part of their land from a nearby horse ranch. The vegetation from the other 70 acres is also available. Food waste available from two communities on site (Masonic Home and Aracia Creek). Historically the food waste has been trucked to a Milpitas composting site for conversion into compost. The carbon footprint for this operation has been high.
- TriCed Recycling has been responsible for the food waste transportation. As the state's largest non-profit recycling business, they felt that there should be another way to reduce emissions and help green the hillside. TriCed is also part of a multiyear grant to train students (12 each year) to learn about greening jobs. This involves cooperation with Chabot College in Hayward. Dr. Michael Massey of Environmental Science at CSUEB has submitted a funding proposal for money to conduct a feasibility study on composting at the CSUEB Hayward campus.
- MSN uses science, community service and service learning at restoration sites in Fremont. A 15-year project at Tule Ponds at Tyson Lagoon has transformed a fallow area to an urban forest with over 300 trees. It is presently used as an education center to teach students about the environment and to train university and high school students on res-

toration techniques. Long-term composting with wood chips has proven very successful. The techniques used at Tule Ponds will be modified in this project.

Project benefits include the following:

- We will develop a process to incorporate food waste and other on-site organics to reforest 200 acres to a Live Oak Woodland Community. This improves "greening" in an innovative way.
- We will create a process for the three non-profits to develop reforestation best practice management practices. This will especially benefit the Masonic Home maintenance crew and staff at CSUEB that will be trained on ecosystem management approach to urban forestry. Currently they are unaware of such options in managing land.
- Documenting this process of reforestation will advance the practice of urban forestry and will help to arrest the decline of the urban forest through community education. It will also provide a way for replication through online information.
- A hands-on job training will teach students how science is important in restoration and the greening of an area. Through classroom presentations, this will reach a highly diverse audience, particularly at CSUEB and the local high schools.
- Collaboration among very different non-profits will benefit the environment and community. This encourages organizations to think outside the box, so they can focus on multiple benefits of urban forestry, even in low income area. Outreach to low income areas brings the information to the community through schools.

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U.S. MAB Updates: Discussion Notes from the 2015 GWS Conference

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Status of U.S. MAB Program and Revival

The U.S. Man and the Biosphere (MAB) program has been inactive for past 15 years. Over the past year, 35 out of 47 biosphere reserves (BRs) completed UNESCO's periodic review. The responses reflected existing interest of many to maintain their BR designation. However, UNESCO has not approved these units because of lack of buffer and transition zones. There appears to be a lot of interest to reengage with the international network which is very promising!

There have been recent efforts to revive the U.S. MAB program including the reestablishment of U.S. MAB Committee and creation of the Biosphere Reserve Associates, an organization established to support the revival efforts of the U.S. MAB. We are currently in the process of drafting a letter to UNESCO from U.S. Secretary of State with U.S. MAB plan and developing guidelines to improve compliance with the periodic review reports. We also hope to work with the 35 BR sites that submitted periodic review and engage with the 12 BR sites that still didn't submit their periodic review. There is a long road ahead, but the first step is to identify the current challenges and identify potential solutions.

Challenges and Potential Solutions

Zoning system

- Consider other "titles" than buffer and transition, that would serve the same purpose
- Use case studies to demonstrate that the U.S. is applying the concepts of buffer and transition zones though not using those exact titles
- Coordinate with other countries and groups to gain more support for zoning issue with UNESCO

Lack of relevance of BRs to society and communities

- Demonstrate economic incentives for locals linked to tourism; create ownership of the BR designation
- Learn from World Heritage Sites

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Low level of visibility of UNESCO programs in the US

- Increase promotion trough information sharing platforms

Title/name of program associated with negative image

- Raising awareness about meaning of BR concept, changing misconceptions about land ownership
- Swedish BRs call themselves Biosphere regions
- Reimaging and marketing BRs in U.S. for their unique niche

Lack of relevancy and clear benefits

- Engaging youth and young professionals
- Connecting with local communities/gaining support
- Need clear way to demonstrate impacts/results including intangibles
- Focus on a few BRs who are enthusiastic about reviving status

Loss of institutional memory and partnerships over time

- Existing platforms that can help BRs share historical documents and communicate: the OPN (openparksnetwork.org, version 3.0 to be launched next summer); and the GWS BR sharing platform
- Connecting these platforms with existing international MAB platforms online
- May be a MAB online platform already created by German University of Greifswald
- Online sharing of information needs to be complemented by face-to face capacity building

Lack of resources

- Need resources to support and institutionalize the U.S. MAB program
- Partnering with universities
- Engagement with LCCs (landscape conservation cooperatives) and NGOs (nongovernmental organizations)
- Sister biosphere reserves in the international network or within the U.S.
- Engagement with Canada and Mexico—currently a proposal for research on capacity building an governance of BRs in North America

Next Steps and How to Stay Involved

The U.S. MAB program is at a critical turning point for reengaging itself in UNESCO's international network after over a decade of inactivity. Some next steps and questions:

Department of State is drafting a letter to UNESCO with U.S. strategy for BR renewal

- What should be included in the letter to address the current challenges and how do we narrow down the strategies for the U.S. renewal?

Reestablishment of U.S. National MAB Committee

- Who should serve on this committee and what should be the committee's main role in the revival effort?

Engage sites who did/did not review

- How can we support sites who did and did not participate in the recent review and emphasize the unique benefits of staying involved in the program?

Biosphere Reserve Associates acting as support organization

- How do we recruit people who want to stay engaged in the U.S. BR program and where

should the organization focus their efforts to meet the needs of the individual units and also support the National MAB committee?

We need your help to answer these questions and are seeking individuals who want to stay involved in the effort and discussions!

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Developing a Citizen Science Program that Supports Your Park's Resource Management and Monitoring Needs

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Abstract

Budget cuts, decreasing staff, and increasing resource management issues are common themes for parks and other protected areas. How do parks address the growing resource management issues given the decreasing available resources? Engaging visitors in citizen science programs that support the park's resource management needs and issues may be part of the answer. This paper discusses citizen science and its benefits, points to consider when developing a citizen science program, and concrete examples of citizen science projects that support natural and cultural resource needs of Mammoth Cave National Park (MCNP).

Introduction

Citizen science has been around for centuries and has been called many different things. Public Participation in Scientific Research (PPSR), volunteer monitoring, crowd-sourced science, and amateur naturalists are just a few of the names it has had throughout history. At one point, it was even just called "science" because full-time, professional, scientific careers didn't exist.

Of all its aliases, the term "citizen science" is the one that has gained the most popularity in recent years. It is the term that the public is most familiar with, the one the National Park Service and many other agencies are using, and the one most funding sources recognize. However, the political connotation of the word "citizen" can create inherent issues with the phrase in some locations and among some populations. These are real concerns, and practitioners should be sensitive to them, especially when reaching out to many underserved or under-represented audiences.

At the same time, there is a strong need for the field to come together around a single name and common terminology. If everyone is calling the same technique by a different name, then it is difficult to find that technique in the professional literature. By building consensus around a

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single name, the value and validity of citizen science as a tool or technique can be studied like any other scientific or educational technique (Miller-Rushing 2015).

Whatever we call it, citizen science is simply a collaboration between the public and scientists to conduct research. It is an extremely valuable scientific tool that also has built-in educational opportunities because of the public engagement.

Benefits and challenges

Citizen science integrates research and education in a very hands-on way that deeply engages participants with the resource, and has scientific, educational, and policy-related benefits (Figure 1). One of the advantages of a citizen science project is the number of volunteers that can be involved. By utilizing well-trained volunteers, a scientist or resource manager can collect more data than he or she could do alone. Data processing of videos and pictures also goes faster when there are more eyes sorting through the videos and photographs.

Another advantage of citizen science is that the participants often have a very different knowledge-base and skillset than the scientist or resource manager. Having a diverse set of skills and knowledge working on a project can be valuable in identifying new ways of looking at situations,

Figure 1. Citizen science projects engage visitors in research and have inherent scientific and educational benefits. Many MCNP citizen science projects were developed specifically for the park to address its unique resource management needs. However, the park also participates in national projects like this multi-park citizen science project studying mercury bio-accumulation in dragonfly larvae.

and in developing solutions to some of the inevitable challenges of fieldwork and data management.

Citizen science projects also have important educational benefits. The volunteers have the opportunity to learn first-hand about the resource and the work that goes into caring for and managing that resource. This can lead to deeper visitor connections to the resource and to the park or protected area. Participation in citizen science projects may also lead to increased scientific literacy at a larger scale because the volunteers are actively involved in conducting scientific research.

Citizen science projects may also lead to greater buy-in and support for science-informed policy decisions that are based on the results of a citizen science project. The increased support and buy-in comes from the volunteers' active engagement in the research. Their engagement in the research gives them first-hand experience and a better understanding of the issues, how the research was conducted, and the research results. Even when disagreements occur, the citizen science project can provide a shared platform for conversations based on the science and research.

Like anything else, citizen science also has its challenges. Some of the challenges, like data management, quality control, and fieldwork, are inherent in any scientific research project. One of the biggest challenges unique to citizen science is the idea that it is free. Often the impetus for creating a new citizen science project goes something like this: "We need this research done, but we don't have any time or money to do it. I know! Let's turn it into a citizen science project and get some volunteers to do it for free."

Well-done citizen science projects are not free. Citizen science projects may not even be cheap when the cost of staff time and other resources to support the project are taken into consideration (Fauver et al. 2015). However, just because citizen science isn't free, doesn't mean that it isn't valuable or that it can't be more valuable than the resources that are put into it. It is and can be.

When developing a new citizen science project it is important to recognize and account for the staff time and other resources that need to be invested. If the necessary time and resources are not available, then creating a citizen science project is probably not the best answer. Adequate staff time must be dedicated to working with and training the citizen scientists, building and maintaining relationships, and managing the data. Volunteer training is one of the keys to a successful citizen science project. Professional scientists spend years in college and on the job learning how to conduct the research. It is unrealistic to expect anyone to be able to collect valid data without any training. How much training is required depends on how complicated the task is.

Another challenge is the misperception that citizen science is primarily an educational activity. Luckily this misperception is beginning to fade, but it still exists in some circles. Helping to change this misperception are numerous studies showing that citizen science is a valuable scientific tool that can result in scientifically accurate and valid data (e.g., Meentemeyer et al. 2015, Hoyer et al. 2012, Droege 2007, and Fore, Paulson and O'Laughlin 2001).

Developing a citizen science program

Not every research project is a good candidate for turning into a citizen science project. Before creating a new citizen science project, it is important to consider whether it is the best technique to use in the given situation. All good citizen science projects have four characteristics in common.

First, the volunteers' contributions must matter. Studies show that the primary reason people participate in citizen science projects is to contribute something and make a difference (Raddick et al. 2013). One important way to ensure that their contributions matter is to use the data they collect. If the data aren't being used, then the project is a science experience, not a citizen science project. Whenever possible, share with the participants how their data are being used and the results of the project. Reinforcing how their work is being used helps show that their work is important and is making a difference.

Second, the project needs to have clear, scientifically valid protocols. Clear, scientifically valid protocols are important for any research project. Citizen science projects are a scientific tool and have the same requirements as other research projects when it comes to protocols that produce valid data. Making sure those protocols are in place also helps ensure that the participants' contributions matter.

Third, the protocols should be easy to follow and include relatively easy techniques. Many of the citizen scientists will have little or no previous scientific training to draw upon. Being able to train them how to do the work is critical to the project's success. Therefore, relatively easy techniques are important because it is easier to learn something simple than to learn something complex. That's not to say citizen scientists can't conduct complex research or use more complicated techniques. They can, but will either need more training or more knowledge and experience coming into the project.

Fourth, the project should be something people care about or can have fun doing. Don't forget that the citizen scientists are volunteers. They are choosing to help with the research instead of doing the multitude of other things they could be doing.

Developing a new citizen science project for a park or protected area can be done in a number of ways. Given the importance of making sure the data are used and that the participants' contributions matter, we typically consider two important questions when developing new citizen science projects for MCNP. What projects would we do if we had unlimited resources? Do our researchers need help with a piece of their projects?

The unlimited resources question can be divided into a number of sub-categories including inventory and monitoring projects, follow-ups to previous studies, and pure research or curiosity questions. There are a number of national inventory and monitoring citizen science projects that already have established protocols, educational tools, and data management systems. Tying into these projects whenever possible saves time and allows the data collected at your site to also be used for larger, landscape-scale questions. Project Budburst is an example of a national citizen science project that Mammoth Cave has partnered with and is using to look at phenology and climate change.

Many citizen science projects focus on natural resources; however, cultural resource projects can also be sources for new citizen science projects. At MCNP, there are ongoing questions about when cultural resources in the cave appeared or were modified. In 2013, a series of these questions came up that were eventually answered by looking back through the historic photographs. We realized that people in 50–100 years will likely ask similar questions about the cave in the early 2000s. To address this issue, we developed a citizen science project that uses photo-documentation to monitor changes in cultural resources within the cave. This project finds historic photographs and retakes the picture from as close to the same location as possible. The pictures create a photographic record showing any changes that may have occurred between the times when the two pictures were taken.

Follow-up studies are another source for new citizen science projects. In the mid-1990s, wood frog and salamander egg mass surveys were conducted at Mammoth Cave. Since that study concluded, climate change has continued, amphibian diseases have spread, and policy changes have occurred that allow for brining of park roads during winter weather events. Each of these changes could impact early breeding amphibian species. A group of middle school students from the park's neighboring school district is now conducting wood frog and salamander egg mass surveys as an ongoing citizen science project (Figure 2). They are using the same protocols and a subset of the same ponds as the original researcher so their results can be directly compared to the earlier research. These students are actively engaged in every step of the scientific process and their teacher is the PI on the research permit.

Figure 2. A class of middle school students are conducting wood frog and salamander egg mass surveys at MCNP. This is a follow-up to a project that was originally conducted in the mid-1990s.

Pure research and curiosity questions provide yet another rich source of citizen science projects. This can be a dangerous category to pursue because there are so many interesting questions and topics, but it can also be very rewarding. One of the questions that we pursued was to learn more about one of Mammoth Cave's underground rivers that routinely flows backwards. Seventh graders from a local middle school did a 4-year study gathering temperature data on the river. They used that data as a proxy for determining the frequency and duration of the reverse flow events. We are currently working on a paper publishing the students' findings.

When developing new citizen science projects, MCNP also talks to its researchers to find out if they need additional help with their projects. One scientist conducting research at the park is studying how quickly runoff from parking lots and roads can transport contaminants from the surface into the cave at different times of the year and with different precipitation patterns. However, the scientist needed more data than he and his students could gather on their own. We worked with him to develop a citizen science project where middle school through college students who visited Mammoth Cave could collect data for his project (Figure 3). The citizen scientists use the same techniques the PI and his students use to collect water-discharge data. The data are then sent to the researcher who incorporates it into his mathematical model. We are also beginning to develop additional citizen science projects with him.

Conclusion

Citizen science can be a valuable asset to parks and protected areas that have the time, resources,

Figure 3. Researchers who need help gathering additional data may be receptive to developing a citizen science project to gather that data. The Mammoth Cave International Center for Science and Learning worked with a researcher to develop two citizen science projects based on his work at MCNP.

and interest to invest. It is an important scientific tool that includes inherent educational and visitor outreach opportunities. Like any other tool, citizen science projects have benefits and challenges which should be considered before the project is started. MCNP is one of many parks and protected areas that are using citizen science projects to support the park's resource management and monitoring needs.

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Natural Neighbors: Encouraging Cooperation between onservation Agencies, Museums, and Similar Institutions to Introduce More Urban People to the Natural World

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Urban people need to spend time in nature for their own good, and because nature conservation nationally and globally depends on their support: in an urbanizing world, people will value nature only if they care about nature where they live. In metropolitan regions, several kinds of institutions, along with conservation agencies, are designed to educate and sensitize people to the natural world, but they rarely work together toward that purpose. The institutions include natural history museums, science centers, zoos, aquariums, botanic gardens, and museums of cities and regions. The conservation agencies include those responsible for nature reserves and wildlife management.

Cross-promotion is the simplest and easiest way for such institutions and agencies to cooperate. For example, a museum can provide visitors with information about natural places to explore nearby, and visitor centers in protected areas can direct people to museums. In most cases, this doesn't happen. To correct this, natural history museums and similar institutions can do the following:

- include more and better exhibits about local and regional nature,
- direct their visitors to "real nature" nearby,
- stock and promote a good selection of natural history guides to their regions,
- work with conservation agencies in engaging with schools, universities, and underprivileged neighborhoods, and
- link their websites to one another.

Conversely, managers of protected areas can find ways to inform their visitors of opportunities to learn more about nature at nearby museums and similar institutions.

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The project

The Natural Neighbors project is working to encourage more cooperation between such organizations toward these ends. It is being carried out by InterEnvironment Institute in cooperation with the Urban Specialist Group of the IUCN World Commission on Protected Areas, with the support of the Santa Monica Mountains Conservancy and Mountains Recreation and Conservation Authority. The project follows up a recommendation in *Urban Protected Areas: Profiles and Best Practice Guidelines* (Trzyna 2014), a volume in the IUCN Best Practice Guidelines Series.

I began by collecting examples of cross-promotion, or the lack of it, through IUCN and other networks, discussing the subject at meetings of museum and conservation professionals, and visiting 36 museums and similar institutions in six countries. I also visited many protected areas in urban regions (Trzyna 2015).

General findings

There are fine examples of what natural history museums and similar institutions can do to encourage their visitors to spend time in local natural areas. Some simpler but effective things require minimal investments of time or money. These institutions have captive audiences, but at most of them, unfortunately, this is a lost opportunity.

Many institutions devoted to educating and sensitizing the urban public about the natural world pay little attention to their local and regional environments. The major ones often see their roles as global, rather than local.

No examples were found of protected area visitor centers publicizing nearby museums or similar institutions.

Exhibits

More and better exhibits about local and regional nature are needed in natural history museums and similar institutions. In many cases, exhibits in these institutions focus on the exotic, giving visitors the impression that nature is someplace else. Entrances to zoos, for example, can feature buildings in pseudo-African style with signs in Swahili and piped-in tribal music.

In some cases, there is virtually nothing about the natural environment of the region. Most such institutions are organized by kinds of animals and plants, rather than by habitat, biome, region, or country. Even where there are exhibits of species found in the locality or region, they may not be labeled as such. Here are good examples of what *can* be done:

- The Oakland Museum of California's 25,000-square-foot Gallery of California Natural Sciences focuses on seven places that depict the state's ecological diversity, including Oakland.
- The Natural History Museum of Los Angeles County has a Nature Lab with exhibits on native wildlife and invasive species in the Los Angeles area. A large interactive wall map points to wildlife species found in the built environment, rather than natural areas.
- The California Science Center in Los Angeles has an "L.A. Zone" in its Ecosystems section with displays on water, waste, energy, and wildlife. A large wall map of the region has photos of a few native plants and animals found in the built environment, but does not tie them to natural areas that can be visited.
- The American Museum of Natural History in New York City has a Hall of New York State Environments focusing on Stissing Mountain and the farming village of Pine Plains, 90 miles from the city.
- Among museums of cities and regions, the Chicago History Museum has exhibits on over-trapping of fur animals and deforestation in the nineteenth century.

- One of the Hong Kong Museum of History's eight large galleries is The Natural Environment.
- At the Oakland Zoo, a planned California Trail exhibit "will honor our state's most revered wildlife and enable visitors … to understand how the stories of California's plants and animals are actually our stories too."
- The Los Angeles Zoo has a California Condor Rescue Zone, an immersive, facilitated play space for primary school-age children.
- Aquariums are often focused on their immediate environments. The Monterey Bay Aquarium in California relates mainly to Monterey Bay and its submarine canyon.
- The Aquarium of the Pacific in Long Beach, in metropolitan Los Angeles, focuses on the marine environments of Southern California, Baja California (Mexico), and the Pacific Ocean more generally.
- Also in metropolitan Los Angeles, the 85-acre Rancho Santa Ana Botanic Garden in Claremont is planted with California native species by region, and promotes understanding and conservation of these plants and their use in horticulture.

Information about nearby natural areas and other museums

Museums and similar institutions, as well as protected areas, rarely tell their visitors about each other, although this can be done easily and can benefit all involved.

Once they become interested in what they have seen in a natural history museum or similar institution, visitors can be directed to natural areas close by to see the "real thing." This can be done by staff or with maps, models of terrain, kiosks, websites, apps, or brochures. Conversely, visitor centers in protected areas can publicize nearby museums and similar institutions where they can learn more about nature. Finally, such institutions can publicize each other; for example, a natural history museum can post information about nearby aquariums, botanic gardens, and zoos.

This is where almost all of the institutions visited fail, although little cost need be involved. The reason given by museum professionals is that their institutions compete with each other for funds from many of the same donors. Here are examples of what *can* be accomplished**:**

- In Chicago, on summer weekends, rangers from nearby Indiana Dunes National Lakeshore are posted at the entrance to the Field Museum of Natural History to show visitors what they will find at the lakeshore and how they can get there.
- At the Oakland Museum of California, panels in the Gallery of California Natural Sciences include a map and information about the nearby East Bay Regional Parks, which include many natural areas.
- At the Peggy Notebaert Museum in Chicago, panels with maps and photos direct visitors to protected areas within a short driving distance of the city.

Books

Selling books about nature in the city or region is usually a lost opportunity; so is selling toys and souvenirs with a connection to local nature. Few stores at natural history museums or similar institutions sell more than a token selection, if that, of natural history guides to their localities or regions, even when many such titles are in print. Typically they carry generic nature books for children.

In Los Angeles, the Natural History Museum of Los Angeles County sells a few nature guides focused on California. The Los Angeles Zoo and the California Science Center have none. In Chicago, the Field Museum and the Brookfield Zoo once had serious natural science bookstores

that attracted graduate students from local universities, but these were closed some years ago. The Bronx Zoo in New York City carries only generic titles, mainly for children, although there are many nature guides available for New York City and its region.

It may be that only a very small fraction of visitors will be interested in such publications, but a very small fraction of 1.2 million (in the case of the Field Museum), 1.3 million (the California Science Center) or 1.9 million (the Bronx Zoo) is still a large number and is certain to include people whose lives will be changed by reading and using these books. Good examples of what *can* be accomplished:

- The Monterey Bay Aquarium's store displays many field guides on California's marine and terrestrial species and ecosystems. It also carries many of the books of John Steinbeck, who wrote about the Monterey area and its natural environments in such novels as *Of Mice and Men* and *Cannery Row.*
- Although it is small (5,000 square feet) and has only 70,000 visits a year, the Santa Cruz Museum of Natural History, in Santa Cruz, south of San Francisco, prides itself on the broad selection of books it sells, making the museum store "*the* place for hard-to-find publications on natural history." This in a university town with no shortage of bookstores.
- The bookshop at the Rancho Santa Ana Botanic Garden in Claremont has many titles on California natural history, especially about plants and birds.

Other onsite activities

In addition to tours and onsite events, some institutions include drop-in centers or natural or quasi-natural areas. Almost all institutions offer tours of their sites to school and other groups, and hold events such as nature festivals. Depending on the content of exhibits and events, these can be useful in introducing people to local nature. School groups account for most such visits, and staff confess that they have limited value: two-thirds of these trips are taken up by logistics, and students tend to pay more attention to each other than to exhibits. Public events are attended mainly by people already interested in nature. Good examples include the following:

- The Natural History Museum in London has the drop-in Centre for UK Biodiversity, which helps visitors with public identification of specimens, research, and equipment, such as microscopes.
- Along a restored bank of the adjoining Bronx River, the Bronx Zoo has the half-mile-long Mitsubishi Riverwalk, with signs identifying the many birds and mammals found there.
- The Rancho Santa Ana Botanic Garden in Claremont has the Grow Native Nursery, which sells and helps gardeners with California native plants.

Activities in metropolitan areas

From field trips to engaging with schools, universities, and underprivileged neighborhoods, natural history museums and similar institutions have opportunities to work with protected areas on several levels. Good examples of such connections include the following:

- In the Chicago region, several natural history museums and similar institutions, as well as conservation agencies, are among the over 300 members of the Chicago Wilderness Alliance, which works on four fronts: restoration of natural areas, green infrastructure, climate change, and "leave no child inside."
- In Tucson, Arizona, the Arizona-Sonora Desert Museum cooperated with the National

Geographic Society and Saguaro National Park in putting on a BioBlitz, an intense period of biological surveying.
- The New York City Museum School, an elite public high school established in 1994 that has 500 students, draws on the resources of the city's science, art, and cultural museums.

Electronic media

Websites of museums and similar institutions, and those of protected areas, could easily provide links to each other, but they rarely do. On the other hand, things made possible by advancing technology are being given more attention from museums, to the point where exhibits are becoming ever more distant from real nature. Such fashionable technology often fails to take into account visitors' interests or needs. For instance, QR codes in exhibits often get near-zero downloads; the reason given by museum experts is information overload.

Web-based park directories could include natural history museums and similar institutions, but usually don't. Examples of such directories are Oh Ranger!, a GIS directory of parks in the United States available on the web or as an app, and LAMountains.com, an online guide to parks and trails in the northwestern part of the greater Los Angeles area. In both cases, the only museums listed are those within parks.

Promoting nature conservation and sustainability

Almost all of the institutions visited actively promote nature conservation in their regions, as well as sustainability more broadly. These are examples of institutions doing just that:

- Zoos Victoria in Australia, under the banner of "Love Your Locals," is committed to helping save 20 local animals from extinction through captive breeding, reintroduction, research, and raising their profile locally and nationally.
- The American Alliance of Museums, whose membership includes all the types of institutions mentioned in this report, has been active in promoting sustainability standards and best practices, for example, in its 2014 publication *Museums, Environmental Sustainability and Our Future.*
- Many of the institutions visited include climate change messages in their exhibits and outreach. For example, the Field Museum has a Chicago Community Climate Action Toolkit in print and on its website. In London's Science Museum, "Climate Changing Stories," spread throughout the museum, focus on personal behavior.

Promoting good eating habits

Childhood obesity is a serious public health problem in the United States and many other countries. At some point in their scholastic careers, almost all students will visit at least one of the kinds of institutions described in this report. Yet few of these institutions take this opportunity to offer healthy choices in their eating places.

Typical are the Los Angeles Zoo, which has a prominent Churro Factory, and the Brookfield Zoo near Chicago, which features the Midwestern equivalent, funnel cakes (both foods are made of deep fried dough sprinkled with sugar.) Also common are institutions that have onsite branches of fast-food chains.

A pioneer in offering healthy food choices is the Monterey Bay Aquarium, where the café operates with the slogan "Savor sustainability: we source our ingredients locally from farmers, ranchers, and fishermen who use sustainable practices." As part of First Lady Michelle Obama's Let's Move! initiative "to get kids moving and eating healthy food," the U.S. Institute of Museum and Library Services has a program called Let's Move! Museums & Gardens. None of the Cali-

fornia institutions described in this report are members. Museums and similar institutions could learn from an initiative of the Institute at the Golden Gate, Food for the Parks, which aims to expand availability of nutritious, local, organic, and fresh food in U.S. national parks.

Next steps

Project results to date are being shared in the nature conservation and museum communities. In California, a steering committee is being formed, to include representatives of conservation agencies, museums, and similar institutions in the Los Angeles metropolitan area. At the international level, next steps will be decided in consultation with the IUCN and key museums and conservation agencies, especially those which are IUCN Members.

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Recreation, Values, and Stewardship: Rethinking Why People Engage in Environmental Behaviors in Parks and Protected Areas

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Introduction

Successfully promoting and encouraging the adoption of environmental stewardship behavior is an important responsibility for public land management agencies. Although people increasingly report high levels of concern about environmental issues, widespread patterns of stewardship behavior have not followed suit (Moore 2002). One concept that can be applied in social science research to explain behavior change is that of values. More specifically, *held* and *assigned* values lie at the heart of understanding why people around the world continue to live in unsustainable ways that impact parks and protected areas. A *held* value is an individual psychological orientation defined by Rokeach as "an enduring belief that a specific mode of conduct or end-state of existence is personally and socially preferable" (1973, 550). Held values are at the core of human cognition, and as such, influence attitudes and behavior. *Assigned* values on the other hand, according to Brown (1984), are the perceived qualities of an environment that are based on

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and deduced from held values. In other words, assigned values are considered the material and nonmaterial benefits that people believe they obtain from ecosystems. Held and assigned values predict stewardship behaviors (Figure 1).

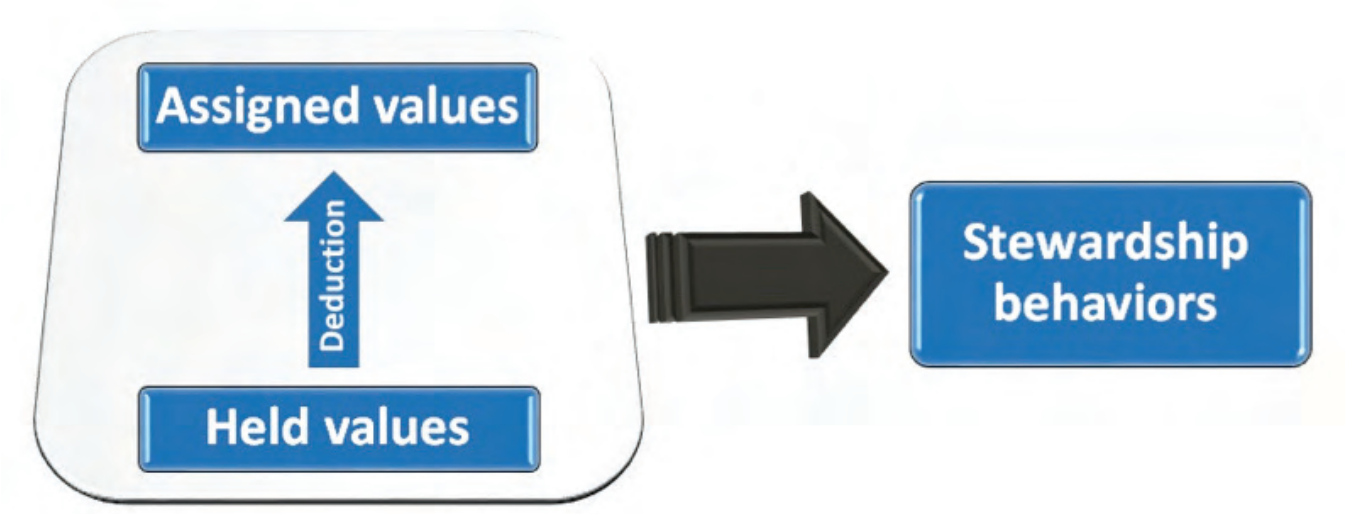
During the 2013 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites, we organized a session to improve our understanding of why individuals and groups choose to engage in stewardship behaviors that benefit the environment. We used held and assigned values as vehicles to explore what people cared about in diverse landscapes, review select case studies from across the globe, and question how best to incorporate visitor perspectives into protected area management decisions and policymaking. In addition to sharing project results, we also discussed the importance of accounting for multiple and often competing value perspectives, potential ways to integrate disciplinary perspectives on valuing nature, and future directions for social science research and practice.

In this paper, we present the results from our session to provide fodder for further contemplation about the timely question of how park and protected area managers can foster values that lead to environmental protection.

Ryan Sharp

An investigation of value orientations and Leave No Trace Behaviors among whitewater rafters. The first paper presented in this session explored *held* value orientations reported by whitewater rafters that visited the Kern Wild and Scenic River in California. Four dimensions of held value orientations were examined: egoistic (self-centered values), altruistic (welfare of others), biospheric (nature based values), and hedonic (pleasure based values). The study hypothesized that value orientations predicted motivations to engage in rafting activities, and that motivations were affected by leave no trace (LNT) behaviors (e.g., avoid trampling vegetation, properly disposing of waste, observing wildlife from a distance) specific to the Kern River context. Confirmatory factor analysis verified the measurement properties of scales used for this study, structural equation modeling examined the hypothesized relationships between values and motivations, and invariance testing gauged whether this relationship was moderated by LNT behaviors. Consistent with past work, values predicted motives for rafting. For example, recreationists who held

Figure 1. Conceptual relationship between held and assigned values, adapted from Brown (1984).



biospheric values were most likely to be motivated by learning about nature while on their rafting trip. However, value orientations and motivations for participating were not moderated by LNT. In other words, LNT behaviors did not vary with different value orientations and goals for engaging in recreation (in this case, rafting). Given that rafting was a team-based experience, it could be that the group dynamic overpowered individual inclinations to derive benefits from rafting activities. Findings suggest that providing information about LNT may not be enough to elicit LNT behaviors in contexts such as white water rafting. Replicating this study in the context of individually-driven outdoor recreation activities (e.g., rock climbing, kayaking) may provide a fuller exploration of the boundary conditions under which individual versus group values account for their behaviors (Manfredo et al. 2014).

Wade M. Vagias

Predicting behavioral intentions to comply with recommended leave no trace practices. The LNT (LNT) visitor education program is used extensively by land-management agencies in the U.S. and abroad; however, empirical evidence for why visitors do or do not follow recommended LNT practices remains limited. This presentation focused on the extent to which attitudes regarding specific LNT practices, perceived peer pressure to perform these practices, and a person's perception regarding their abilities to perform recommended practices predicted their behavioral intentions to comply with commonly promoted LNT practices in protected areas. Study participants were overnight backcountry visitors to either Olympic National Park, Washington, or Glacier National Park, Montana. The final model explained over 44% of the variance in the dependent variable of intentions to practice LNT, but significant predictors differed between the two parks. Specifically, for the Glacier National Park sample, subjective norms (i.e., group or peer pressure), how difficult they perceived the minimum-impact behaviors to be, and their self-reported knowledge of LNT were all significant predictors of their intention to follow LNT practices. For the Olympic National Park sample, the only significant predictor of intention to follow LNT practices was how difficult visitors perceived practicing LNT to be. This study highlighted that specific factors appear to determine backcountry recreationists' LNT behaviors and that future strategic educational messaging should be designed around targeting these factors (Vagias et al. 2014).

Jane Kwenye

Pro-sustainable behaviors and loyalty: Exploring factors that influence revisits to a protected area using a Zambian domestic tourism market. This study of Zambians' destination loyalty in a nature-based tourism context. A model was tested to identify the relationships among service and facility quality, perceived value, satisfaction, and place-attachment on tourists' loyalty to the Victoria Falls World Heritage site. Loyalty refers to visitors' willingness to return to the site and recommend it to others, satisfaction to the extent to which tourists believe the visit evoked positive feelings, and perceived value referred to tourists' evaluation of what they experienced relative to what they paid.

Results showed that domestic tourists' perceptions of service quality at the site and the perceived value of their visits most affected the visitor's loyalty. Unique to this research was the additional demonstration that place attachment had a positive relationship to site loyalty. Loyalty to the Victoria Falls World Heritage Site was positively correlated with sustainability behavior (such as recycling and conserving water), which suggests that promoting tourists' interest in returning to the site could be an avenue for fostering improved nature stewardship among Zambians. The relationships identified in this model give resource and recreation managers a tool for devising communication and management plans that will enhance domestic tourists' loyalty to protected

areas which, in turn, may help influence a greater culture of sustainable behavior among Zambians.

Carena van Riper

Connecting concepts of place and value: The case of Channel Islands National Park. This presentation examined multiple values of the visitor experience at Channels Islands National Park, California (van Riper and Kyle 2014). Data for this study were collected via an on-site survey administered to a representative sample of adult visitors June through August, 2012. Our objectives were to assess the strength and characterization of place attachment, determine the relative perceived importance and spatial dynamics of 12 assigned values, and explore the meanings of places according to survey respondents. We analyzed survey items measuring four dimensions of place attachment (identity, dependence, affective attachment, social bonding) and discovered that respondents could be organized into five subgroups. Differences emerged in these subgroups' evaluations of assigned values that were ranked, and then mapped across the study area using a participatory mapping exercise. Multiple locations in the park were considered important, and respondents with stronger attachments tended to identify more locations that they felt embodied assigned values such as aesthetic, therapeutic, and cultural values. Additionally, individuals with stronger attachments, particularly those reporting high levels of identity, appreciated areas that they had not visited or experienced first-hand. In our analysis of place meanings, we found that encounters with the Santa Cruz Island fox (*Urocyon littoralis*) and sightings of the island scrub-jay (*Aphelocoma insularis*) were motivating factors that explained why places were considered important for the purpose of protecting biological diversity. Areas in view of the coastline and closer to infrastructure such as trail systems and interpretive centers explained why locations were assigned aesthetic and recreation values, respectively. This study suggested that the multiple values of the Channel Islands were formed as a function of human-place bonds and that research on attachment, assigned values, and place meanings can provide complementary information about the quality of visitor experiences in parks and protected areas.

Ken Bagstad

Economics, ecosystem services, and protected areas: Monetary and nonmonetary perspectives. This presentation offered a conceptual overview of the value concept from the perspective of an ecological economist. Data presented illustrates how society can, and increasingly does, value nature's services using methods adapted from ecology, social science, economics, and geography, and why criticism of ecosystem services (ES) valuation remains. Monetary valuation of ES, based on the economic theory that individual consumers rationally rank economic tradeoffs in their decisions, is widely applied, but is less appropriate for many cultural ecosystem services. However, tools exist to prioritize cultural and biophysical ES based on nonmonetary preferences (Bagstad et al. 2015). Given the field's experimental nature, ES have been used in economic decision making on a sporadic rather than a systematic basis, though agencies increasingly use ES as a justification for successful one-off conservation efforts, and a recent White House memo is requiring agencies to consider ES in decision making (CEQ 2015). Indeed, efforts by governments and institutions to manage natural resources that provide ES at local, national, and global scales can improve market efficiency, environmental sustainability, and, potentially, economic equity.

However, ethical questions remain about the role of ES in the economic system. ES valuation in particular has been widely popularized in recent years yet is still criticized (Norgaard 2010). For some, these concerns reflect less a criticism of ES science, which, while still growing, has developed rapidly in recent decades, and more a criticism of the basic "operating system" of the economy in which they are embedded. A key question for the future—and perhaps the real

root of remaining opposition of the ES paradigm—may be whether ES researchers, economists, and ethicists can learn to account for nature's value while broadening the discourse about economics' underlying operating system. Understanding how economics both exacerbates and can help address today's "wicked problems," such as climate change, food security, and poverty and economic development, is a very different approach from viewing ES simply as an add-on to the neoclassical economic paradigm that currently dominates academic and policy discourse. Whether the economic system is well equipped to deal with such key global issues is an important point of contention for critics of ES. Given new agency requirements to consider ES in decision making (CEQ 2015), these topics are likely to be of increasing interest to protected area managers.

Panel discussion with audience

The presentations from this panel prompted a lively and productive discussion about the role of values in protected area management decisions and policymaking. The first question asked how managers could inspire conservation ethics that encouraged particular values and maintained persuasive messages for the general public. The panelists noted that research suggests that held values (i.e., enduring beliefs) are not easily changed through interpretation and other outreach materials introduced when people visit parks and protected areas. On the other hand, assigned values (e.g., landscape qualities detected by visitors) are more effectively targeted by resource and recreation managers. That is, interpretation can draw attention to particular qualities of places, clarify acceptable ways to act, and encourage environmental behaviors over shorter time periods. These messages can simultaneously foster long-term changes, such as support for "biophilia," a theory that suggests people share instinctive bonds with other living systems (Kellert and Wilson 1993).

The panelists also mentioned that cultural narratives could be employed to provoke thought and emotional responses among park visitors. To do this, communication strategies should tell the stories of different user groups and help visitors realize the importance of their role in decision making. "How can we honor visitors and show that they are part of the solution? How do I engage my visitors to share power and decision making?" These were two of the questions raised, which led the panelists to position social science research as a tool for addressing some of the universal challenges that face parks and protected areas.

Audience members were interested in the how protected area managers could yield more immediate results, given that held value orientations typically take lifetimes to shift within a population (Dietz 2005). Social media is one avenue for maintaining and enhancing relevancy for younger generations, and this approach is increasingly embraced by government agencies such as Parks Canada and the U.S. National Park Service. Another method is to tug at the heartstrings rather than pocket books of public constituents. The panelists and audience members discussed the idea that stewardship behavior could be energized by not only monetary compensation but also feelings of awe and transcendence. There was general consensus that the meanings people assign to places are highly variable, so multiple channels of communication should be adopted to encourage human-place bonding.

The values and stewardship behaviors of visitors were examined by most panelists; however, the activities of local residents were largely omitted from presentations in this session. One audience member raised concerns about the difficulties of capturing the perspectives of people who aren't already committed to parks and protected areas. In response, the *idea* of wilderness was raised as an avenue for creating attachment and generating public support for nature protection (Williams et al. 1992). Another panelist noted that although residents may form attachments to nature-related concepts, these connections likely change over the course of generations. Social science research that purposely targets a younger demographic will provide currently underrepre-

sented insights on how best to increase activities outdoors that expose children to nature (Larson et al. 2010). In other words, social science research focused on young generations—alongside visitors and resident populations—may yield interesting and useful results.

A range of social science disciplines can help address many of the questions raised during this panel discussion. Increasingly, the social and natural sciences are being integrated to shed light on human-environment interactions, as evidenced by the growth of social science research programs in U.S. national parks, such as Yellowstone and Yosemite, which are meant to complement existing efforts within the natural sciences. Disciplines such as social psychology can provide insights on how to best craft messages in a way that appeals to different internal processes, political science offers valuable perspectives on policy change, and human geography can reveal the intricacies of bonds formed between people and places, which in turn motivate behavior. These are several examples of social science disciplines represented in the panelists presentations that can inform interdisciplinary research to protect key natural resources while providing enjoyable experiences for the public.

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Changing Levels of Heavy Metal Accumulation in Birds at Tumacacori National Historical Park along the Upper Santa Cruz River Watershed in Southern Arizona

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Introduction

National parks and other protected areas can be influenced by contamination from outside their boundaries. This is particularly true of smaller parks and those with riparian ecosystems. Riparian woodlands provide a critical resource for breeding, migratory, and wintering birds, and support more species than any other vegetation type in southern Arizona (Knopf et al. 1988). The degradation of riparian systems from heavy metal contamination can have detrimental impacts on avian communities and other organisms living within that ecosystem. Animals living in contaminated areas are susceptible to adverse health effects as a result of long-term exposure, and bioaccumulation of heavy metals. Therefore, understanding contamination source locations and how birds are living within a national park or protected area are crucial for making decisions regarding avian species management.

The upper Santa Cruz River in southern Arizona is dry throughout most of the annual cycle, but a 35 km stretch that flows through Tumacacori National Historical Park (NHP) was revived to a perennial flow in the mid-1900s, when the river started being filled with treated effluent from the Nogales International Wastewater Treatment Plant (NIWTP). The plant treats sewage and wastewater from both Nogales, Arizona, and Nogales, Sonora, Mexico. Furthermore, the river receives water from intermittent tributaries (e.g., Sonoita Creek) that flow through urban and abandoned mining areas. The Santa Cruz River corridor within the park now supports lush riparian vegetation, but concerns about water quality have arisen because heavy metals, pesticides, and other contaminants have been discovered in this riverine system (King, Zaun, and Velasco 1999; Kirkpatrick, Conway, and LaRoche 2009). Avian monitoring at Tumacacori NHP,

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which lies approximately 17 km downstream of the Nogales wastewater treatment plant, found a relatively high incidence of deformities between 2001 and 2009 (Kirkpatrick, Conway, LaRoche, and Robinson 2010), possibly indicative of high heavy metal contaminant levels.

Song sparrows (*Melospiza melodia*) provide an ideal subject for studying the extent of contaminant exposure because of their non-migratory habits in the Southwest (Davis and Arcese 1999). Utilizing this bird species assures that any contaminants that may have accumulated did not come from locations outside the park, such as a migratory bird's wintering grounds. Moreover, song sparrows in the Southwest rely heavily on riparian habitat, and feed on aquatic insects and invertebrates, especially during the breeding season (Aldrich 1985). As a result, individual birds can be directly exposed to heavy metals through foraging on contaminated prey.

Our study was part of a collaborative effort to quantify the levels of contaminants in the upper Santa Cruz River ecosystem, including water, sediments, plants, insects, fish, and birds (Norman et al. 2008). Lester and van Riper (2014) documented sources of bird contaminants, such as heavy metals that originate from a variety of point sources and accumulate as water moves down the riparian corridor, that can have profound effects on birds in Tumacacori NHP. An unhealthy avian community may be an indication of detrimental conditions for other wildlife and for humans that visit the park. Within this study, our assumption was that the distribution of metal concentrations in birds would represent the metal's sources. The objectives of our study were to (1) quantify the concentrations and distributional patterns of heavy metals in blood and feathers of song sparrows at Tumacacori NHP; (2) quantify song sparrow hematocrit values (percentage of whole blood volume that is red blood cells), blood parasites, and immune system condition in the park; and (3) compare our findings with prior studies at the park to assess the extent of heavy metal accumulation in birds at downstream sites after the 2009 wastewater treatment plant upgrade. These objectives allowed us to determine if birds in the park were accumulating heavy metals in patterns consistent with their source, and how heavy metal concentrations changed over time. Our study also was undertaken to provide a baseline of information for Tumacacori NHP.

Methods

Tumacacori NHP was our principal study site and is located along the Santa Cruz River approximately 17 km downstream of the Nogales International Wastewater Treatment Plant (Figure 1). Song sparrows were captured between April and August during 2011 and 2012. We used 6- and 12-meter long mist nets (30 mm mesh) to target individual birds. Blood and feather samples were collected from each song sparrow and sent to Activation Laboratories Ltd. (Ontario, Canada) for preparation and heavy metal analysis. Samples were analyzed for 21 focal heavy metals including silver (Ag), aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), mercury (Hg), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), antimony (Sb), selenium (Se), strontium (Sr), thallium (Tl), uranium (U), vanadium (V), and zinc (Zn). Although As and Se are not considered heavy metals, for simplicity they will be referred to as such throughout this paper. Background concentrations of heavy metals in blood and feathers were determined from previous studies that examined concentrations in birds at unpolluted reference sites (e.g., Eens et al. 1999).

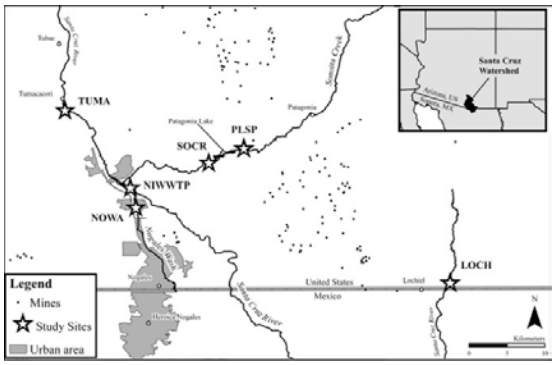

Figure 1. Schematic showing locations (latitude 313833; longitude 1109158) of five reference sites (from Lester and van Riper 2014) in the upper Santa Cruz River watershed, southern Arizona, 2011–12: Lochiel, San Rafael Grasslands (LOCH); Nogales Wash (NOWA); Sonoita Creek, above Patagonia Lake (PLSP); Sonoita Creek, below Patagonia Lake (SOCR); Nogales International Wastewater Treatment Plant (NIWWTP). Also shown is our principal study area, Tumacacori National Historical Park (TUMA).

White blood cells were analyzed as a proportion of total number of cells read for each blood smear. In healthy birds white blood cells

average 5000–10000 cells/mm^3 of blood, and any higher values can indicate health problems. Proportions were natural log transformed and a two-way ANOVA with LSMeans Student's t-test was used afterward to look for differences in white blood cell proportions among the six field sites. One- and two-way ANOVAs with LSMeans Student's t-tests were used to test for differences in hematocrit values. A larger residual above or below the line of regression indicates individuals that are above or below average body condition (Ots et al. 1998).

We used the 2010-JMP 9.0 package (SAS Institute Inc.) to perform all statistical analyses. For individuals with heavy metal concentrations less than detection limits, we assigned a value equal to one-half the detection limit (Wong et al. 2002). All concentrations were converted to parts per million and natural log-transformed. We used two- and three-way analysis of variance (ANOVA) to test for differences in mean concentrations of each focal heavy metal among years for blood and feathers, respectively. Sex was considered a main factor, whereas feather age was included as a main factor only for feather analysis. This was done to account for increasing heavy metal concentrations as a result of external deposition that was not removed by vigorous washing. Feather time of collection (age) was entered into the model as the number of days from the first date of feather collection for that particular year. All possible interactions were included in both models, with the exception of feather age-sex-site interaction, so as to avoid over-fitting the models. We used matched-pair t-tests for feather samples of 37 individuals and blood samples of 33 individuals captured in both 2011 and 2012 to determine if heavy metals are accumulating from one year to the next. Student's t-tests were used to determine overall differences in heavy metal concentrations between years.

Results: Distributional patterns and inter-annual differences

Feathers. We collected 99 sparrow outer tail feathers in 2011 and 102 in 2012. Of the 21 focal heavy metals, 15 showed at least one significant difference in 2011 from heavy metal levels in birds at unpolluted sites, while in 2012, 16 showed at least one significant difference (Table 1).

Comparison to previous studies. Blood concentrations of Cr and Ni for Song Sparrows at Tumacacori NHP were lower than blood concentrations of these metals reported by Kirkpatrick et al. (2010) for Abert's towhees and yellow-breasted chats. Cadmium showed similar concentrations between Abert's towhees and song sparrows, but concentrations in yellow-breasted chats were below detection limits. Lead, Cu, and Zn concentrations were only slightly higher in song sparrows than in Abert's towhees and yellow-breasted chats, whereas Hg and Se were two to six times higher in song sparrows than in Abert's towhees and yellow-breasted chats (Figure 2).

Hematocrit values. Hematocrit values were determined for 54 males and 28 females in 2011, and 65 males and 42 females in 2012. Red blood cell content in males averaged 50.15 and 51.05 percent in 2011 and 2012, respectively, whereas red blood cell content in females averaged 47.67 and 49.29 percent in 2011 and 2012, respectively. Although males have a significantly higher hematocrit values than females in 2011 (two-way ANOVA, $F_{(1, 80)} = 6.67$ $p = 0.0119$), the difference is not significant in 2012 (two-way ANOVA, $F_{(1, 105)} = 1.38$, $p = 0.2427$).

Leukocyte and parasite count. Blood smears were examined for 88 Song Sparrows in 2011 and 115 in 2012. In general, the proportion of white blood cells were significantly higher in 2011 than in 2012 (two-way ANOVA, $F_{(5, 197)} = 8.98$, $p = 0.0031$). Only three birds were found with blood parasites, two with *Haemoproteus* sp. and one with *Plasmodium relictum*. There were no birds with multiple parasite infections.

Discussion

This study provides an understanding of how heavy metals are accumulating in a riparian bird species in a national park, associations between heavy metal levels and body condition, and

Metal	TUMA 2011 (n=23)	SE	F	p	TUMA2012 (n=16)	SE	F	p
Ag	-4.840	0.27	0.3779	0.8625	-4.611	0.17	1.8273	0.1801
Al	5.087	0.09	1.8299	0.1163	5.028	0.11	1.1781	0.3270
As	-1.452	0.07	5.7764	0.0001*	-1.708	0.09	4.2432	0.0017*
Ba	2.233	0.08	4.4341	0.0013*	2.079	0.11	19.5213	<0.0001*
Cd	-0.923	0.09	28.2896	<0.0001*	-1.056	0.13	19.6068	<0.0001*
Cr	-0.949	0.09	2.7657	0.0235*	-1.364	0.12	4.1930	0.0019*
Cu	2.475	0.03	3.1866	0.0113*	2.146	0.07	2.9834	0.0159*
Fe	5.400	0.09	3.8058	0.0038*	5.139	0.10	2.9353	0.0173*
Hg	-1.469	0.17	3.0617	0.0140*	-2.681	0.15	5.9185	<0.0001*
Mg	5.138	0.06	1.1787	0.3270	5.171	0.06	1.7051	0.1425
Mn	3.786	0.11	5.4383	0.0002*	3.579	0.13	13.6671	<0.0001*
Mo	-0.889	0.04	4.8374	0.0006*	-1.095	0.08	14.0622	<0.0001*
Ni	0.427	0.12	13.4433	<0.0001*	-0.640	0.10	15.5751	<0.0001*
Pb	0.196	0.06	5.1424	0.0004*	-0.356	0.07	18.7977	<0.0001*
Sb	-2.971	0.05	19.1914	<0.0001*	-3.249	0.07	11.8235	<0.0001*
Se	-0.491	0.15	0.4042	0.2317	-1.740	0.45	5.9181	<0.0001*
Sr	2.391	0.09	0.7161	0.6131	2.256	0.10	6.0776	<0.0001*
Tl	-5.973	0.09	5.9579	<0.0001*	-6.030	0.09	8.5320	<0.0001*
U	-3.150	0.07	13.2079	<0.0001*	-3.315	0.10	9.2162	<0.0001*
V	-0.621	0.06	1.5775	0.7844	-0.824	0.09	1.9850	0.0893
Zn	5.205	0.03	2.4513	0.0405*	5.008	0.06	1.2722	0.2837

Table 1. Mean natural log (Ln) in parts per million, standard error (SE), F value and probability (p) of 21 heavy metals in tail feathers of adult song sparrows at Tumacacori NHP in the upper Santa Cruz River watershed, southern Arizona, 2011 and 2012 (see text for names of heavy metal abbreviations). Probabilities with an * denote heavy metals that are significantly different than average background concentrations listed by Lester and van Riper (2104).

demonstrates the importance of examining a larger geographic region in order to clearly define source areas of park contaminants.

Distributional patterns. For feathers and blood, Lester and van Riper (2014) found that concentrations of 15 heavy metals were significantly different among their sites in 2011–2012 on the Santa Cruz River. Generally, birds accumulated heavy metals in relation to their length of presence in locations with sources of specific pollution. Data were relatively consistent between 2011 and 2012 in terms of which sites showed the highest or lowest concentrations of metals, indicating that the sources of pollution did not change between years of their study.

For most heavy metals, mean concentrations were lower at Tumacacori NHP than Lester and van Riper (2014) found at five other sites in the Santa Cruz watershed (see Figure 1). This corroborates our prediction that heavy metals may be mobilized from natural sources and are entering the park via river water from distant locations. For example, Lester and van Riper (2014) found that Nogales Wash had high concentrations of Cu, Cr, Fe, Mo, Sb, Se, and U. Nogales Wash is upstream of the park and receives surface-water drainage, water from leaking sewage pipes, as well as random "fugitive flow" from both Nogales urban areas. Fugitive flow is wastewater that bypasses the collection and transport system to the Nogales International Wastewater Treatment Plant, allowing it to instead flow into Nogales Wash. The park receives runoff from Sonoita Creek which acquired runoff from abandoned mining areas in the Patagonia Mountains; the elevated Hg concentrations were most likely a result of earlier gold mining in the Patagonia Mountains, because Hg is used to extract gold from ore (Malm et al. 1990). Metals that may be released in the effluent of the Nogales treatment plant are likely at a lower concentration by the time they reach TUMA, due to adsorption to sediments and settling. However, in 2011 concentrations of Ni in feathers were high at Tumacacori NHP, exceeding background concentrations and likely an artifact of

the higher Ni concentrations in water released from the wastewater-treatment plant (Lester and van Riper 2014). This clearly demonstrates that differing levels of heavy metals at the park are a result of numerous point sources over the larger landscape outside the park.

Comparison to previous studies. In 2008 and 2009, Kirkpatrick et al. (2010) examined the extent of heavy metal exposure in the blood of Abert's towhees and yellow-breasted chats at Tumacacori NHP. In general, our study shows an overall decrease from Kirkpatrick et al. (2010), as most metals in song sparrow blood were at concentrations similar to or less than the birds they sampled in 2008 and 2009. Blood parasites occurring in 3.2% of song sparrows we tested was well within the range of average hematozoan infections found in birds throughout North America (Greiner et al. 1975). The thin blood smears could have contributed to the lack of observed *Trypanosoma*, as thick blood smears is the preferred method for surveying these blood parasites. Overall, it does not appear that the heavy metal levels that we found are enhancing blood parasite infections at Tumacacori NHP.

Although this study does not demonstrate any major physical associations between chronic heavy metal exposure and condition at Tumacacori NHP, it is possible that there are unseen effects, such as at the molecular level. The development of differential gene expression assays to assess the immunological health of marine mammals provides a promising new technique for monitoring avian health (Bowen et al. 2007). Our study was not able to examine the reproductive effects of heavy metal exposure on birds. Future studies should consider examining the productivity of resident birds at the park and other locations along the upper Santa Cruz River watershed, particularly in relation to heavy metal exposure. Nestlings may be a better indicator of environmental conditions because they are more sensitive than adults (Janssens et al. 2003).

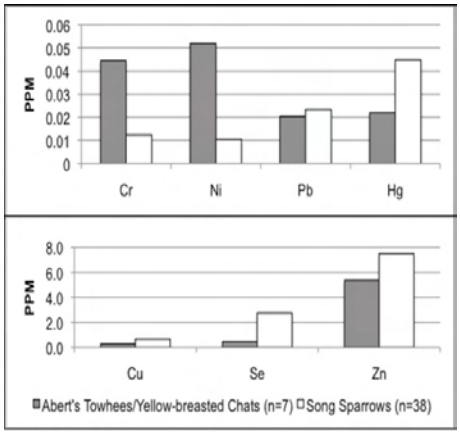

Figure 2. Comparison of heavy metals in Abert's towhees (*Melozone aberti*) and yellow-breasted chats (*Icteria virens*; from Kirkpatrick et al. 2010) represented by dark bars, with what we found in song sparrows (*Melospiza melodia*) represented by white bars. Mean concentrations for song sparrows were averaged for 2011 and 2012. Presented are mean concentrations in parts per million (PPM) of chromium (Cr), nickel (Ni), lead (Pb), mercury (Hg), copper (Cu), selenium (Se), and zinc (Zn) in blood of birds at Tumacacori NHP, Arizona.

Conclusion

Distributional patterns of heavy metal accumulation in birds at Tumacacori NHP reflected urban and mining sources of pollution outside the park, at point source areas among sites within the upper Santa Cruz River watershed. Certain potentially toxic metals, such as Cd, Ni, Cu, Hg, and Se, did exceed background concentrations found in the literature, but these concentrations have not reached what are presently considered toxic levels. Overall health of song sparrows at the park appear to be normal, as we did not find any strong evidence currently suggesting altered hematocrit values, white blood cell counts, or blood parasites in song sparrows due to heavy metal exposure. We also failed to find any lesions on birds as was reported in earlier studies from the park. Most heavy metal concentrations have decreased over time following an upgrade to the wastewater-treatment plant; concentrations we found at sites downstream of the treatment facility were lower in 2011 and 2012 than in 1997, 2008, and 2009. Heavy metal concentrations in birds at Tumacacori NHP were largely a result of sources from outside the park boundaries.

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Prioritizing Lightning Ignitions in Yosemite National Park with a Biogeophysical and Sociopolitically Informed Decision Tool

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Abstract

Entering the 2014 fire season, managers in Yosemite National Park had cautious optimism while the rest of California had an exceptional drought on their minds. That, coupled with memories of the 2013 Rim fire, gave reason for cautiousness. However, optimism was due, in part, to the park's successful management of lightning ignitions since 1972, including 2012 and 2013 when large fires dotted the state. To identify risks and wildfire potential, Yosemite developed a decision tool (*sensu* Wildfire Management Go–No-Go) based on biophysical conditions, surrounding fuels, and sociopolitical "situation awareness." Three zones were identified. High-elevation areas presented the greatest opportunity for managing wildfires because they rarely burn in any but the driest years. Middle-elevation bands were "conditional" and would need extra scrutiny. Fires at lower elevations would be suppressed. We present the decision support tool using case studies to validate that there is an appropriate place for managing fires in Yosemite.

Introduction

Yosemite National Park covers 747,955 acres of the central Sierra Nevada in California and varies in elevation from 2,000 feet in the west to 13,000 feet in the east along the crest of the range. The elevation profile from east to west highlights distinct vegetation types. Lower montane forests (yellow pine–mixed conifer) occur between 2,000 feet and 6,000 feet, upper montane forests from 6,000 feet to 8,000 feet, and subalpine forests from 8,000 feet to tree line at 11,000 feet. The higher the elevation, the shorter the growing season and the more harsh the growing conditions, so the less fuel accumulates over time.

The Mediterranean climate of Yosemite is characterized by warm, dry summers and cool, wet winters with precipitation primarily occurring between November and April. However, during the summer, a monsoonal flow from the southeast, south, and southwest can create numerous thunderstorms responsible for lightning and occasional rain at the higher elevations. Studies of

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the distribution of lightning strikes show that at the lower elevations, where burnable vegetation is abundant, lightning is less frequent. Conversely, at higher elevations, lightning is abundant but vegetation is sparser (van Wagtendonk and Cayan 2008). In Yosemite and the Sierra Nevada, lightning ignited-fires will burn fire-adapted and fire-dependent vegetation every year.

Because the Sierra Nevada has an extensive history of lightning strikes and subsequent fires (van Wagtendonk et al. 2002; van Wagtendonk and Fites-Kaufman 2006), managers must consider factors in addition to ecology when deciding whether to manage a fire. In 1972, a Prescribed Natural Fire Program was established in Yosemite, establishing the opportunity to manage lightning-ignited fires so as to allow them to burn under prescribed conditions (van Wagtendonk 2007). Yosemite National Park's extensive fire records (1930 to the present) have facilitated studies of the spatial distribution of lightning fire ignitions (van Wagtendonk 1994; van Wagtendonk and Davis 2010; van Wagtendonk 2012). An understanding of the ignition patterns presents opportunities to manage fire in locations that frequently get lightning but few fires except in the driest years.

In 2014, the then three-year drought dominated discussions regarding the beginning of the fire season. Fire managers across the western US knew that a challenging fire season was coming. Additionally, managers in Yosemite were acutely aware that the 2013 Rim fire was still smoldering, not only on the landscape, but in the collective psyche of the region. Yosemite, therefore, found itself in a unique position, and under the microscope, for prioritizing the management of lightning ignitions. Could the park adhere to its mission of restoring fire as an ecosystem process in the face of exceptional drought on the heels of the largest fire in Sierra Nevada history? The park needed a science-based risk management tool to pick the successful starts from those that could cause partners and neighbors to lose our trust.

Lightning ignition patterns

An initial step in creating the decision tool was to identify where fires have historically burned in the park. Fire data from Yosemite National Park's GIS spatial database were used to assess when and where fire ignitions occurred. These data are updated annually and date back to 1930. In recent years, ignition point location data have been collected by fire personnel using GPS. However, for historic fires—with locations gleaned from reports, digitized, and integrated into the park GIS dataset—the center of each fire perimeter was calculated in GIS. The lightning-ignited point database was used for the spatial analysis of lightning fire ignition patterns (van Wagtendonk 1994; van Wagtendonk and Davis 2010; van Wagtendonk 2012).

An assessment of ignition points and final fire perimeters was done to see where Yosemite experienced lightning starts and their subsequent growth. Elevation was a major indicator in this spatial pattern due, in part, to the changing vegetation types with elevation and the duration of snow pack on the landscape. Other factors such as slope, aspect, and soil moisture capacity relate to how wet or dry the landscape is and are measured by water deficit and the actual evapotranspiration of the vegetation. These factors all play a role in where and when ignitions occur in Yosemite and how large they become.

The majority of ignitions and acres burned in the park occur between 6,000 feet and 9,000 feet (2,327 ignitions for a total of 131,709 acres). Of those, the largest number of ignitions and acres burned are between 7,000 feet and 8,000 feet (921 ignitions for 72,079 acres). The 8,000 foot contour is a threshold where strikes and ignitions are prevalent, but acres burned are low (639 fires for 13,941 acres). Hence, not all lightning strikes produce ignitions and the park has identified these areas as fire shadows (van Wagtendonk 2012). Fire shadows are important because they do not burn very often but present opportunities for accomplishing resources objectives under dry conditions. In fact it may be only in drought years that fires can burn in high-elevation upper

montane and subalpine landscapes with longer fire return intervals than in the lower-elevation montane forests.

2012 and 2013 fire seasons

Two thousand twelve marked the first year of California's drought and, when the lightning came, provided Yosemite with the opportunity to begin to understand how to manage fires in a drier climate. The Cascade fire started in the fire shadow at 7,880 feet and burned largely unnoticed by visitors under prescribed conditions for four months for a total of 1,705 acres. It is during dry years that fires will burn in places with longer return intervals or that typically have snow on the ground well into June despite northern California experiencing large and expensive fires.

Two thousand thirteen was a significant year for the region. Its winter was the second in a row with less than average precipitation, which helped intensify California's drought. Additionally, the Rim fire burned over 257,000 acres of the Stanislaus National Forest and Yosemite National Park from mid-August through mid-September. That May the park received lightning strikes, one of which ignited the Forbidden Fire at 7,383 feet. This slow growing fire was re-burning a managed lightning ignition from the mid-1980s in red fir and Jeffrey pine. It burned for four months for a total of 198 acres. During its final month, which coincided with the month that the Rim was active, the Forbidden grew by 28 acres.

Identification of 2014 fire management units

Yosemite's Fire Management program is guided by the 2004 Fire Management Plan/Environmental Impact Statement (FMP). The plan identifies two management units: Suppression and Managed Fire (NPS 2004). All wildfire ignitions in the Suppression Unit are immediately suppressed using the 2009 Guidance for Implementation of Federal Wildland Fire Management Policy (2009). In the Managed Fire Unit, lightning-ignited fires are used to meet ecological target conditions (NPS 2004). In 2012 Yosemite developed a prioritization decision tool that incorporated the knowledge of ignition patterns along with other biological, physical, and sociopolitical factors for fires that ignited in the Managed Fire Unit.

For the 2014 fire season, the park used knowledge gained from assessing the historic patterns of lightning ignitions and the lessons learned from the Cascade and Forbidden fires. Because these fires burned in the fire shadow, they were used by the park to craft new fire management units. Three distinct units were created (Figure 1). All areas above 8,000 feet were placed into the Managed Fire Unit where ignitions are considered for management. The fire shadow areas between 7,000 feet and 8,000 feet and areas within the Rim footprint were considered to be in the Conditional Unit. The Suppression Unit was made up of areas below 7,000 feet outside of the Rim footprint and areas in the Suppression Unit in the 2004 FMP.

2014 decision support tool

The 2014 version of the decision support tool varied slightly from the previous two years in that it addresses the idea of a seasonally dry fire season and introduces the Conditional Unit. "Seasonally dry" equates to the April 1st Tuolumne Meadows (elevation 8,600 feet) Snow Water Equivalent being 40 cm or less (Lutz et. al, 2009). Generally, Yosemite fires burn more acres in years that average more than 40 cm of snow water equivalent, so this decision tool is used as a "Go–No-Go" when conditions are dry. Once an ignition is detected, the first step is to determine if it occurred above 8,000 feet, which is the threshold for the Managed Fire Unit. If that ignition fell outside of the Suppression Unit while the National Preparedness Level is less than four, the fire would be considered for management. However, if that ignition occurred within the Suppression Unit, in

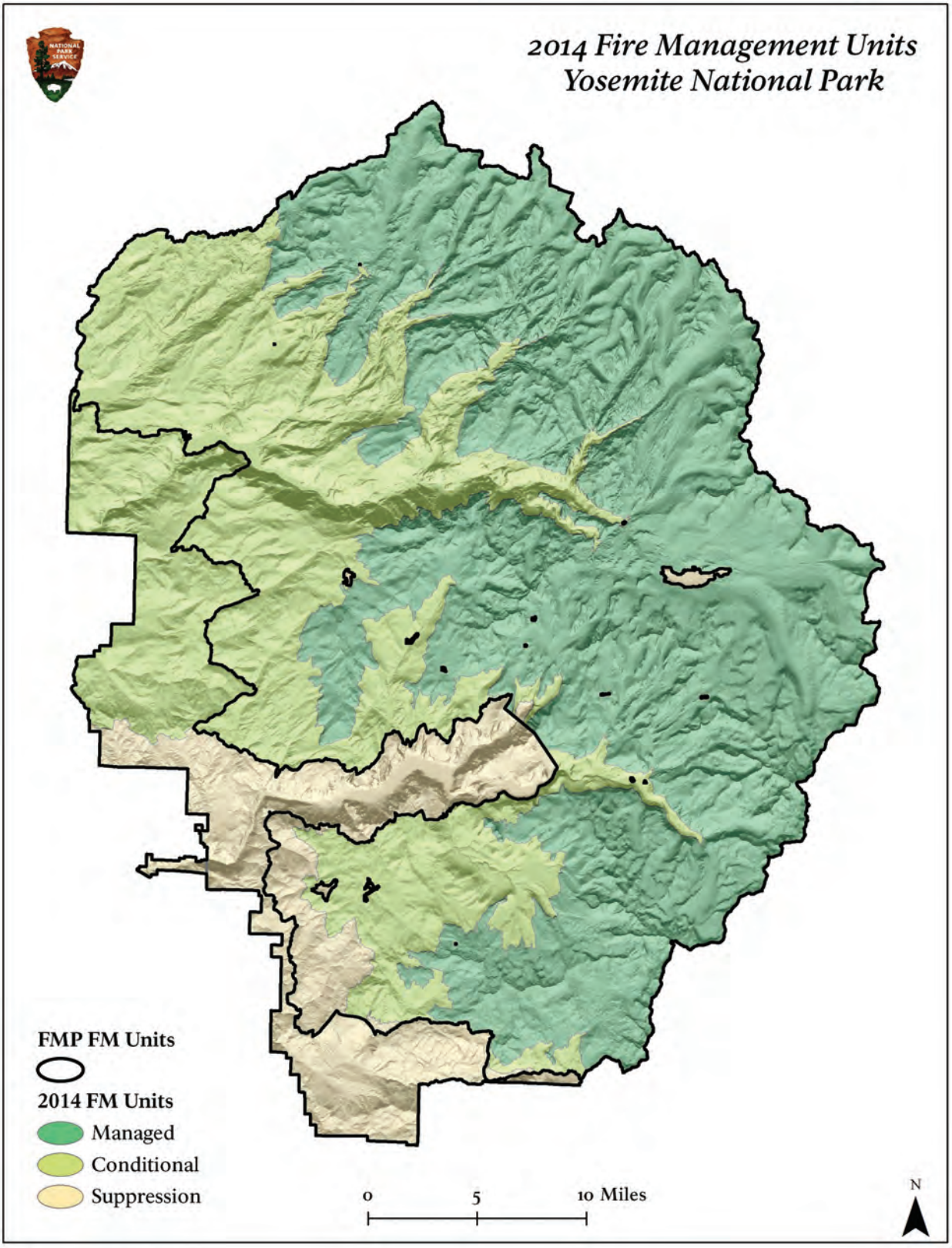

Figure 1. Map of the 2014 Fire Management Units for Yosemite National Park. The Managed Fire Unit is dark green, the Conditional Unit light green, and the Suppression Unit is tan. The black lines represent the Fire Management Units as identified in the 2004 Fire Management Plan for reference to show how the Units were altered for 2014.

Tuolumne Meadows, for example, the fire would be suppressed. If the fire occurred when the National Preparedness Level was above three, the park would consult with the National Park Service Pacific West Regional Office before management of that fire began.

If the fire was below 8,000 feet, the Conditional Fire Unit assessment criteria are evaluated. In order to be a managed fire, the ignition must occur within the 2013 Rim fire footprint. If it did not fall within the Rim footprint, the fire would have to be between 7,000 and 8,000 feet to be considered. In both cases the risks and benefits of managing the fire are weighed with internal and external factors as posed in the final assessment. If the natural ignitions did not meet the Conditional Fire Unit criteria, that is, if it was outside of the Rim footprint and below 7,000 feet, the fire would be suppressed (Figure 2).

Once the candidate fire for management is assessed, a final evaluation, or secondary situational awareness and risk analysis, is undertaken using biogeophysical, sociopolitical, and management factors (Figure 3). The biogeophysical factors of Fire Return Interval Departure (van Wagtendonk et al. 2002), lightning ignition density (van Wagtendonk 2012), barriers to spread, and seasonality of the fire help to identify how the fire may grow and spread. More nuanced and less scientific sociopolitical factors, such as impacts on visitors and infrastructure, impacts on hol-

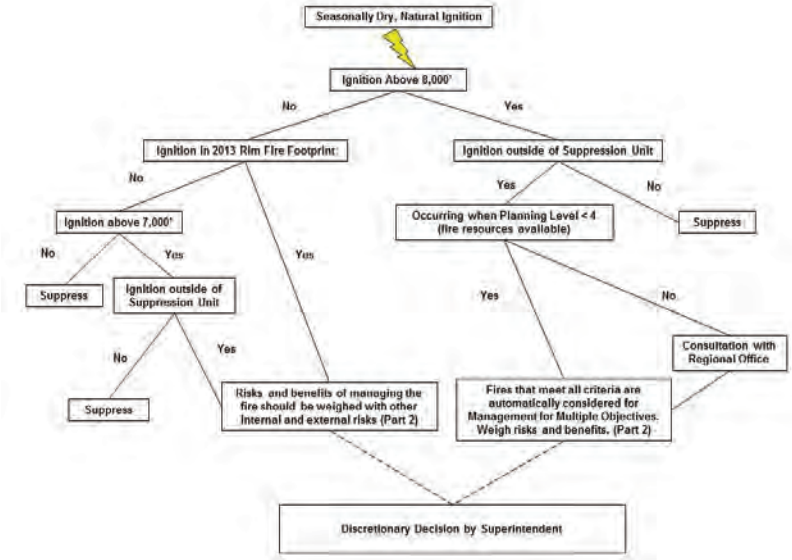

Figure 2. Natural Ignition Decision Support Tree. This diagram can walk managers through the decision making process when evaluating candidate fires for management for multiple objectives.

	Fire Situation	Meadow
Biogeophysical	Fire Management unit (If suppression, stop here)	Outside the Suppression unit
	Lightning density	Low
	Fire Return Interval Departure	2 (30 FRI)
	Seasonality (ERCs increasing or decreasing)	Probably decreasing
	Barriers to fire spread	Some, moderate
Socio-political	Visitor disturbance (smoke, traffic, closures)	Smoke in Yosemite Valley
	Impact to holiday visitation	Labor Day
	Values at risk	Air quality
	Regional smoke impacts from other fires	No
	Gateway events that could be impacted	Labor Day, Wilderness celebration
	County	Mariposa
	Potential to impact boundary	No
Managerial	Number of resources needed to manage fire	TBD
	Are there fires in neighboring Federal units creating local demand on resources?	No
	Other fuels projects or wildfires in the park	Yes
	Likelihood of meeting objectives with prescribed fire	No

Figure 3. Part 2 of the Decision Support Tool. These are the internal and external factors that are assessed when determining whether a fire will be managed for multiple objectives. These factors fall into three categories: biological and physical, socio-political, and managerial. The 2014 Meadow Fire is being used as an example.

iday visitation and gateway community events, air quality, proximity to the park boundary, and the county in which the fire is burning are also considered. These factors could ultimately swing the decision from managing a fire to suppressing it, but not vice versa. Additional management factors such as number of fires burning in Yosemite or on neighboring federal lands or whether the park could utilize a prescribed burn in lieu of the natural ignition would also need to be assessed when prioritizing these ignitions.

Another key component of the tool is the risk management gained from fire spread models after ignition. This could also begin the validation process behind the decision to suppress or manage. The final part of this decision-making process requires a rationale signed by and at the discretion of the Superintendent. The rationale would include all of the factors evaluated in the decision support tool.

2014 fire season

In 2014, Yosemite had 36 lightning-ignited fires. Therefore, park had many fires to evaluate through the prioritization process. Eighteen fires were within the Managed Fire Unit of the 2014 Yosemite Fire Management Units (Figure 1). Of those, five were suppressed, 11 went out naturally and two were managed for multiple objectives. These two fires were both above 9,000 feet and burned from mid-July until the end of fire season in November. Combined they burned about 25 acres. In the Conditional Unit, there were 17 ignitions: 11 were suppressed, five were extinguished naturally, and one was managed for multiple objectives and burned about 1,070 acres. The Suppression Unit had one ignition, a low-elevation 3 acre fire that started when lightning struck a power line.

Conclusion

The decision support tool developed by Yosemite takes into account fire history, biogeophysical, and sociopolitical factors unique to the park. However, this tool can be adapted for use by any Land Management Unit (LMU) where fire is part of the fabric of the landscape, as is the case in Yosemite. By integrating issues and factors pertinent not only to the LMU, but for the fire season, managers are equipped with the best available science and data to make informed decisions on which fires could be managed for multiple objectives.

In Yosemite, there are areas that can have fire in any given year. By understanding the fire history and some of the other biogeophysical and sociopolitical factors, park managers can identify those areas that can burn even in drought years. Drought years present the opportunity to accomplish resource benefits that might not be possible at other times. The park learned many things from the 2014 fire season with respect to ignitions occurring above 8,000 feet. Many fires went out naturally, thus reducing the risk to firefighter safety. Additionally, the fires that did make it to the end of the season only burned 25 acres. This showed that the park should manage fires at higher elevations even in drought years.

In an era of longer, hotter, and drier fire seasons, park managers are faced with the tough tasks of trying to preserve and protect the landscape knowing that fires will ignite each and every year. Fire is a natural process that Yosemite has committed to returning to the ecosystem. It is a vital part of a healthy forest and may be one of the few tools that managers can use right now to build resiliency in a changing climate. This is not to be undertaken lightly. By developing a prioritization/decision support tool, the park has integrated many different and varying factors to assist and document its process. This is paramount for a science-based program to operate.

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22

Merging Economic Reality with Park Stewardship: Learning from the Presidio and Other Models (Session Overview)

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Note: this narrative is connected to a slide presentation available on the George Wright Society website (see Reynolds at www.georgewright.org/gws2015_powerpoints) which also includes slides for presentations by Amy Meyer, Cherilyn Widell, Craig Middleton, and Katherine Arrow (Meyer 2016; Widell 2016; Middleton 2016; Arrow 2016).

Introduction

This paper and the four others that follow (Meyer 2016; Widell 2016; Middleton 2016; Arrow 2016) grew out of Rolf Diamant's sixth "Letter from Woodstock," published in *The George Wright Forum* in 2013. Rolf began the letter saying:

> A few years ago, I suggested that US national parks were facing a paradoxical future. This was, I said, an era of unprecedented changes and challenges but also, in many ways, a golden age for the National Park Service...as it was an organization becoming more sophisticated, focused, and better trained than it has ever been in the past. I thought we should recognize that the park system was still growing in many positive directions. Park superintendents, overall, were becoming more emotionally intelligent and adept at dealing with complexity.... Partners were increasingly more nimble and capable and pockets of useful experimentation and innovation were able to flourish. In my 6th *Letter from Woodstock* I take a closer look at one of those nodes of useful experimentation and innovation, the Presidio of San Francisco. (Diamant 2013, 225)

Rolf ended the article this way:

> Given the magnitude and breadth of this remarkable 15-year transition from 'post to park,' I think it is time to give the Presidio greater recognition as a valuable part of our national park system. A great urban national park laboratory has been created...The Presidio is an opportunity to experiment with new approaches to partnership, community-building and civic stewardship. We should take advantage of all that can be learned. It is time to pay more attention. (Diamant 2013, 229)

Citation: Weber, Samantha, ed. 2016. *Engagement, Education, and Expectations—The Future of Parks and Protected Areas: Proceedings of the 2015 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites.* Hancock, Michigan: George Wright Society.

Today, we are paying attention to one facet of what has made the presidio work, and what is a growing movement to make other parks and protected areas work in a future very different than the past in which they came to be. We are paying attention to the opportunity to steward natural and cultural resources with excellence, using innovative applications of public and private resources, to benefit place and synergy in park settings.

Our examples range from the vary large to the very small. They concentrate primarily on using leasing authorities, but we recognize that other instruments to use building or spaces exist, and are a part of the useful mix. We also recognize that doing so is not always easy. Our goal is, at the very least, to get you to think positively about the idea, though we hope you will become excited about the potential.

An array of examples and potentials

My purpose is to show you several examples of kinds of uses that are being achieved by the NPS and others. My hope is to inspire you regarding the possibilities, and encourage you to think positively and creatively when you go back to work. Preservation, interpretation, visitor enjoyment and smart-focused money generation are not incompatible.

Fort Hancock is a national historic landmark district at Sandy Hook, in Gateway National Recreation Area, New Jersey. The NPS is working to lease about 35 buildings in the district in order to preserve them, to enhance visitor enjoyment of the entire district, and to become a part of the local communities.

Following feedback from responses to a request for expressions of interest, the NPS created a "community map." The purpose was to provide guidance in achieving a vibrant working community including residential, office, commercial, lodging and educational uses. There is a variety of building types at Fort Hancock, including officer residences and barracks buildings. The park is currently advertising to lease six buildings.

The Quincy Mine Headquarters building at Keewenaw National Historical Park, Calumet, Michigan, currently has three occupants, including the George Wright Society. Leases keep the building occupied and used, and rents cover utilities and light maintenance. Calumet is not in an affluent rental market. Yet, by making the building available one small step at a time, the park is not only preserving this national register building, it is providing employment, and making itself a working part of the community, in addition to being a nationally significant place to visit. The park is expecting additional money to further rehabilitate the building in 2016, and will then be able to lease more of it. There are additional historic buildings in the park, and step by step success here is expected to lead to further opportunity in the future.

The Cape Cod vacation rentals in Massachusetts consist of five beach houses, most with waterfront views. Four are located in Wellfleet, Cape Cod, the fifth is in Eastham. They are rented to the public, with stays as short as one night.

El Presidio de Santa Barbara State Historic Park, in Santa Barbara, California, was established by the California legislature. It is managed through an operating agreement between the California State Parks and the Santa Barbara Trust for Historic Preservation. The agreement gives the trust the authority for development, improvement, restoration, care, maintenance and control of the Presidio. The park superintendent is responsible for administration of the agreement. Income is used to carry out the purposes of the agreement, and none of it goes to the state general funds. The Presidio is on the National Register of Historic Places.

Crystal Cove Historic Cottages, at Crystal Cove State Beach, California, is a National Register property and a California state park. There are 46 historic cottages. It is operated through a concessions agreement by a private operator. The operator rehabilitates the buildings, then manages the rental of them to the public. The cottages were in terrible condition before rehabilitation. The

cafe and rehabilitated cottages are highly popular with the public. Each year, cottages are generally booked for the year starting on the first day they are open for reservations.

Fort Monroe, Virginia, is a military base that is no longer needed for military purposes. It is, in its entirety, a national historic landmark district. Most of the developed portion of the base is administered by the Fort Monroe Authority (FMA), created by the Commonwealth of Virginia. A part of the historic star fort and the undeveloped area on the north end of the base comprise Fort Monroe National Monument.

The FMA owns 176 homes, of which 156 are leased. It has 1.15 million square feet of commercial space, 236,000 of which are leased. When the Army transfer is complete, 57 more buildings (400,000 sq ft) will be added to the FMA's inventory. The historic officer homes at Fort Monroe are beautiful places. Unlike at the Presidio of San Francisco, the Commonwealth of Virginia did not establish an initial multi-year appropriation to rehabilitate utilities and prepare enough buildings for full potential leasing income to put the FMA on a sound financial footing. Though struggling, the FMA is successfully heading toward being a financially self sufficient operation.

The Northeast Region of the NPS has an active regional business office which helps parks identify buildings that may be leased or used in other ways to preserve them and generate income to manage the park. Two such examples are the Tudor-like Vanderbilt Mansion Coach House (currently being used for park maintenance activities) which could be used as a restaurant, hotel or housing facility, and the Philander Chase Knox house at Valley Forge, which could be rented for housing some months of the year, or all or in part for events that do not conflict with existing park uses.

National parks and the NPS Northeast Regional Office are actively surveying buildings around the region that are currently underutilized. One example is the 3,000 square foot Weir Farm House, which is currently used for storage for Weir Farm House National Historic Site.

George Washington was first sworn in as president at what is now Federal Hall National Memorial, in New York City. The memorial's rotunda is now seeing extra duty as a special event space on evenings and weekends, when the site is closed to the public.

The intent of my paper, combined with papers by Amy Meyer, Cherilyn Widell, Craig Middleton, and Katherine Arrow (this volume), has been to show you a broad array of examples and to have you begin to think about how they might apply to your own situation. As Rolf said, "It is time to pay more attention." No one is advocating giving up basic ideals of conservation, preservation and visitor enjoyment. We are, though, advocating broadening our perspective in how we make the next 100 years of national parks as successful in all three ideals (conservation, preservation and visitor experience) as it has been in the last 100.

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Creating Golden Gate National Recreation Area and Continuing Involvement

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Bay Area residents have been stewards of our landscape for more than 100 years. In 1970, when I began working with Sierra Club leader Edgar Wayburn to protect the land that became the Golden Gate National Parks, we built upon the efforts of San Francisco's mayors who set aside Golden Gate Park and other city parks in the 1870s and the Kent family who donated Muir Woods in 1907. Army land at the Golden Gate preserved the scenery of the western entrance to the United States.

In 1970, President Nixon, Interior Secretary Walter Hickel, and members of Congress realized that the guns and missiles at the Golden Gate could no longer provide for national defense. In a marvelously foresighted bi-partisan effort, the federal government worked to establish "National Parks for the people, where the people are––in the urban areas." The New York-New Jersey harbor, Santa Monica Mountains, Cuyahoga Valley, and the Chattahoochee River were part of this program.

The Presidio of San Francisco is at the center of the group of national parks that includes the Golden Gate National Recreation Area (GGNRA), Muir Woods National Monument, and Fort Point National Historic Site. In 1972, the Presidio was an active Army post, but its productivity was waning. Some of its sub-posts had been declared excess to military needs. The GGNRA's enabling legislation provided that if the army closed the Presidio, the post would become part of the national park system. Closure came in 1994.

By that time the Golden Gate National Parks had almost reached their present size of 80,000 acres, from the top of Marin County in the north, along the ocean coast of San Francisco, and halfway down the San Mateo County coast to the south. A comprehensive program of partnerships and stewardship had been underway for over 15 years and the Park Service and the Golden Gate National Parks Conservancy had found many ways for residents to support their parks.

What is the Parks Conservancy? Our first superintendent, Bill Whalen, knew that the usual gift shop park cooperating association would not provide enough support for a park requiring extensive rehabilitation, and bound to have an extraordinarily large number of visitors. Bill worked with Greg Moore, still the beloved President and CEO of the Conservancy, to start the most suc-

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cessful park cooperating association in the country. During 35 years the Conservancy has raised $350 million for park projects, mainly through philanthropy that includes grants, donations, an annual gala dinner, and also stores and cafés. The Conservancy's contributions come through direct donations and staff resources to programs like the Crissy Field Center, native plant nurseries, volunteer programs, and park stewardship. They support capital projects such as Crissy Field and Rob Hill Campground on the Presidio, and the miles of their "Trails Forever" program. They give direct financial grants to the Golden Gate National Parks. Volunteers staff visitor centers, there are docents, a habitat restoration program, cleanup crews, event assistants, painters and fence builders, placers of Legos for the Ai Wei Wei exhibit on Alcatraz––and more.

The parks' many other partners include Fort Mason Center, the Bay Area Discovery Museum, and the Marine Mammal Center. Because of so many partnerships, Bay Area residents feel their national parks belong to them. Our park campaign organization, "People for a Golden Gate National Recreation Area," was a coalition of over 65 groups, ranging from the Sierra Club to the San Francisco Apartment House Owners Association. Some people get a "not in my backyard" attitude about the number of cars in their neighborhood or are unhappy that their dogs can't run free, but for almost everyone it means that, since the beginning of this park, the inclusive campaign and implementation processes have worked to create passionate stakeholders

The Presidio was saved from development by its 1972 legislation, but keeping it saved was tough. Members of Congress moved to sell it. A realtor joked that if the government sold the Presidio, it could pay the national debt. Congresswoman Nancy Pelosi mounted a massive campaign, aided by The Presidio Council, an organization shaped largely by businessmen with nationwide connections, who reached out to their compatriots in other states for support in Congress. The Presidio's 800 historic structures and a deteriorated infrastructure was too expensive as another piece of the national park system, and its costs would have taken funds from every other national park. A new kind of public-private governance was needed. The legislation for the Presidio Trust gave the Presidio 15 years of appropriations to get rehabilitation and renting underway, and gave its board 15 years to achieve self- sufficiency––which the board accomplished.

The spirit of committed stakeholders fostered by all the park partners should have carried over to the management of the Presidio Trust, but it was not a smooth trip. As a new kind of financial and administrative entity within the national park system, the Trust had to earn the trust of the community. It took time, because the structure of the Trust's partnership often appeared closer to a private sector, corporate entity than something familiar to national park supporters. The board held only two highly structured public meetings a year with limited time for public expression, and did not engage in open discussion.

Over time, the Trust realized that this closed style did not build support for policies and proposed developments. Two proposals for art museums failed after great public outcry, mostly because the Presidio is a National Historic Landmark and each of the proposed buildings would have violated the National Historic Preservation Act. Gradually the Trust approach has become more open. The public was invited to walk with Trust staff through a site chosen for a fine Andy Goldsworthy sculpture,"Woodline." The public reviewed the plans for two sculptures on the Main Post and gave the Trust board good reasons to turn them down. Now the Trust has hired an outstanding design firm to shape the New Presidio Parklands over a redesigned highway, and has asked the public to weigh in at every step.

For people to have a stake in their parks and be committed to their preservation, they have to feel park managers listen and respond to their ideas and concerns. People need opportunities to take some responsibility for a park's well-being and invest in its future. Since I retired from the Presidio Trust board in 2003, I have convened a group called People for the Parks. It brings together conservation, education, and open space groups plus park advocates with government

agencies and park professionals. It is a forum to discuss proposed park projects, policies, and programs. In the face of complex challenges and increasing demands on our national parks to meet the needs of a growing and diverse population, the group acts as a sounding board and promotes dialogue among the Trust, the National Park Service, neighbors, and park-related organizations. It does not vote on park policies. Rather, members of this group, with accurate and sufficient information, advocate for the preservation, restoration, and interpretation of the parks' resources, individually or through their organizations.

At the Golden Gate we have a long history of taking responsibility and loving our parks. As long as park management works with park users and keeps open opportunities for them to take on responsibilities, we are confident this committed attitude will pass down through succeeding generations.

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Historic Preservation Tax Act and Department of Defense Rehabilitation Study

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What program is out there that you can use right now in parks and protected areas, like Fort Monroe, Virginia, to take care of historic buildings? What program has no dollar limit, uses public–private partnerships, and each year generates $4 billion annually in private investment for approximately 1,000 projects, and is run by the National Park Service (NPS)? It is the Federal Rehabilitation Tax Credit Program. Tax credits are the most valuable economic and historic preservation tool in your tool box. Just in case you think that this is some obscure program for old buildings, I will begin with two high profile projects currently being done with leased federal buildings, one on each coast.

The 1899 Old Post Office on Pennsylvania Avenue in Washington, DC, a historic property owned by the federal government, has just been leased for 60 years by Donald Trump's organization to undergo a $200 million rehabilitation. It will become a luxury hotel in time for the 2017 presidential inaugural parade. On the West Coast, NASA is leasing three former Navy blimp hangars, located just a little south of San Francisco on Moffett Field, to Google. The buildings will undergo a rehabilitation to support public and private flight operations and are pursuing receipt of the federal rehabilitation tax credit.

Big historic buildings or small ones, the federal rehab tax credit has been behind the transformation of thousands of buildings since the 1970s. So what is this tax credit and how can you use it in your park, heritage area or protected area?

The Federal Rehabilitation Tax Credit enables investors to obtain 20% of the total cost of a certified rehabilitation (money spent inside and outside) to be used as a dollar-for-dollar credit (it is not a deduction) against the federal income taxes owed—up to 90% of one's tax liability. That means if a private investor spent one million dollars on a rehab, he would receive $200,000 as a credit against his or her federal income taxes. It can be carried back two years and forward ten. The credits can be combined with state rehabilitation tax credits.

The building must be on, or eligible for, the National Register of Historic Places. The work must be substantial and follow the secretary of the interior standards. If it is owned by the local, state or federal government, it must be leased for at least 28.5 years for housing uses, or 39 years

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for commercial and industrial uses. Most important of all, it must have an income-producing use. That includes any kind of income-producing use from commercial or housing rental, a barn, a store, a café, or even an aircraft hanger.

If you think tax credits are only for hotels and offices in urban areas, think again. In Chicago the 1893 Daniel Burnham horse stables are being converted through use of the federal rehab tax credit into a gallery space for the DuSable African American Museum in the Chicago Park District. It is called the Roundhouse Project. In the Stories of the Chesapeake Heritage Area on the Eastern Shore of Maryland on the Worsell Manor Farm in Earleville, a 1920s milking parlor was converted into a music and party venue. And a nineteenth century granary was converted into a dining and meeting venue. An Amish timber framer completed the repairs.

How many empty or underutilized buildings do you have in your park or heritage area? "But wait," you say, "I want a green building. I want to reduce carbon emissions." President Obama recently issued a new executive order. It calls for all federal agencies to cut greenhouse gas emissions by 40% by 2015 from 2008 levels. The executive order specifically calls for an agency-wide reduction of Scope 1, 2, and 3 greenhouse gas emissions by 2015, and at least 15% of an agency's existing buildings are the target of energy efficiencies.

Can rehabbing old buildings be one of the most effective ways to achieve this goal? Most definitely. I recently finished a study for the Office of the Secretary of Defense for Installations and the Environment, *Demonstrating the Environmental & Economic Cost- benefits of Reusing DoD's Pre-World War II Buildings* which compared new, green LEED construction with rehab. It shows through extensive data documentation that rehabilitating masonry buildings built before World War II produces less carbon emissions than new construction. How is that possible?

Nationwide the Department of Defense (DoD) owns 344,950 buildings and, of these, 142,409 are 50 years old or older. In other words the DoD manages 75% of all federal buildings and one-third of those are 50 years old or older. They are the largest building owner in the world.

Constructed before the era of "cheap" energy (the 1960s to the 1980s) masonry buildings built before World War II exhibit many qualities which we have coined "original design intelligence." Specifically, they were sited and built to respond and be resilient to their environmental conditions. When rehabilitated, this quality makes them greener than new leadership in energy efficiency design (LEED) construction, and makes the buildings no more costly to heat and cool. In fact the density of the materials used in these buildings such as the thermal qualities found in a nineteenth century brick wall combined with new technologies leads to energy operating efficiencies which are the same or less than new construction.

This is not some pie-in-the-sky generalized feel-good report about how wonderful it would be to save old buildings. Our team of 10 prepared detailed specifications (at the planning level) of actual federal buildings at three different installations in different climates. The specifications corresponded with all required DoD united facilities criteria requirements, including whole building design guidance, anti-terrorism force protection, the LEED silver checklist, and the secretary of the interior's standards for rehabilitation as part of the alternatives. The results are applicable way beyond the DoD.

Can we reduce carbon emissions by rehabbing an old building? According to the U.S. Environmental Protection Agency, the built environment accounts for 39% of total energy consumption, 38% of all carbon emissions and 40% of raw materials use in the United States. If we are going to dramatically lower the carbon emissions in this nation, repurposing *existing* buildings, rather than building new "green" ones, is key.

The findings of the DoD study showed us that reusing pre-World War II masonry buildings, which easily meet LEED standards, rather than constructing new green LEED certifiable buildings will save federal dollars and lower carbon emissions. The building industry would have

us believe that through new green construction and net zero buildings we can build our way to reducing carbon emissions through new green construction, that existing buildings, especially those from before World War II, are the biggest energy hogs of all. Through this study we learned that the broad assumption that these buildings use more energy every day than new Green LEED certifiable buildings and cost more to rehabilitate and operate than new construction was wrong, very wrong. And we have the data to prove it.

The way to lower carbon emissions is not to build more buildings, even green ones. That only produces more Scope 3 carbon emissions, the kind generated by extraction, production and transportation of new materials to a site which can take as long as 70 years to dissipate. That kind of carbon emissions will increase carbon emissions if we continue building new buildings rather than repurpose old ones. Building more new buildings will actually contribute to the spike in the generation of carbon emissions we are seeing right now rather than reduce it. Further, the study found that rehabbed buildings could also match the energy performance of new construction for Scope 1 and 2 emissions with lower costs than new construction. In summary, rehabilitation can reduce carbon emissions, reduce operating expenses, generate jobs, provide less costly and more durable buildings, and create innovative space for new uses.

Masonry buildings constructed before World War II exhibit original design intelligence, a term coined in our study to describe the passive design features which contribute to an ability to naturally conserve energy, such as durable materials, natural lighting and ventilation, heat wells, open floor plans, siting to take advantage of prevailing winds, basements, tall ceilings, and plaster walls. These are built-in green design characteristics which contribute to an ability to naturally conserve energy. Before there was central heating or cooling, builders took advantage of solar patterns and prevailing winds in siting buildings. We found in our study that if these features could be recovered, made operable, and combined with new energy efficiency technologies, the operation efficiency of these buildings could equal or exceed those of newly constructed buildings.

The environmental benefits of rehabilitation include the following:

- minimal use of new materials equals significantly lower greenhouse gas emissions,
- less waste stream generated,
- recovery of original intelligence features and reuse of durable materials,
- less sprawl, more heritage protected,
- less cost to existing infrastructure, communities and local governments, and
- rehabilitation of pre-war buildings can achieve comparable levels of energy consumption as new construction at LEED Silver level.

The take away lessons of all this are the following:

- use tax credits in protected areas—be creative,
- use private money for public stewardship,
- rehabilitation generates far fewer carbon emissions than new construction,
- original design intelligence reduces energy expenses, and
- tax credits are an NPS program.

For more examples and information, go to http://www.nps.gov/tps/.

So there you have it: money for rehabilitating historic buildings, big and small, through tax credits, and seeing historic buildings with new eyes as renewable resources for your agency that can reduce carbon emissions and energy operating costs while providing new and exciting space for a broad variety of uses. What are you waiting for?

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Guardian of the Golden Gate

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For those not familiar with the Presidio, let me begin with a few facts and a bit of history. The Presidio was established by Spanish colonists in 1776. Clearly recognizing the strategic importance of the harbor, later to become known as San Francisco Bay, the Spanish established a fort, or presidio, at its entrance. Nearly a century later, that entrance would be named the "Golden Gate."

The Presidio stood sentinel at the Golden Gate for over two centuries, serving under the flags of three nations. When it closed as a military post in 1994, the Presidio had been the longest continuously operated military base in the nation. Over the centuries, the Presidio presided over the development of the American West and the extension of U.S. power into the Pacific area, including the birth and development of San Francisco as a great city of the West; the influx of people through the Golden Gate, during the California Gold Rush and subsequent waves of migration; and the establishment of California as a state, and the United States as a continental, then global, power. Throughout, the Presidio operated in a command role. Throughout, the Presidio exerted outsized influence relative to its small but strategically positioned 1,491-acre geographical presence.

In its most recent century, the Presidio stood sentinel as the urban environment of the San Francisco Bay Area developed quickly, particularly following World War II. It witnessed both the challenges that this rapid urbanization created, and some of the conservation activism and achievements that resulted as a reaction to this growth. It was here that a group of committed individuals reversed the destruction of San Francisco Bay, the largest estuary on the West Coast, and created the world's largest national park in an urban area, the Golden Gate National Recreation Area (GGNRA). Amy Meyer (2016) was a key player in that fight and ultimate victory.

As GGNRA was created and included in the national park system, a provision was inserted in its authorizing legislation that would prove fateful for the Presidio several decades later. The law required the Presidio to be included in the new park, if and when it were ever deemed to be in excess of the military's needs. This was in 1972; in 1989, the Presidio landed on the first of several lists of bases to be closed. Five years later, it was transferred to the NPS for inclusion in the GGNRA.

It is here that the latest chapter in Presidio history begins. The story of the Presidio over the past 20 years is one of people joining to address myriad challenges, often in very innovative ways.

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Let me give you a glimpse of some of these challenges. The Presidio has six million square feet of buildings, nearly 500 of the 847 buildings are contributing structures to the national historic landmark district that comprises the entirety of the Presidio. In 1994, these buildings were in various states of disrepair. The infrastructure—roads, water lines, sewer, electrical and gas systems—was antiquated and suffered from a long period of deferred maintenance. As in most base closures, there were environmental remediation challenges, including ten landfills, leaking petroleum (heating oil) lines that crisscrossed the base, leaking fuel tanks, and lead and asbestos throughout.

A once-thriving natural environment, containing isolated remnants of the native habitat that had existed in this important ecological zone, was on life support, and needed immediate attention. The Presidio forest, itself the most significant contributor to the Presidio's landmark status, was in decline, with half of its approximately 70,000 trees at the end of their natural lifespans.

We figured at the time that we were facing the need for about $2 billion in investment to get the Presidio back on its feet. But the budget provided by Congress, $25 million a year (down from $70 million that the Army spent on annual operations), and no construction budget, was completely inadequate for the task. We learned quickly that "color of money" matters. Seventy million dollars in the Defense budget is a drop in the bucket. The same amount of money in the NPS budget is a heavy lift, indeed. Congress, moving as it was in 1993–1994 toward fiscal austerity, began to question openly whether it should be bound by a single phrase in a 1972 parks bill. There were calls, resulting in a series of increasingly close votes, either to defund the Presidio (while keeping it as federal land), or simply to sell it.

If ever there was a time for an innovative solution, this was the time. We needed to get creative, and fast. What were the ingredients of a structure that could be successful?

We needed access to federal money and private money. We needed organizational flexibility, and a way of making the real estate assets (six million sq ft) generate funds to support park costs, while also preserving the historic buildings. We needed to protect the Presidio, its cultural and natural resources, while inviting outside investment. We needed independence from bureaucracy, while maintaining a strong and essential relationship with the NPS. This would be an entirely new way of managing a national park.

A group of prominent citizens, the "Presidio Council," working closely with Congresswoman Nancy Pelosi, went to Washington and made three promises: to save the Presidio as part of the national park system, while also making it financially independent; to rehabilitate buildings and infrastructure, protecting the national historic landmark district and conserving cultural and natural resources; and to welcome the public to the Presidio, and ensure that it always remains a public place.

Congress bought the concept. Pelosi introduced legislation with bipartisan support. The legislation passed in 1996, the trust was established in 1997, and we were provided jurisdiction over 80% of the Presidio in 1998.

Over the next fifteen years, the trust accomplished the following:

- invested in housing (1200 units) to generate early and reliable cash flow,
- leased 23 acres to George Lucas, and oversaw his development of the Letterman Digital Arts campus,
- took over cleanup responsibility from the Army (to ensure it would be done well and timely) in return for $99 million and covered against overruns and surprises with $100 million in environmental insurance,
- developed a partnership with the Golden Gate National Parks Conservancy to raise money together that would fund key park improvements,
- grew an ever-increasing array of partnerships to insure our success in meeting our prom-

ised responsibilities,

- worked with Congress and others to obtain funding an agreement was struck that authorized annually-declining appropriations for 15 years, after which no additional annual funding would be provided, and
- worked hard to encourage the public to stick with us and to delay gratification while we focused on building revenue, reversing deterioration, upgrading infrastructure.

The trust was able to deliver on the first two promises. Financial self-sufficiency was achieved in 2013. The trust-managed portion of the Presidio no longer receives taxpayer support.

The trust is currently managing the largest and most dynamic historic preservation project in the nation. Over 400 historic buildings have been restored and are occupied and generating rent that is used directly for park operations and resource preservation. The historic forest is in the midst of a 50-year revitalization, numerous historic landscapes have been restored, plant and animal species are healthier now, and degraded water features (e.g., a sizable watershed, a freshwater lake) are being upgraded.

For every dollar of federal money received, the trust and its partners have attracted four dollars of private or philanthropic money. We are using some of the preservation financing techniques that Cherilyn Widell describes (2016) to leverage our limited resources.

The environmental cleanup was completed in May 2014. The price tag of $176 million was covered almost entirely through a combination of the original $99 million provided by the Army, earned interest, and insurance claims.

The trust and its partners have welcomed a new community to the Presidio, replacing a military community with a civilian community, comprising 3,000 residents, 4,000 employees of Presidio tenants, and an estimated 5 million visitor each year. In order to deliver fully on the third promise, to welcome the public, and contribute to their development and quality of life, the Presidio has developed a series of public-serving features that are intended to encourage people to come to the Presidio, make a military base more hospitable as a public park, and make it easier to navigate the site on foot or by bike. At the post's Main Parade, a parking lot was converted into a seven-acre public commons. The historic Officers' Club, with remnants of the oldest foundations in San Francisco, was restored and is now a public space, with a heritage gallery dedicated to the history of the Presidio, grand rooms for free public events, and classrooms that host a variety of youth-based programs. A former bachelor officers' quarters has been converted into the "Inn at the Presidio," the park's first overnight lodging facility. The trust has opened three new restaurants during the past year in a partnership with local chef, Traci des Jardins.

A network of trails and overlooks (24 miles of trails, 8 scenic overlooks) has been completed; and a newly-upgraded campground now serves 6,000 kids a year. All of this was built with funds raised by our partner organization, the Golden Gate National Parks Conservancy.

Having achieved the existential requirement of financial self-sufficiency (Congress mandated that failure to achieve that goal by 2013 would result in the sale of the Presidio), we are now building partnerships that we hope will extend the Presidio's reach beyond its borders, in keeping with the Presidio's legacy as a military base that was relatively small in size, but large in influence. At a historic fort atop coastal bluffs (Fort Scott), we have begun a partnership with the White House and others to create a center for cross-sector leadership, civic engagement, and service. We are also working with the NPS, the Golden Gate National Parks Conservancy, and other partners on a youth collaborative which aims to provide transformational programs for young people. We have committed to increasing the Presidio's outreach to veterans.

The keys to the Presidio's success in transforming a post into a park are the following:

- a willingness to try the unconventional,
- using all the tools available (tax credits, leasing authority, a generous community),
- an engaged community of Presidio supporters,
- bipartisan support in Congress,
- an agreement to take early money in return for a promise of self-sufficiency,
- an incredible place, amazing history and a one-of-a-kind location, and
- people like the others addressing this topic (Meyer 2016, Widell 2016, Arrow 2016, Reynolds 2016), creative, committed to a great public outcome, and willing to take risks.

The Presidio is a magnificent work in progress. It is truly a partnership park made possible by many people and many organizations. We are thankful for all that they do for parks and for the people who enjoy and learn from them.

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Leveraging Partnerships to Achieve Rehabilitation of Park Assets at Golden Gate National Recreation Area

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Golden Gate National Recreation Area (GGNRA) was created in part when the Army closed several facilities in the Bay Area over a period of years. GGNRA received hundreds of historic and non-historic buildings, all needing rehabilitation, seismic stabilizing, and lead remediation and asbestos abatement. Our building maintenance and historic rehabilitation challenges are similar to the challenges across the park service.

This paper will present how GGNRA met that challenge through building partnerships with nonprofit facilities-based partners and leasing. I will describe leveraging partnerships (agreement types and outcomes), as well as partnership projects (smaller park projects, GGNRA residential master lease, Fort Mason Center, and Cavallo Point Lodge at Fort Baker). I will also briefly discuss the new NPS National Leasing Team.

GGNRA's partnering mission statement is to enable NPS and GGNRA strategic goals by utilizing sound business and community engagement practices in developing and managing partnerships. We have a variety of agreement types we can use to enter into in-park partnerships, including cooperative agreements, concession agreements, leases, special use permits, and interagency agreements. GGNRA has 35 facility-based partners, including our cooperating association. Our cooperating association and largest park partner is the Golden Gate National Parks Conservancy. Other partners include the Cliff House, the YMCA, Alcatraz Cruises, Bay Area Discovery Museum, the Presidio Trust, and Fort Mason Center. GGNRA has an amazing array of park partners that brings a wide variety of services and visitor experiences to the park.

In GGNRA there are 535 buildings, totaling 1,993,970 square feet. Our partners occupy nearly 60% of our buildings. Early in the park's history, park managers sought partners to occupy the vacant buildings to keep them from being vandalized, or decaying from exposure to the elements. Relevant partnerships were started, many of whom are still with the park.

Our partnership outcomes for FY 2013 included the following:

- $140 million in leveraged support,
- 5.25 million total visitors served,

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- 120,000 K-12 youth served,
- 1,250 staff employed,
- $13.25 million in revenue to park,
- 293 buildings assigned facilities, and
- over $2 million in annual maintenance.

Our partnering infrastructure creates an effective partnering organization, based on incentives, teamwork, culture, communications, and information systems and records. It is important to note that any size park can use this partnering framework.

The 3-part system includes development, management, and revenue management. Development must include strategy and planning, negotiation, contract writing and execution, and partnership and project implementation. Management includes managing visitor and program experience (program, rates, and service quality), operations compliance (cultural, natural, safety, public health and accessibility), asset management (environmental, fire, maintenance), coordination and relationships (communication, operational integration, and issue resolution), branding and marketing (web site, media, events), and annual reviews. Revenue management includes invoicing and receivables, rent and fee analysis, financial reporting, expenditure planning, and project tracking.

Unique to the GGNRA Business Management Division is a historical architect that works full time with park partners. Our historical architect manages over $2 million of non-profit partner investment annually, and provides systematic management of park partner facility management activities, working with non-profit and commercial partners on the following:

- maintenance plans for each partner each year which aligns with annual reviews, and looks ahead through the end of their current agreement;
- National Historic Preservation Act and National Environmental Policy Act approvals, providing assistance through the compliance process;
- project implementation support;
- documentation of project completion, resolution of issues; and
- tracking and reporting through annual reviews, records management, and NPS facilities management reports.

The GGNRA realty specialist has a master's degree in historic preservation, and oversees $500,000 to $1,000,000 annually in repair, maintenance, and rehabilitation work.

Partnership example: Cooperative agreement

A good example of a mission-focused partner with limited financial resources is A Home Away From Homelessness. They have been with the park since 1994, operating out of two facilities, and the duration of the cooperative agreement is five years. No capital investment was required, and they contribute $18,000 a year in maintenance. The revenue to the park is cost recovery.

Partnership example: Special use permit

NOAA is a long term partner with GGNRA and will be funding a utilities infrastructure project expected to cost about $900,000. The term of their permit is 5 years. They operate out of 3 buildings, with an annual maintenance contribution as needed. The revenue to the park is cost recovery.

Partnership example: Concession contract

Hostelling International has a 10-year concession contract with the GGNRA, operating out of

four facilities. There was no initial capital investment required. Their annual maintenance contribution is $188,000, and revenue to the park is a concession franchise fee. They are located at upper Fort Mason and Fort Barry in the Marin Headlands. In 2014 we had over 20,000 guests at Fort Mason and over 10,000 guests at Fort Barry.

Partnership example: Lease

The Hontalas family has owned and operated Louis' restaurant since 1937. The park issued a request for proposals (RFP) in 2010. The Hontalas family was selected to remain and operate the restaurant for a 10-year term. Their initial capital investment was $575,000, and revenue to the park is market rent (base plus a percentage).

Other partner requirements included the following:

- full compliance with the Americans with Disabilities Act of 1990, including installation of an accessible unisex restroom and an accessible front entrance,
- installation of a secondary emergency exit,
- responsibility for all maintenance and repair of facility during lease, and
- environmentally responsible back-of-house operations and integration of sustainable food and beverage options into the menu.

Partnership example: Residential master lease

There are 28 historic residential buildings, encompassing 38 units at Fort Mason and Fort Barry. NPS issued an RFP in 2012 and selected Gaetani Real Estate as the master lessee for a 10-year term. No initial capital investment was required. There is an annual maintenance contribution of $450,000 and revenue to the park is market rent. Gaetani collects the rents and utilities charges. We developed a repair and maintenance plan and implement the plan through a reserve of 20% of the gross receipts is rent. The park receives 71.5 % of gross receipts, plus utilities charges.

Partnership example: Lease

The Fort Mason Center has been a park partner since 1977. Their mission is to connect and engage people with arts and culture, inspiring and fostering creativity by providing a vibrant gathering place and a home for thought-provoking programs, events, and organizations. And they respect and preserve Fort Mason Center as stewards of this National Historic Landmark. They operate under a 60-year lease for nine buildings and have recently made capital investments of $21.4 million. The annual maintenance contribution is about $1.1 million. Revenue to the park is market rent and cost recovery.

The Pier Shed 2 Rehabilitation Project has accomplished the following:

- performed a seismic retrofit,
- repaired spalling concrete and rusting structural supports,
- installed solar power,
- installed a in-floor heating system,
- replaced non-historic exterior doors, and
- completed ADA compliance.

In 2006, the NPS invested $12 million to renovated the Fort Mason pier substructure. Fort Mason Center is proposing to sublease Pier 2 for the San Francisco Art Institute's Master of Fine Arts Graduate Program. A new two-level space would be constructed within the historic Pier 2 Shed for the program. It would include 17 studios, classrooms, and workshops, "floating mezzanines," and a public art gallery. The construction budget would be $14 million.

Partnership example: Lease

The Cavallo Point Lodge at Fort Baker has a 60-year lease term and is comprised of 29 existing historic structures and 14 new facilities. The annual maintenance contribution is about $1 million. Revenue to the park is market rent and annual cost recovery of $465,000. An initial capital investment of $95 million included $11 million of historic rehabilitation tax credit investment including 30 acres of rehabilitated historic landscaping. It is the first National Park Lodge and the first on the National Register of Historic Places to Gain LEED Gold Certification for Sustainable Design.

NPS historic facility rehabilitation challenge

Based on a 2013 report from the National Trust for Historic Preservation, the NPS is responsible for maintaining over 27,000 historic and pre-historic structures located within the national park system. Of this number, there are approximately 9,600 historic buildings, of which approximately 8,250 are not operated by concessioners. This leaves the NPS with the responsibility of maintaining over 8,000 historic buildings independently, or to authorize their use and maintenance by other parties. For decades, federal appropriation levels have not tracked with the maintenance needs for these historic resources.

As a result, the NPS's maintenance backlog has grown to unprecedented size and reached near-crisis levels. Recent estimates provided by the NPS value the deferred maintenance backlog at approximately $11.5 billion. Of that deferred maintenance amount, approximately $4.5 billion is attributable to the unmet needs of historic and prehistoric structures in the NPS system that are listed on the National Register of Historic Places. This includes 2,811 historic buildings that are currently listed as being in poor condition.

Government funding alone has been insufficient to address this crisis, and the assistance of non-federal funding partners is necessary. The NPS has the legal authority to enter into historic leases, cooperative partnerships and permits with non-federal partners. The newly formed NPS Washington Office Leasing Team is responsible for the following:

- making the 'business case' for leasing with upper management,
- advocating for a national leasing expert or champion, and greater staffing capacity,
- developing a draft communication and education strategy to promote awareness,
- developing presentations about current and potential leasing projects,
- working with park managers that are "ready" and identify a list of leasing opportunities, the low hanging fruit,
- exploring a simpler leasing process by identifying self-imposed (NPS) barriers, and
- simplifying the appraisal process.

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San Francisco State University Conference Session Highlights and Reflections from Student Attendees

Introductory Note

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San Francisco State University is grateful for the opportunity to connect our students with the 2015 George Wright Society conference in Oakland, California. This upper division seminar in recreation, parks, and tourism is called "Recreational Use of National Parks and Protected Areas," a course cross-listed with the Environmental Studies Program. Because this is a university elective, there are other majors represented as well such as archeology, theatre, history, psychology, broadcast electronic communications, and geography.

Throughout the conference week, 23 students in my class had a chance to network with professionals and attend a variety of sessions. As part of their conference experience and course assignment, students signed up to be a rapporteur for one session of choice on their day of attendance. Subsequently, they were assigned to write a 500-word essay highlighting presentation content relating to the session they attended. They selected sessions from panel discussions, contributed papers, lightning sessions, café conversations, or invited speakers.

Furthermore, they wrote a brief reflection (200 words or less) to accompany the content presented during the session regarding implications. That is, the goal was for them to write about how the details presented in the session were relevant (or not) to students who are interested in professional development for their future. Reflection statements at the end of each student paper were intended to relate to the notion of inspiring a new generation of stewards. Some of the reflective comments included how their needs, as students, could have been better served through session organization or content. Another facet they wrote about in reflection is simply their greatest "take away."

Last, the conference committee hosted a career session on how to get government, public-service employment in conservation science, and opened this session to SFSU students in this class. One student, in fact, selected this very session for their written assignment as well. Any questions or comments readers have can be communicated to Dr. Nina Roberts.

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Where Am I Going, How Do I Get There? Conservation Careers

Brad Alper

I BELIEVE THE SESSION WAS AN AWESOME IDEA and I felt very lucky to be a part of it. Everyone was very excited about the concept of the session, especially the grad students who were eager to get their careers started. Being in a room full of professional conservation scientist was both inspirational and humbling. All of them brought something unique and it was cool to hear them explain their career paths.

I learned so much just by listening to their stories and passion for the conservation sciences. It was the first time that they ran a session on this topic and overall I think it went smoothly. They divided the professional into three groups as follows: NPS government employees, university employees, and employees of private businesses/organizations. Each professional was given the chance to talk about their career path and how they ended up in their field. It was really encouraging to hear about all the work opportunities available in conservation and the diversity of paths one can take. The session continued by allowing students to ask each group of professionals' questions about their field and hear about some of the pros and cons. Professionals rotated between groups of students answering individualized questions. Students and professionals continuously interrupted one another as they rotated, skirmishing to get in questions and comments! I found myself wondering if questions I had where being asked and answered in other group circles. The way it was organized only allowed me to hear the questions answered in my specific group. Additionally, I was put in the group of students who attended the university in which most of the professors taught. Therefore, the questions asked seemed to be biased toward those who wanted to become teachers.

Professors and program directors urged students to remain members of academia, forever writing research papers. They were convinced that they had the safest and most secure jobs in the country, especially those with tenure. When explaining their careers paths, the professors seemed quite proud of all the universities they were associated with. I could only wonder how one could be so interested in conserving natural resources on paper but have what appeared to be little interest in immersing themselves in that very nature.

Furthermore, it was apparent that members of private organizations had the largest salaries of the three categories of professionals. Although they were interested in helping to conserve natural resources, they seemed to profit off the concept of "going green." The idea of conservation was commercialized and turned into something that could be bought and sold. In general, the NPS

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employees seemed to be the most excited. Along with other employees of the government, they jokingly complained of the bureaucracy, yet rejoiced in the fact that they were making the biggest difference in the world of conservation. I learned it really is up to the biologists and ecologists employed by the government to balance and manage our natural resources.

Reflection

In the first part of the session it was very helpful to hear about the different paths of the professionals. However, I believe the session could have been organized in a way that better expressed the overall goal. First, the session needed to be longer. It was a really important subject that deserves more than one two-hour window. I felt I was unable to have all my questions addressed simply because there was not enough time. Continuously, I believed that the second part of the session, where questions were addressed, should be organized better. There were too many people trying to speak at once and not enough time for professionals to make their point. If, perhaps, they kept the same categories of professionals and put them in front of everyone and have each of them answer a set of general questions one by one, that might work better. Examples of questions might include: What's the difference working for the government versus working for a private organization? (or vice versa?). What are some key ways to be successful in an interview? What are some of the downsides to working for the government, university, or private organization? What kind of work does your particular job include?

29

Global to Local Perspectives on the Role and Growing Importance of Urban Protected Areas

Kyra Bohnett

I ATTENDED THE PANEL DISCUSSION ABOUT NATURE WITHIN METROPOLITAN REGIONS titled "From wilderness to city edge: the role of urban protected areas in metropolitan regions and protected area systems." Six speakers talked about the importance of nature within city planning at different scales from global to regional, and at different levels of "wilderness." The panel encompassed a global perspective on urban protected areas. Ted Trzyna discussed the bigger picture of how urban sprawl threatens natural areas by means of fire, air and water pollution, invasive species, and domestic animals in regions throughout the globe. Then Mike Watson gave a presentation regarding the political and personal relevance of "near wilderness." He touched upon how humans define and feel towards wilderness throughout history, and broke down the concept of "wilderness," as we tend to see it as a separate entity from our human environment. He pointed out that nature sparks fierce emotions within people such as fear, love, and passion. Some, however, can disconnect and see nature to be useful resources. Generally, though, humans share a collective belief that wilderness is important to our well-being.

Lynn Wilson spoke about regionally about decision-making concerning nature conservation in North America. The four main attributes she listed as important for expanding urban areas were: "presence of vision, political commitment, organizational capacity, and consensus-building." Then she spoke of the "collective impact model" consisting of a common agenda, shared measurement, mutual reinforcement, communication and backbone support. Laying out these strategies was useful in seeing how projects and plans actually operate at large levels organizationally.

Annie Burke brought previous points to a local scale by giving information on protected spaces of the Bay Area, its changing demographics and the need to connect people with each other and nature. She spoke about the diversity within the Bay Area's protected areas and how land is managed among conflicting interests. Moving on, Jeff Ward spoke on planning regionally for a system of parks and protected areas in British Columbia, similarly to Annie Burke in the Bay Area. Robert Doyle then took an environmental justice perspective centralized around the Bay Area and using land to connect less privileged people to parks in a way that is relevant. His examples included public outreach and youth engagement in the urban East Bay of California, an urban

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shoreline restoration program which hires inner city kids to plant seeds, garden, and connect to a place. He spoke about a model program connecting hospitals and protected areas taking children with illness out into nature with a medical doctor and naturalist and simply implementing natural themes within hospitals.

The panel brought up all sorts of current organizations, as well as projections for change in the future, in terms city population and how we can live more harmoniously among nature. The universal theme was to connect people, all types of people, to nature in a variety of different ways to benefit both the human community as well as the ecosystems we live amongst.

Reflection

As a San Francisco State geography student, I am always looking for connections between humans and place, and I understand the importance of that relationship to the wellbeing of the Earth and its population. What I found the most fascinating aspect was changing demographics of cities and park-goers. This seems to be a crucial subject matter as we face a new set of challenges in the human race brought on by the combination of global climate change and population growth. I believe that it is vital, beyond any barriers of ethnicity, sexuality, age, or class to be able to work with each other and with nature cooperatively, compassionately and creatively as communities grow. We will need to operate on such values in order to tackle the challenges we face as a species in such a pivotal time in our history. In my own career, I know I would like to bridge the gaps between humans and each other and nature. Hence, this panel was incredibly useful for seeing the nature of the projects currently in operation and how to implement future plans for connecting city populations with the wild natural world.

30

Gain Understanding of Shale Oil and Gas Development, Impacts, and the Tools to Help Mitigate the Effects of These Activities

Cain Buckler

This session focused on the growing industry of hydraulic fracturing and natural gas development and its implications to parklands. In recent years, increasing overseas oil prices have prompted a boom in the U.S. natural gas and shale oil production. Such production is argued to be cleaner than coal and non-detrimental to ecological resources. This session focused on the unforeseen impacts of such activities and outlined cutting edge technologies that aim to mitigate these impacts.

The process of hydraulic fracturing involves drilling a deep narrow hole through the bedrock to deep shale deposits and forcing water laden with chemicals to fracture these deposits, eventually to be chemically weathered and pumped to the surface. Fracturing is often critiqued to lead to contaminating watersheds and inducing earthquakes. However, the presentation by Pete Penoyer about the true impact of fracturing outlined that if the process is done correctly watershed contamination is very rare, if not impossible, and indicated there has been little to no evidence that fracturing induces earthquakes. He did argue, however, that the lack of foresight into the process is the main cause for watershed contamination.

Fracturing is a particularly loud and bright process that is conducted mostly in wide open landscapes and generally away from densely populated areas. This makes parks most vulnerable to the negative factors associated with fracturing and oil extraction as most are in places ideal for fracturing and extraction. Frank Turina, in his presentation, outlined these impacts and suggested some mitigation technologies. The process of fracturing is very loud from the sound of generators and water pumps creating noise pollution concerns not just for wildlife in national parks but even in far off populated urban areas. Frank Turina explained how the use of "sound blankets" and insulated coverings mitigate some of the noise pollution but at best only around 50%. Frank Turina also outlined the impacts of light pollution from fracturing sites. Because these sites generally operate 24/7, and the equipment is very dangerous, the facilities must be extremely well lit. Light pollution reduction, Frank Turina argued, compared to noise reduction, is fairly cheap and easy

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to implement, outlining the practice of decreasing the angle of light fixture and installing inexpensive hoods. Frank Turina stressed the need for strong regulations of fracturing facilities.

Andrea Stacy, in her presentation outlined the negative impacts fracturing and oil consumption has on air quality. Bad air quality can create haze in the atmosphere and decrease visibility. This is particularly important to national parks as it makes it difficult to truly enjoy wide scenic vistas, one of the main reasons people go to these parks. Andrea Stacey also outlined the negative impacts of natural gas extraction and movement, sourcing that the leakage rate for any segment of oil pipeline is 31% meaning that any benefits over coal are null. Andrea Stacy also outlined the dangers of nitrogen deposition on soil nitrogen content, creating mass die offs of vegetation. This is most observed in the Bakken regions of North Dakota.

Reflection

As a student I found this panel to be very applicable to my studies of environmental science. I was not aware of the details of Hydraulic fracturing and its true impacts on the urban and natural environment. Seeing the data and images from satellites and cameras really drove home for me the true impacts of these processes. Frank Turina showed us a satellite image of light pollution before and after a fracturing apparatus was set up. You could literally see it from space! I also was surprised to learn that the leakage rate of oil pipelines was over 31% making it just as negatively impactful as coal burning.

My main take away from this panel was the need for greater regulation of these facilities to ensure their impacts are mitigated as much as possible. My main critique of the panel was its focus solely on mitigation. I would have been really interested to learn about the policies and laws that allow these facilities to operate with little regulation and in such proximity to protected lands when their negative impacts are well known. As well as what is currently being done to tackle these issues and how to get involved.

31

How Can the National Park Service Use Healthy Outdoor Recreation to Become Relevant to More Americans?

Daniel Byrne

The challenge to meet the demand of "How can the National Park Service use healthy outdoor recreation to become relevant to more Americans?" was a café conversation. Jennifer Stein and Stephanie Tepperberg guided the structure of the meeting as well as floated between the multiple conversations during the different rounds. Each round was a chance to sit and discuss with new people and tackle a new question. These questions simulated a discussion relevant to race, culture, age, and various other backgrounds. A reoccurring theme appeared, and we found we were asking, is "how do you make the initial connection between communities and the parks to be able to share the health benefits?" At the end of the conversation, the session returned to the entire group and summarized what we had shared in small groups. Ideas included a breakdown of successful programs as well as a development of a communication model for parks both externally and internally, as well as a model broken down for how to establish connections.

Some examples, shared in the main group discussion, on how to tackle the issue were explored. Pamphlets, promoting nearby parks, in doctors' offices were the most direct connection of how to make clear the relevancy to people. The group also found that an effective way in engaging specific populations was by holding culturally relevant celebrations in the park and using the opportunities to promote healthy activities. These events could look like "The Cesar Chavez bike race to the park" or the "Celebrate Martin Luther King Jr. Day at a local pool." It's these combinations of culture and park use that proved the chance to expose populations to the parks and their health benefits. Perhaps the most popular and successful types of programs, making the desired connections, were the ones that bring the parks into new places. The Appalachian Scenic trail's program, for example, "A trail in every classroom" brings together youth and the NPS through inviting teachers to the parks as well as having park representatives go into the classroom environment. This model was also discussed in the GGNRA's Roving Ranger program that has had similar success in physically bringing an old converted bread truck (wrapped in park murals) to local universities and other areas where non-users are located and educating the local community.

Another major element addressed in facilitating relevancy included communication behaviors. The model was broken down by external and internal focuses. External communication models that brand towards family-oriented healthy behaviors are significant. This, in combination

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with cultural relevancy and expressed accessibility (e.g., transportation, physical access, varying ability access), created a model for external commutation model. The internal aspect of this model emphasized sharing information between the different parks of NPS as what has worked and what hasn't. The importance of engaging partners was highlighted as well, finding local organizations engaged in the task such as doctors, community leaders, and non-profit organizations. Another element discussed was promoting role models in the communities that are already connected with the culture and park use. By utilizing those who already have "trail blazed" in the park, diverse cultures within the communities would more likely be able to relate to the parks and be open to interpretation.

Reflection

The examples and models established in this discussion tackled a very complex and important issue. How the parks stay connected to health in the ever shaping nation is not easily answered. The discussion discovered that the NPS can make progress through inroads in underserved communities and formatting their message into a relevant, open approach. By promoting the communities themselves and making the park part of those experiences, the NPS can create connections. It's through these connections the park system can promote their own interests, including healthy park use. In answering the question the discussion highlight the importance of sharing resources and ideas within the park system. The question was unraveled by sharing experiences and ideas different communities had experienced. It's this process that lead to an enriching experience and a better understanding of current challenges facing the park system.

32

National Park Service-wide Emeritus Volunteer Program

Julia Collins

On Monday, March 30, 2015, I chose to attend the 10am-12pm session about "National Park Service-wide Emeritus Volunteer Program" which was presented by Lynne Murdock, the interpretive specialist from the National Park Service (NPS) out of Washington DC. When I arrived to the lecture, I sat down near the front and noticed that a gentleman by the name Bob Winfree from Alaska who is an ecologist in the NPS were the only ones present. I thought that more people would attend this lecture so I was disappointed, yet relieved because I knew that the discussion in the end of the lecture would go much easier. As the presentation began, I periodically took notes and paid close attention to the slides.

Volunteers. While listening to Lynne talk, I was intrigued by hearing a story of NPS volunteers who got angry when the NPS asked them to complete a background check, despite being a part of the NPS for a long period of time. They were insulted because they had been asked for a background check after years of diligent service. In response, the NPS created a new form for long-time volunteers that skipped the background check called USAccess application. Volunteers are the heart and soul of the NPS. Currently, most of the volunteers in the parks programs are aging retirees. There is a push to get younger and more youthful volunteers to bolster the volunteer programs that the NPS relies on. The reasons for this are younger volunteers will, hopefully, be able to give years of service, as well as influence others to join and help out. Another reason is that the aging retirees are starting to leave because of health reasons and unable to continue their excellent work. Monitoring where the retiree volunteers are located throughout the country is a current program, which helps the NPS target where they need to make pushes for new volunteers. In areas with a lot of retiring volunteers they can craft programs, which will draw a new generation of volunteers.

National park emphasis programs. The areas of emphasis of the national park programs that stood out to me were: State of the Parks, Cultural Resources, and Acoustical Monitoring. The State of the Parks was intriguing because it creates a picture of how healthy the parks are right now and what needs to be done to maintain, preserve, protect, and improve them for the future. Cultural Resources focuses on the resources provided by people and their cultures throughout the parks system such as Native American cultural heritage, history of important locations, as well as current cultures created by the national parks themselves. Acoustical Monitoring really struck me as interesting and important. Until hearing about it, I would never have thought about what

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role noise plays in a visit to a national park. It is fascinating that the parks system monitors as much noise as they can, from airplanes flying overhead, delivery trucks, tour busses, as well as wildlife. All these noises can impact the environment of a national park and, in one case highlighted, can help the NPS rediscover a thought to be extinct species. In this case, monitoring equipment used was able to identify the species of woodpecker and was surprised that it came from one thought to have been extinct.

Reflection

As an avid visitor to the national parks, I learned more about how much the volunteers actually provide for the parks, how the whole NPS is responsible for so many different departments that make the national parks what they are. I also learned how what I, as a visitor or future volunteer, can do in order to maintain, preserve, protect, and improve parks for the future. This was the first professional conference I ever had the opportunity to attend, and even though I only had time to sit in on a single session, it was an experience that impacted the way I look at the national parks.

33

Ecologically Sustainable Recreation in US MPAs: Are We Ready to Ride the Wave?

Alexis Comes

I attended the session "Ecologically Sustainable Recreation in US MPAs: Are We Ready to Ride the Wave?" and met Charles Wahle, Cliff McCreedy, and Gary Davis who presented the topics in a café conversation format. We were greatly involved in the ideas being presented. The conversation centered on recreation in Marine Protected Areas (MPAs), and what we can do to prevent the deterioration of these areas while still allowing for recreational activities.

MPAs are struggling with how to approach the matter and identify what would be the most effective way to maintain the balance between recreation and the preservation of these areas. They indicated that right now there is little information on the users of these areas, which makes where to approach the problem more difficult. The users of MPAs can access these areas from a multitude of entrances along the coastline, either on land or from the water. This makes addressing entrance regulations more difficult because of the open availability to enter MPAs. This also makes the recreational activities that are being participated in, as well as the number of participants harder to track, which directly affects the ways MPAs can be managed and any policies or laws that want to be passed.

With this background, the boardroom was split into two different tables where the participants would discuss the ways to better control and protect MPAs. The two groups came up with similar ideas as ways to better protect MPAs but still allow for recreational activities. One idea was to create more government job openings for those already involved in marine areas to bridge the gap between an internship, or volunteer work, to a full-time employee. This idea would allow for more educators on the topic and in the MPAs. Another part of that idea was to partner with universities to get young adults emotionally connected to marine environments leading to greater stewardship. These ideas were intended to create, or build on the creation, of an emotional connection that leads to the public also caring for MPAs because they have been educated and connected.

Another leading idea was to create zones that would be regulated. For example, recreational use would not be allowed in certain areas, but there would be specified areas in which recreational use would be allowed. This would cut down on the use of part of the zone, while still allowing use

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within the MPA. The zoning idea followed suit with adding other restrictions such as permits or allowing a definite number of vehicles in the MPAs per day.

The discussion "Ecologically Sustainable Recreation in US MPAs: Are We Ready to Ride the Wave?" introduced the problem of recreational activities in MPAs. Through the discussion, the leaders were able to hear a variety of answers that were discussed thoroughly and which will hopefully be used to address recreation in marine areas.

Reflection

I was very interested in the topic of sustainable recreation in MPAs because of my academic study focusing on recreation. Marine recreation is especially important to an immense amount of people around the world. Many people do not have a deeper understanding of marine areas, and those that do have a strong connection with the marine environment. I feel that it is important to build the relationships of the participants with the areas they are using. This can create a bond, leading to the stewardship coming from the users themselves rather than exclusively people with authority or educators. Though many agreed, a large majority felt that the most important thing to focus on was creating zones or policies that enforced the protection of marine areas. I believe that these would assist in the maintenance of marine areas, but a large proponent for MPAs would be the users themselves and getting them to care enough. Overall, the discussion was very informational and interactive with every participant, and was able to share a problem, create a discussion, and leave the attendees closer to the topic of MPAs and sustainable recreation.

34

Cultural Resources and Climate Change Above and Beyond: The Accumulation of Great Minds All Around the World

Alex Eidam

Throughout the George Wright Society Conference in Oakland, California, there were multiple moments where I felt way out of my league. The level of intelligence some of the presenters demonstrated regarding the topic was at an extent that I had not anticipated. I attended the panel titled "Beyond Sydney: Achieving Our Goals for the Next Decade of Marine Conservation" with six different speakers: Lauren Wenzel, Stephen Woodley, Karen Keenleyside, Mike Wong, Tim Badman and Melia Lane-Kamahele (who only handed out a paper version of her power point presentation because she lost her voice). This topic mainly covered various conversations regarding marine protected areas across a vast span of regions all over the world. The primary aspect of information that caught my attention was that marine protected areas include specific areas on land as well, such as marshes, swamps, and even some lakes. This means that the strategies implemented to each individual marine protected area are going to greatly vary.

The mere definition of marine protected areas has the potential to be so huge with a broad span of factors, which brings additional challenges when trying to conserve these areas. These challenges include the public/private access, preserved areas, passing laws/policy, identifying harmful effects and controlling them, and identifying other factors that play a role in the various ecosystems of marine protected areas. Since these areas have such a degree of sensitivity and vulnerability, researchers and organization leaders do the best they can to keep in mind all the challenges to conserve the areas.

The panelists gave great insight into the problems they are encountering in their own research. They all discussed various strategies they have been implementing in their local organization and what seems to be working and not working. I was able to see behind the scenes of the work and thought involved to make an organization operate as effectively as possible. All the speakers shared their experiences with the specific things they are working on currently and how it is helping these marine protected areas. These speakers were from Canada, Australia, and the U.S. East Coast and all presented on completely different climates which seemed to make it slightly more difficult. Depending on the location, climate, and outside harmful effects also makes conservation efforts vary from one marine protected site to another. This was another major issue they were facing. However, it was also beneficial to have other professionals there and present to

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help gain a different perspective on the specific issues they are facing with their own research and implementation. At the end of each presentation, there was time allotted for open questions. Many people provided new ideas and thoughts that could be of great service for the marine protected areas.

Reflection

The dynamics of this panel between the presenters and the response of the audience directly helped my professional career. It all gave me a great sense of what is happening systematically with some of these large scale and international organizations. Beyond the difficulty of trying to keep in mind what is in the best interest of the species and organisms living within these marine protected areas, organizations have to take into consideration the opinion and vote of the public. Decisions made within an organization are not simply based on one person's scientific results or opinion. However, it is a networked system that incorporates and benefits from a larger scale of input. Being exposed to various opinions based on people's great experience helped me to formulate my own opinion. There is much more that goes on with marine protected areas then I could have ever imagined! Everything matters and is important, from the smallest levels of all plants and animals being affected, to the larger scale of what factors are causing these effects and it was awesome to be exposed to that dialogue.

35

Restoration of Protected Areas Will be Necessary for a Long, Long Time to Come

Cassandra Florez

The opening speaker to kick off "Restoration: The 'Long Game' of Protected Area Conservation" was Steve Buckley. He began with explaining the essential process of seed collecting. The designated months for the process are from August to December and among the few reasons why it's so imperative are: the pollinator crisis, aiding plants for climate adaptation, assisting migration for plant species, restoration projects, etc. He also mentioned the nectar landscape which includes pollinators like bats, hummingbirds, bees and other insects. I would have enjoyed for him to expand on this a bit more and make a stronger connection to seed collection because I was left assuming that it was linked to the pollinator crisis?

Laura Jones spoke about the Merced River running through Yosemite. Her presentation was rather easy to follow due to the fact that she focused on the pros and cons of development around the river and in Yosemite. She illustrated the skills that are required to balance the community's suggestions along with what is best for the designated protected area. A practical example of this was the expansion of parking lots in Yosemite. Being such a popular park, Yosemite visitors are requesting more parking sites, yet this brings up the problem of expanding on the park's valued land. She also commented on bridges that reside in the park; bridges are recognized as a cultural resource as they aid in the exploration of the parks. Yet there is the question of whether it's more important to protect a cultural resource or the free flow of the river.

Next up was John Burghardt. He gave a detailed presentation on Abandoned Mineral Lands (AML) by including outstanding statistics such as the fact that there are over 37,000 AML features throughout the national parks. In addition, a whopping 85% of them require no action to be taken in order for the area to be deemed safe. AML sites are hazardous to the public since they pose threats such as drowning, vertical drop-offs and bad air quality. Concentrations of carbon monoxide are extremely deadly by the time a person starts feeling nauseous, they're usually too weak to react.

The last speaker of the day was Evan Wolfe. His presentation was the most elaborate as far as encompassing the various angles of his issue. His main discourse demonstrated soil water plant feedback specifically in wetlands. The star example throughout the session was the identification of a gully in the Halstead Meadow residing in Sequoia National Park; a gully is created by the

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channeling of extreme water flow up or down a meadow. The reason why they're detrimental to the wetland is because they cause sediment to erode removing nutrients for native vegetation such as bull rush, certain grasses and herbaceous dicots. The ultimate goal for restoration was to fill the gully with enough water for it to naturally disperse itself throughout the meadow, creating healthy soil organic matter which acts as a sponge in a normal meadow.

Reflection

While being educated on these topics, I realized that the identification of a problem and solution process is essential to executing goals. I appreciate the attention to detail and admire the many building blocks that are generated in order to attain conservation and preservation in the parks. Any student can take these tasks and lessons to critically think of avenues for concerns or answers in their own major. Additionally, what students can take away from this is the effectiveness of teamwork. Every individual has unique insights and ideas to bring to the table that help create an ultimate goal. Each one of these projects was devised and executed by large and small teams, not just by one person.

36

The Scientific and Land Management Community has Made Huge Advances in Identifying and Mitigating Impacts to Protected Areas

Cory Goldstein

The George Wright Society brought numerous influential speakers to the ears of the public via numerous concurrent session panels. One such panel was the Renewable Energy Development Case Studies and Applications for Enhanced Resource Protection. Within this panel five speakers took the stage to demonstrate some of the most recent technologies, challenges, and practices currently happening with Renewable energy Development in California.

The first presenter was Valerie Grussing who brought attention to issues that may arise during renewable energy development in or near tribal landscapes. She discussed multiple proactive strategies that either are being used or should be used to mitigate potential conflict with tribes. She outlined Tribal pre-consultation and engagement approaches using the Tribal Cultural Landscape, which focuses on a seven7-step plan to limit conflicts with Tribal leaders. The first is to identify clear management objectives, second is to engage tribes, third is identify places, landscapes, and values, fourth is plan for management of cultural values, fifth is integrate into existing a management framework, sixth is using feedback dialogue, and finally monitor and review the impacts and reactions.

The second presenter was Mark Meyer who discussed the use of "Visual Impact Evaluation for Protecting View Sheds from Offshore Renewable Energy Development." One of the key strategies Mark discussed in his presentation is the use of visual simulations as a tool to represent the impacts renewable energy would have on view sheds. He would record sunsets in potential offshore renewable energy construction areas, and create models to represent the visual impacts to these areas.

The third speaker was Susan McPartland who wanted to spread a practice of "Assessing Visitor Thoughts on Impacts Caused from Wind Energy Development Surrounding Southwestern U.S. National Parks." Within the United States, renewable energy construction is being expanded yearly, the issue these large renewable energy projects are being constructed near national parks. Many park managers feel this seriously impacts the natural beauty of these national parks. Susan believes park goers have a sense of place identity with these areas and creating renewable energy

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may impede on that identity. She encouraged members of the audience to talk to visitors about these developments to try and spread the word on the impacts of renewable energy within national parks.

The fourth speaker was Andrea Compton perfectly followed up Susan's point by discussing "A Case Study on Mitigating Solar Development near Joshua Tree National Park." Andrea discussed the pros and cons of renewable energy production near Joshua Tree. Even if these projects create renewable energy, the loss to landscape can't be mitigated. She urges others to push to move these projects further from national parks.

The final speaker was R. Sky McClain who encouraged the audience to be proactive in discussing energy development within parks with park goers. She discussed multiple tools to help set the stage for visitors to feel comfortable discussing thoughts. Some tools she discussed were using ice breakers, sharing personal perspectives, withholding judgements, and to think of questions connected parks to everyday life.

Reflection

Students within the environmental movement are taught about how revolutionary renewable energy is and as a society we should push to implement renewable energy all across the globe. The negative impacts of renewable energy are not as highlighted as one may think in traditional education, the panel leaders each brought up separate issues regarding renewable energy development in the United States. The development of renewable energy is not black and white; a plethora of problems can arise from its development. Issues largely addressed in this panel focused on renewable energy development and its effect on natural view sheds. Students within environmental studies need to look at both sides of an issue and this panel did exactly that for us. Within the environmental movement one of the most powerful tools we have is communication. One of the speakers spent her whole panel discussion bringing up ways to improve educational information given to park goers, which felt like a powerful tool in spreading awareness of key issues within the parks. In order to spread the word on environmental issues discussion is needed, we are the voice of the planet, if we want to make a change then let's, one word at a time!!

37

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

Angelica Greenlaw

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.

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As Large Majorities of the World's People Migrate to Cities, the Park Professions Need to Significantly Ramp Up the Focus on Urban Parks

Kianna Kagawa

In attending the George Wright Society Conference on Tuesday, March 31, 2015, I was able to attend a session called The Growing Importance of Urban Parks. I had the honor of listening to this contributed papers session, as presented by Melissa Guerrero, Joseph Edmiston and Amy Lethbridge, Elizabeth Perry, Lincoln Larson, and Xiao Xiao. Each presenter highlighted their own section of emphasis within significant urban park projects and studies to be summarized in the next section.

Melissa Guerrero, and Joseph Edmiston and Amy Lethbridge's presentations about Grey to Green and "Natural Parks" demonstrated innovative and successful urban park strategies. The Grey to Green projects revolved around Mountains Recreation and Conservation Authority (MRCA) preservation and management efforts, based on watershed and flood control efforts around Los Angeles River and metropolitan areas. Accomplished projects such as Vista Hermosa Natural Park, Marsh Park, Compton Creek Natural Park, and Pacoima Wash Natural Park have all been parks created in the name of water conservation by the MRCA and other partners. As well as enhancing the quality of water for the Los Angeles river, these parks also serve as valuable spaces for outdoor recreation to communities around the city. Joseph Edmiston and Amy Lethbridge talked about similar efforts in Los Angeles; however, their focus dialed in on providing urban parks as social justice. As claimed by Lethbridge, park programs at Vista Hermosa Natural Park are a hit with the community, especially since the community was well involved in the park planning processes.

Lincoln, Xiao Xiao, and Elizabeth Perry brought in more quantitative data to share about urban parks. Lincoln discussed a study conducted to explore urban parks and human well-being. His studies revealed that park expenditures had no relation to the perception of quality experiences at urban parks and that single people generally responded with lower marks of happiness. Xiao Xiao conducted a study for the National Park Service showing park perceptions from White, Black, and Hispanic population perspectives. Elizabeth Perry introduced us to the concept of "partnerships" including the value of in-depth research showing the relationship of people and

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sense of place in communities. According to Perry, the three most important pillars of designing an urban park are to have interviews, show resilience, and include multiple voices. By doing this, communities can feel their needs, and environmental needs, will be taken care of.

Reflection

Students interested and involved in urban parks must be aware of the needs of local communities as well as ecology, in order to continue the legacy of socio-environmentalism as the presenters demonstrated. I found that the "Grey to Green and Nature Parks" were great examples of meaningful, beneficial projects to be built upon further by students and upcoming professionals. Parks created under Grey to Green set precedence for taking underutilized spaces, and turning them into community hot spots while also functioning as an ecological system supporting the Los Angeles River watershed. Setting Nature Parks around urban neighborhoods is another great way to engage communities with high levels of barriers to reaching national parks. These two examples, plus the research synthesized by the rest of the speakers, are just the beginning of introducing parks into everyday urban American lives. With further research and effort put forth into similar projects, students and current professionals alike can invest in urban park projects, so as to make green open space available around the globe.

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Managing a Park without Knowing What Your Visitors Know is Like Driving Blind: Visitor Impact Sessions

Marina Krauss

The workshop I attended was a Cultural Resources Toolkit for Marine Protected Area Managers. This was led by Valerie Grussing who is a cultural resources coordinator for the National Marine Protected Areas Center of the National Oceanic and Atmospheric Administration (NOAA). NOAA is a government agency focused on the wellbeing of the oceans and atmosphere. Their mission is to create ecosystems, communities, and economies that will sustain their prosperity and possible change in the future. NOAA's National Marine Protected Areas Center's mission is to use science and technology, in the planning, management, and evaluation of the nation's system of marine protected areas. Marine protected areas (MPAs) were created to conserve marine habitats and resources. Examples of MPA's include national marine sanctuaries, national parks, wildlife refuges, state parks, conservation areas, as well as fishery management closures. Conservation focuses are natural heritage, cultural heritage, and sustainable production.

This workshop explored one aspect of MPA's focus; techniques using cultural and national heritage of indigenous people to sustain the ecosystems. We took a look at places that would be included in this idea of cultural importance. Shipwrecks, indigenous sanctuaries, historic tribal destinations, and cultural landscapes were some areas of importance. The issue was how to work with indigenous people to create an environment that would still manage the habitat, instead of relying on restrictions and regulations of an area. Some restrictions include no impact, no access, no take, or zoned areas. At the moment, when a location is chosen to be a protected area management puts restrictions on fishing, hunting, hiking. These are western ideals that create abundance of wildlife. Her topic was to work with indigenous from the beginning, to create these rules. Traditional cultural resource management allows management to still create this abundance of flora and fauna, while sustaining cultural views and identity. While working with indigenous people, they can come up with innovative ideas to protect the area. Using traditional knowledge of area was key including taboos on fishing, blessings, and oral stories that command when to fish and when not to fish. These are some of the ways to manage the protected areas through a cultural construct.

Valerie continued to talk about how locations are chosen to be considered as cultural marine protected areas, as well as a new management tool kit that helps define and sustain this. This toolkit is still being formed. National Marine Protected Areas Center has developed a way to classify

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these places using five characteristics. This includes conservation focus, level of protection, permanence of protection, constancy of protection, scale of protection. There are nine topics on this cultural resource guide and all are variations of ways to incorporate cultural heritage into MPAs.

Reflection

This was a very interesting experience for me. The conference gave me a chance to see a variety of protected areas and parks that are being reached out to. I went to a night workshop so because of this there were only four of us in the room. It was a very intimate setting so we all sat at one table. The presentation was short and sweet, and it gave us lots of time to have a more detailed conversation about the topic at hand. Another professional attending this session was Cliff McCreedy. He is a marine resource management specialist of the National Park Service. He had a lot of knowledge on the content of this workshop. It was definitely hard to keep up with them! They all knew the same professionals and current events that were happening on this topic. I had no previous knowledge on the subject and was not sure what MPAs do or even what NOAA is. This gave me the opportunity to do some research. I took what was discussed during the workshop and later went online and researched all the organizations that were mentioned. I learned about a whole other area of conservation and project implementation. At the end of our discussion they offered me a lot of information on internships that have to do with MPAs and other organizations that deal with the same issues. I am very interested in cultural resources after attending this workshop.

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NPS Cultural Resource Challenge: Preserving America's Shared Heritage in the Twenty-first Century

Terryn Liljedahl

On March 31, 2015, the Associate Director, Cultural Resources, Partnerships and Science of the National Park Service, Stephanie Toothman, spoke during "The Cultural Resource Challenge: Preserving America's Shared Heritage in the Twenty-first Century" session. The main question she left fellow heritage and cultural lovers was, "how do we continue to be advocates?" The last decade has left cultural resource professionals and employees responding to budget cuts, leaving the community with a loss of expertise, 70% of parks lacking comprehensive documentation of their resources for over 27,000 historic/prehistoric structures, and over 120 million museum objects and archival documents. In 2010, the budget was in decline and between 2010 and 2011 Congress decided to cut trading stock and the $10 million in the American Treasures Program became a big fat zero. With 2012 going into flat budgets and sequestration, cultural resources took a step behind leaving staff discouraged.

The big ask is five goals to achieve a standard of excellence for stewardship of the resources that form the history and culture of this nation, committing across the board a vision for the bright future. The National Park Service team of cultural resource experts developed 40 actions to complete the five goals with any kind of budget, supporting the spirit and direction of the nation. Collaboration with partners is critical in creating a vision that encompasses the responsibilities and essence of both the Organic Act and the National Historic Preservation Act.

Goal one provides leadership, support, and advocacy for the stewardship protection, interpretation, and management of heritage with proper research and science. Duties like proper documentation, backlog cataloging collections, preservation monitoring, and construction. Goal two recommits the spirit of the Organic Act, Antiquities Act, and the National Historic Preservation Act with actually funding the Historic Preservation Fund, upgrading NPS/State/Tribal/Local heritage entities, expanding official reports, supporting research, upgrading websites, and supporting urban revitalization. Goal three aims to connect Americans to their heritage, something that resonates with everyone's life, telling the stories of national diversity. We can do this by engaging youth, supporting National Heritage Area legislation, sharing NPS research, and assessing programs for people to learn about their heritage. Goal four integrates values of stewardship into major initiatives and issues, cultivating science and technical preservation. By promoting scholar-

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ship, conducting research for critical issues today, and updating standards and guidelines, cultural resources can achieve excellence in science and preservation. The last goal attracts, supports, and retains a highly skilled and diverse workforce, creating experts within the NPS. Strategies include filling Cultural Resource Management vacancies, developing career academies, creating succession plans to attract and retain workforce, and support CRM networks.

The five goals now heads straight on towards twenty-first century challenges. They are created as an opportunity to prioritize and maintain National Park Service stewardship responsibilities for historic resources. Building upon existing programs, and adding critical new capabilities, will allow the National Park Service to meet the needs for preserving the historical and cultural foundations of the nation: an irreplaceable heritage.

Reflection

The challenges presented were eye opening to me. Today, we face issues like climate change and environmental existence, but what many people do not realize is our cultural heritage is at risk of existence as well. Of course, our national natural resources are completely worthwhile and need to be preserved, but as we learn more how much funding has been cut from these cultural resource programs, it is unsettling. Just like our natural world, the cultural world can disappear without proper care, appreciation, funding, and expertise. The five goals that were presented by Stephanie Toothman exemplified the importance of the American Heritage for the next century. It is my generation, the ones that are graduating in majors like history, public administration, social science, biology, communications, political science, and recreation that are contributing to the preservation of our own history. It is everyone's job to keep the diverse stories and millions of historical objects well kept. Cultural resources can provide employment to people interested in the history relevant to all our families and future livelihoods as we move into a new career. We all have a shared heritage and it is up to the future graduates to realize the importance of their culture's existence.

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We Have a Story to Tell: Interpreting the Piscataway Culture

Lindsey Marsh

The Accokeek Foundation is an educational nonprofit located in Piscataway Park, Maryland, that oversees the nation's first land trust. This land is cherished by the Native Americans whom have called this land home for over 400 generations. The Accokeek Foundation understands the importance of this land to the native people. They are working with the Piscataway people on interpretive programs and exhibits that can honor and showcase this past with the respect and dignity they deserve. At the George Wright Society Conference, the president and CEO of the Foundation, Lisa Hayes, conducted the session, "We Have a Story to Tell," which focused on the importance of finding the best ways to interpret the native heritage and culture accurately to the public. The session began with a short play. In 2008, the Accokeek Foundation invited scholars and representatives from the three Piscataway tribes to discuss ways in which they could connect the public to their culture. The play was a representation of some of the discussions that took place at this scholarly colloquium. Lisa Hayes performed alongside two students and the professor from the drama program at Laney College. This colloquium made the Foundation recognize that there is a need for a greater understanding of the Piscataway culture in Maryland. Since this colloquium occurred, the Foundation has been working towards educating park visitors about the cultural significance of this land.

After the play, Ms. Hayes opened up the floor for discussion and invited anyone to share their experiences or provide input on how the park can interpret the native history and culture. There were several Native Americans in attendance who gladly shared their past experiences in visiting other parks' cultural exhibits. All of the Native Americans in attendance that afternoon agreed that the most important thing a park can do is to stay away from all of the stereotypes associated with Native American culture. The native people have been stripped of their identity for so many years; the best way to interpret their culture is to invite the natives to share their own stories at the park. It will make a significant impact by just having the natives tell their stories in their own language, or aid in translating interpretive signs into English.

The parks can also improve cultural programs by engaging the Tribal youth and providing more opportunities for them to become involved. While it's important to understand and appreciate the land's history and culture, what can the public learn from the Piscataway people? The native people appreciate and respect the land. They understood that the land takes care of them; therefore, they should always take care of the land. Their conservation efforts helped to leave the

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land full of resources that could be used for many generations of their people. The Accokeek Foundation wanted to continue teaching the conservation lifestyle displayed by the Piscataway people. They developed an ecosystem farm in the park over 20 years ago where they promote and educate the public on sustainable agriculture. The Accokeek Foundation understands the importance of the land to the native people and is working to provide interpretive programs that will demonstrate that.

Reflection

It was an interesting experience being a part of that discussion. Native American culture has been grossly misinterpreted for so many years. The experiences shared at the session helped me understand the frustration felt by the Native Americans, especially when they visit parks that were once sacred to their people that may not even acknowledge their existence. The first step in presenting their story accurately is to remove all of the stereotypes from the parks. Then, the parks should hire Native Americans to help develop and facilitate interpretive programs. While it can be useful for one to research information in books, etc., the best knowledge one can acquire will come directly from the source, especially when one is interested in learning about a person's culture. Therefore, if there is an opportunity to speak with someone directly about their culture, it should not be overlooked. It is encouraging to see that The Accokeek Foundation has recognized this and wants to improve their interpretive programs to better reflect the culture of the Native people.

42

Exploring a Range of Human Impacts on Marine and Freshwater Species, and Offering Management Solutions

Andrew Mcdevitt

The day was bright and sunny, and I got to the Marriott Hotel without mishap and on time. In fact, I had enough time to drink a soda and wander through the lobby. A multitude of displays were on hand, ranging from your standard national and state park advertising to the effects of unleaded bullets on blocks of gelatin and the environment. It was fairly crowded and noisy and I eventually made my way to my conference room, number 208. This session was made up of six speakers, and the topic was aquatic animals and their significance to ecological concerns. Some were pleas for preservation of endangered species, while others were literally asking us to consume more of the invasive ones.

The first speaker's chief concern was light pollution and its effects on endangered sea turtles. In the locations of Pensacola Beach, Santa Rosa, Fort Pickens, and Perdido Key in the Gulf Islands National Seashore, Florida Keys, sea turtles have been laying their eggs for thousands of years. Development on these islands, however, has resulted in many bright lights that stay on all night. Turtles hatching at night are confused by the lights and head inland instead of towards the sea. After doing some research, the participants of Turtle T.H.I.S. (an organization of volunteer youths and scientists) discovered that turtle hatchlings are sensitive to the blue spectrum of visible light, the same spectrum that is strongest in moonlight. They have tried being physically present when the eggs hatch and "steering" the hatchlings towards the ocean, but this is an unreliable method at best. They have been successful in getting a few property owners to shut off or dim their lights at night, but this isn't enough to solve the problem. All lights must either switch to yellow spectrum bulbs or be dimmed significantly, if not shut off completely or the problem will go on; and unfortunately the sea turtle's status as endangered is likely to continue.

In addition, the first speaker (I missed her introduction and she forgot to write her name on the board) pointed out that light pollution is a major problem worldwide, causing confusion in many animal species all over the globe. Slides were presented showing the rapid progression of light pollution starting from the 1950's till today, and it is staggering. In the USA and other industrialized nations, it is actually difficult to find places that are naturally dark at night. On a recent camping trip, I met adults who had never seen the natural night sky with their own eyes. If it wasn't for summer camp in my teens, I would have to include myself with them.

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The second speaker, Sarah Codde, spoke on climate temperature and its effects on elephant seals at Point Reyes National Seashore and Drake's Bay. Rising temperatures are making it more difficult for seal mothers and pups to survive the weaning period, which is spent almost entirely on land. Mothers and pups have opposing thermo-regulatory needs, and the weaning period is extremely stressful on the mother seal's body. During the 28 days she spends on land, she loses 40% of her body mass. Meanwhile, the pups must gain roughly 55% during the same period of time, or their chances of survival in the water are markedly decreased. Research is ongoing, and Sarah is experimenting with new infrared cameras and devices to get the data she needs. In the past data was gathered using thermometers, and I can't imagine the seals were too happy about that!

The third speaker, an NPS fishery biologist, David Anderson, is tracking summer steelhead (threatened status) in Redwood Creek, located in the northern area of California. The yearly survey started in 1981, and is the longest running survey in Redwood National Park. The survey is conducted by putting on snorkels and wetsuits and wading through the river for a week every summer, measuring the populations of several species of fish, as well as river otters, beavers, lampreys and freshwater mussels. Overall, the temperature of the river is falling, which is good; however, the temperature is still higher than average, which is bad. In addition, it has been discovered that as much as 24% of the river is being diverted to marijuana farms. As a result of all this, the summer steelhead is being classified at high risk for extinction.

The fourth speaker, who spoke too rapidly for me to get his name down, talked about the implications of the invasive lionfish. The lionfish is an extremely tough, voracious, venomous, and adaptive species, and has been discovered as far north as Maine and as far south as South America. The main problem areas are in the Caribbean Sea and Biscayne National Park in Florida. He recommended active removal of the lionfish every six weeks, introducing natural predators, designing better fish traps, and consuming more of them at restaurants in the hopes of turning them into a "cash crop."

Next up was Scott Gende, who is keeping watch over the salmon run in the Lincoln River at Sitka National Park, Alaska. In paraphrasing conservation philosophy "more is better," and Scott asked the question, "How many salmon is too many?" There are other overabundant species present in North America, such as white tailed deer, Canada Geese, and some invasive. To further complicate matters, there is the Sheldon Jackson salmon hatchery located at the mouth of the Lincoln River, raising concerns about how many salmon are "natural" and how many are "grown," and is the local species being bred out of existence? Scott's answer is that is a moot question at this point; the salmon population has been hybridizing with hatchery salmon since the 1970s and the average of hatchery salmon in the local population is about 18%. What Scott did bring up as a point of interest was the existence of the hatchery itself. The Sheldon Jackson Hatchery was part of the larger Sheldon Jackson College until the school closed in the 1990s due to insolvency; however, the hatchery remained and is used today to train salmon hatchery managers. It has no commercial motive other than that; its salmon exist simply for the purpose of education. While still keeping track of salmon populations and oxygen levels in the river (which depleted below legal standards in 2013), Scott is searching for a recommended policy.

By the time the last speaker came up front, the entire rook was restless. I failed even to take notes. It was something about fish in the desert. Kids were involved, somehow. After it was over, everyone hurried out and, I imagined, raced to the nearest coffee barista.

Reflection

I knew the presentations would interest me, as I have always been attracted to the sciences. I

was startled by some of the information given; some of it was depressing (I have a soft spot for turtles), and some of it was alarming (the lionfish is a "badass fish," to quote the speaker), and I was impressed at how most of the speakers were able to combine science ideas and terms with some humor in a way that made it not only easy to comprehend but also easier to remember. As I go through my notes I am reliving the conference in my mind, and it is easy to pull out specific information. The displays were impressive, and the sheer amount of free literature was amazing. There were maps and posters that could easily go for $80 or more in specialty stores free for the taking. It's too bad that the fee for attending the conference is so high (relatively speaking, as a starving student). I may have to pester you for another free pass next year!

43

Urban Matters: A Collaborative Path to Relevancy

Alexander McLaughlin

At the George Wright Society Conference I found out that the Urban Agenda is its own group of people who work on the National Park Service (NPS) outreach to urban centers. Whether that is creating parks inside cities, or figuring out how to get less privileged families out to the parks, there's a lot going on. After all, the first parks were sandboxes inside cities! In this session we talked at great length discussing possible ways to involve different groups in the national parks. This meant we talked about cultural relevance and connection to parks. The Urban Agenda speakers gave us a good illustration of what they were really dealing with at the time of the conference. For example, they are working with the mayor of Detroit to create a model city for America's future. Among all the other cities, Detroit was presented as the hardest task since it is becoming an abandoned sprawl of homes. The Mayor, Mike Duggan, and the Urban Agenda are looking to open opportunities for the remaining homeowners in Detroit by bulldozing the abandoned property. This property is then sold to neighbors in the area. The idea is to create open greenspace so the homeowners can grown gardens there. This idea follows the Homestead Act of 1862. Instead of an acre going for $1.25 it would go for $100. The model cities for America's future are supposed to be the cleanest cities around. These cities will promote alternative fuels to cut down on greenhouse gasses and curb dependence on petroleum. Through teaching the public healthier ways to live eco-friendly, they compliment the NPS Climate Friendly Parks program.

We also discussed how we need to be relevant to all Americans. The Urban Agenda illuminated the need for the NPS to reach out to different members of the American community. They did this by talking about the idea of "One NPS." One NPS was broken down into three different ideas: Parks and programs together, connection to meet needs of communities, and nurturing a culture of collaboration. The idea of parks and programs is to combine the histories of groups involved in the park with educational programs. Much like the interpretive Buffalo Soldier walk through Yosemite Valley. Connection of parks to communities was the second idea of One NPS. This means that the parks need to become more accessible to low income families. President Barack Obama took steps towards this goal by launching the Every Kid in a Park initiative. This initiative allows every American fourth grader to bring their family to a national park for free. The third idea was to nurture a culture of collaboration. This idea is all about connecting different groups to each other. At the George Wright Society, they had several sessions geared towards the reaching the youth. I happened to catch a bit of one of these sessions and they discussed everything from the

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classroom environment to actually planting the seed in kid's minds that the National Park Service is a career option.

Reflection

My attendance at the Urban Agenda session held at the George Wright Society was eye opening. For many, like me, urban parks and city land never really seemed like something on the NPS radar. Now they seem very connected. While the vast western national parks are the icons of the Service, places like the forgotten neighborhoods in Detroit appear to be their battleground. I already knew about cultural uniformity park goers seem to have, and I believe the issue to be bigger than what the Urban Agenda can do. I took in so much more information on the struggles of Detroit. Some parts of Detroit have gone to the dogs because the industry and people left. However, the mayor Mike Duggan wants to bring people back into the Motor City. I think his idea of creating open space to be sold to residents is a good idea. In addition, I think that sectioning off an area of abandoned houses to become an adventure playground for kids would be a positive use for the land. It would be a modern ghost town, which if I were a kid, would sound awesome.

44

Everyone Calls for Partnerships and Outreach, But It's Never Easy to Pull Off: How to Do It and What Still Needs to Be Done

Kelsey Rawlings

The 2015 George Wright Society Conference, held in Oakland, California, was a great success this year. On April 1, 2015, from 10am to 12pm, concurrent session number 67 informed the audience all about current natural resource management policies. Representatives presented material through contributed papers with the ultimate goal that audience members would leave with a better understanding of the connection between "policy being the guiding force behind every on-the-ground natural resources management decision" (see GWS 2015 Program Guide).

Jeffrey Skibins, Chair and Assistant Professor, Parks Management and Conservation at Kansas State University, presented material in connection with "Natural Resources Policy on the Frontline and The Future of Science in the National Parks" (by Gary E. Machlis). Skibins discussed the newest technology making natural resource management possible today, including new ocean research platforms which we can study endangered sections of the oceans that were not accessible before and CubeSats, which are new technology satellites NASA is sending into space to collect data we've never had access to before. Skibins also educated audience members on the next generation of citizen science inspiring ordinary citizens to participate in problem solving, basic interpretations and sensor data collecting. Another amazing new technology presented to the audience is genetically modified corals to help restore the oceans precious ecosystems. Lastly, Skibins talked about the triple helix, which is the important helix between government, university, and industry and how they all work together to forge ahead in science problem solving.

Next up, Karl Brown, Vegetation Inventory Program Manager for the National Park Service and Wildland Fire Management, informed audiences on "Advocating for Natural Resources in the Heat of Incident Management" (Richard Schwab). The Wildland Fire Management teams work towards three main goals: restoration and maintenance, creating fire adapted communities and, most importantly, responding to wildfires. Not all fires are bad; some fires are good because they open up the bottom of the forest floor bringing in light to new forming habitats. Resource advisors are used to advocate for natural resources, in this instance help with wildfires, by addressing conflict with care and providing input of observed data. Using authority of the resource is one of the most effective techniques resource advisors can do. The most resources are protected and saved

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when the resource advisor speaks for the resource, giving it authority and slowing or halting the processes that many outside parties quickly jump to conclusions as the best solution.

The next speaker Andy Hubbard also draws on the authority of the resource while educating the audience about "Management Assessment Points: A Bridge between Science and Management in Southwestern Parks." When making management assessment points one must first identify the issues, then determine proper measures, and lastly set the points to achieve the measures. Management assessment points are beneficial because they provide focus, context and scalable situations to achieve goals. Specific management assessment points have been determined for parks in many instances, for example grizzly bear protection, which Jeffrey Skibins discussed in the following lecture.

Reflection

The ideas presented to me during the natural resource management session hold significant value for students interested in environmental studies or sustainability projects like myself. Some key points that I took from the conference are that interpretation drives understanding and instills connections in people which ultimately leads to achieving what seemed like unattainable goals. Meaning, if you feel passionately about a resource or problem, make sure to interpret that resource with authority and appeal specifically to positive emotions in everyday people insuring the viewpoint from the resource, not the human. Also, for my fellow environmental studies peers, the new upcoming technologies, such as genetically modified coral and CubeSats, discussed at the George Wright Society Conference gave me hope to know that others are making progress on technologies to combat the many problems the world is going to face from global warming. Overall, The 2015 George Wright Society Conference was such a wonderful learning experience and I am so thankful I got the opportunity to attend.

45

Arguably, the Most Important Animals on the Planet Are the Ones under Our Feet (or Buzzing through the Air); This Session Explains Why

Robert Shortt

This session at the 2015 George Wright Society Conference dealt with insects regarding both their importance to the local ecosystems of parks, as well as the research being conducted about them by park staff. Six lecturers spoke during the two hour session, each approaching a different aspect of insect science. Topics included a wide range of studies from the broad to the specific, focusing on themes of species diversity, phenology, and citizen scientists.

Eastern tent caterpillars. Insects can give us insight into how ecosystems are adapting to conditions of global climate change. The eastern tent caterpillar and its host, the black cherry tree, are good specimens to use because they cover much of North America and have a lifecycle which is dependent on its own phenology matching up with that of its specific host plant. As temperatures warm, especially wintertime low temperatures, many species' annual cycles are thrown off their normal sequence. In this study it was found that oftentimes warmer temperatures would cause larvae to hatch early, before any tender leaves had grown for them to eat. This "phenology mismatch" is a theme that is being explored in modern biological science, and one which may have larger consequences than starving caterpillars.

Mission blue butterfly. The Mission blue butterfly is a local species of butterfly which has been dwindling both in area and in total population in recent years. They are dying out primarily due to habitat loss, as they depend on three species of lupine to reproduce. Today they are based in the Marin, Twin Peaks, and San Bruno areas of California, within ecological reserves or in state and national park land. Attempts to repopulate the butterfly population are centered around habitat restoration (i.e., lupine). Challenges with this include strong invasive species as well as a fungal pathogen which has been killing Lupine both in the wild and in the park plant nurseries.

Native bee diversity. Contrary to popular belief, not all bees are honeybees! In fact there are 4,000 species of bees in the United States alone, and 19,200 species worldwide. Bee diversity in the U.S. is greatest in the Southwest desert region, and many of these species have not been studied extensively enough to have even been named. Climate change and phenology shifts threaten bees and pollinators in general, by throwing off the seasonality of their host plants. Additionally

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heat agitates the bees, and distracts them from their routine of pollination. Bees must be captured in order to be studied and categorized. This is done, often by volunteers, by laying out colored bowls with soapy water in them which bees mistake for flowers, with different colors attracting different groups of bee species.

Managing citizen scientists. Volunteers can act as an enormous resource to parks conducting research, acting as "Citizen Scientists" who collect, catalog, and organize data for experts to analyze and categorize. Consistent volunteers perform the best, and recapturing volunteers is easy as long as you use certain strategies to make the experience enjoyable and productive. Organizing potlucks and providing basic training can lead to a devoted addition to any park's workforce.

Reflection

The George Wright Society Conference was my first experience in a professional networking context. I arrived at 9:30am on the day of my session and quickly checked in, got my nametag, and headed up to my lecture room. My concurrent session was very crowded, with only standing room at the back for some presentations. I liked the range of speakers we listened to as the six presentations really broke up the otherwise long session of lecture. The topics expanded from a very specific study which established context, into broader lectures describing challenges faced in studying and working around pollinator species in the context of twenty-first century climate change.

The other attendees all seemed very keen to learn more about the micro-ecology of national parks, and asked questions that mostly focused on the practical and scientific challenges or discoveries within each lecture. Overall, it was an encouraging atmosphere to be around, but I did feel out of my depth being only a university undergraduate student. This conference will definitely not be my last, and I am grateful I was invited to attend.

46

Achieving Effective Stewardship by Making the Shift from Traditional to Collaborative Education Program Development

May Slen

This discussion addressed achieving effective stewardship by making the shift to developing collaborative education programs from traditional approaches. The panel consisted of NE Region Education Program Manager, Cris Constantine, NPS expert on place-based service learning (PBSL) Delia Clark, and Parks for Every Classroom Coordinator, Maryann Zujewski. The main goal is to engage young students in projects that uphold cultural and environmental values that invite the community to learn as well as develop a love for the land in stewards of the next generation. The concept of PBSL required being open-minded and exploratory in concepts that help support education by connecting teachers with park partners and sites, all the while co-acting to incorporate evolved ideas that make education opportunities up-to-date. Clark led with a question that made everyone look into the future, "In 50 years, 2066, what do you see?"

The business-as-usual approach of education consisted of field trips emphasizing on formal, didactic presentations since the goal was to enhance audience knowledge. The traditional approach only addressed biology and environmental science in schools, whereas PBSL is cross-disciplinary with the active partnership of schools' teachers and the NPS. A Venn diagram illustrated that where place-based education and NPS learning met in the middle was how PBSL is going to help make students gain a self-identity in an environment and be aware of environmental quality of a place used by the community. After personally participating in pilot programs in their respective national parks, Constantine and Zujewski shared their overwhelmingly positive experiences at Lava Beds National Park, Saugus Iron Works NHS and Essex National Heritage Area. Teachers were energized; students were able to learn intuitively as school culture was transforming to connect schools and communities to encourage future environmental stewards in natural, cultural areas.

Six "Aspirational Principles" were touched upon conveying the goals and gains of PBSL from which promote keeping a place grounded while being real, empowering, collaborative, integrated and rigorous in curriculum. Keeping a place grounded meant that a particular place had multiple attributes that attracts the community to learn the values of the local and previous residents, natural landscapes and resources, cultural heritage and resources and social, political and economic dynamics as well as for people to meet physically and intellectually. The traditional approach's

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primary focal point was limited to a site story and did not make any relating topic connections to the people that visited. Jamaica Bay was an example used in which water quality was deteriorating quickly because Indian rituals called for sending pots, silk flags and fruits down the river that eventually spilled into the bay.

With an abundance of debris visible all over the bay, students, teachers and park partners collaborated to think of creative solutions to the environmental disaster all the while trying to show multiple perspectives of this ecosystem. One of the projects the school groups achieved was with the planting of golden rod seeds in clay pots that would be released along the river to boost restoration in the bay. The aspirational principle of being real in PBSL engages students, teachers and NPS to address authentic, relevant, community issues and look for opportunities that support sustainable communities, cultural vibrancy and economic livelihood that can be linked to other geographical regions. Additionally, empowering students to develop a meaningful role in planning these park projects are meant to pull in communities while focusing on the experience and engagement of the students to this specific place. PBSL also uses integration and rigor to use a park project as an extension of the classroom learning experience to make an educational lesson be learner-centric, using skills and practices that take place across multiple disciplines effectively.

Reflection

The session was enthralling and innovative in addressing twenty-first century educational skills that can be applied readily. I was inspired that programs like Parks for Every Classroom are created as a new age approach of connecting young students to natural areas by teaching them the relevancy they have to this place. I was given a cumulative list of examples of pilot programs held at other NPS spaces that have been proved to be successful or found areas of improvement for the best results.

47

Field Stations in National Parks: Opportunities and Challenges

Ryan Tachibana

Dan Wakelee, California State University at Channel Islands, played a major role in establishing a university research station on Santa Rosa Island, Channel Islands National Park. The research station is equipped with eight bedrooms, three bathrooms, a fully functioning kitchen, onsite laundry facilities, and can sleep up to thirty individuals. The research station operates on a five-year renewable lease. The research station's mainly provides research and educational opportunities for CSU Channel Island students, but also caters to Channel Islands National Park staff and individuals conducting research on the island. In partnership with Channel Islands National Park, students have the opportunity to generate data that will be used to inform management decisions on the island. Students are currently working with the park to monitor changes on the island caused by the recent removal of deer and elk. Some of the difficulties that the CSU field station have faced are overcoming transportation barriers, establishing long-term projects, keeping up with demand for expansion and acquiring long-term funding.

Michael Stevens is the director of Utah Valley University's Capitol Reef National Park research station. The facility was designed with sustainability in mind to utilize natural sunlight and heat, while being equipped with running water, an onsite water treatment center, off-grid solar generation, classrooms, common areas, and can sleep up to 24 individuals. The research station is committed to providing engaged learning and research opportunities for undergraduate students. The research station records visitation data regarding changes in users' environmental ethics during their stay. UVU's research station is funded by the university and operates on a five-year lease agreement with the National Park System.

Becca Fenwick, director of UC Merced's Yosemite field station, is working to provide students, researchers and the general public with educational opportunities centered around science and art in an outdoor setting. The Yosemite field station is part of the Sierra Nevada Research Institute, the world's largest field station network, according to Becca. The field station hosts UC Merced's Yosemite Leadership Program, a two-year Environmental Leadership Program, and Yosemite Environmental Science Research Training, a 10-week summer program for students to complete individual research projects. In addition, the field station serves as a facility for Adventure Risk Challenge a year-round, non-profit program that provides weekend retreats and SAT

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and college application workshops for underserved youth. With such a broad range of uses the research center operates throughout the year.

Tom Arsuffi is the director of Texas Tech University's Llano River field station. The Llano River field station is not located on National Park Service land, and once served as army barracks. The university received $7 million of funding from public and private organizations and grants. The research station is currently hosting environmental events and serves as a research facility for Texas Tech students. The university has a partnership with the USGS South Central Climate Center and the National Park Service Rivers, Trails, and Conservation Assistance Program. Currently, the field station is focusing on fire recovery and prevention tactics, bridging the environmental literacy gap and working on establishing relationships with nearby ranchers and landowners. One of the unique obstacles faced by the Llano River field station is the dangers associated with its proximity to the Rio Grande. Armed guards must accompany students and researchers working in nearby rattlesnake canyon.

Reflection

Speakers mentioned how current statistics show that national park visitation rates are on the decline. This has many people worried about the fate of America's greatest outdoor resource. Partnerships between universities and the National Park Service would provide ways to foster continuous generations of park goers. Mature relationships between universities and the NPS would increase the number of research stations, creating a valuable network and scientific database for students and professionals. An increase in research stations will provide more students with higher learning opportunities, potentially creating a stronger work force. This will also address the difficulties of obtaining land and the need for long-term land leases. Long-term leases will make it easier for universities to acquire the funding needed to manage research stations from investors. Partnerships between the NPS and universities provide valuable resources for everyone.

48

Partnership Case Studies at Parks and Protected Areas from an International Perspective

Spencer Tanguay

There were five case studies for partnerships at parks and protected areas from an international perspective. They range from South America to Asia and provided examples of different areas that need either new recreational areas or to preserve pre-existing areas. Partnerships provide internal support for locals without having some foreign entity take over. Common interests are what create the best partnerships, especially with local communities and figuring out what they want out of it. In Lobau, part of the Danube Floodplains National Park, the local population is projected to increase to the point of over use of the national park. Thus, with the simulation and projections, the national park allocated local farm land into a "Buffer Zone" to absorb most of the recreational output from the new population.

Another panelist discussed partnerships with corporations. NABU develops a relationship with the corporations through logo licensing, consulting, and sponsoring. NABU provides consulting that tackles how a corporation can increase biodiversity, conservation, ecofriendly, recycling, and carbon off setting. By partnering with corporations, NABU gains political backing, environmental support, and increased funds for projects that involve conversation and preservation on their own. For example, NABU partners with Volkswagen to make Volkswagen change policies about environmental impact and overall eliminate environmental impact during manufacturing.

In Brazil, the National Marine Park encompasses high international tourist islands that were eliminating locals from their native lands. New policies and infrastructure were implemented, like allowing locals to sell goods to tourists and having locals provide recreational services that would usually be run by tourists. There are now school children who run tours, local vendors, and educational centers. They also limited the stay time of tourists to eliminate overcrowding and over use, while also providing enough days to experience the wonders of the islands.

Tom Fish guided a partnership with the Marine Protected Areas (MPAs) and Asia's coastal villages. He worked directly with the locals and provided a needs assessment report of the tourism impact. He explained the importance of a plan for sustainable tourism of MPAs. Local leaders and partnerships work through training with the locals to do needs assessments. Thus, implementing policies that allow the local community to be properly equipped for sustainability and community-based conservation and restoration occurred. Also, the partnership developed a program for

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training the trainer, which means that the locals are taught to be sustainable and that a student will be the teacher, and so on.

Near the Amazon River in Brazil, huge deforestation and illegal export still exist. Partnerships with the local communities helped develop tourism relations and local preservation. With the village chief, they were allowed to provide informational walks through protected areas of the rainforest. The partnership with the locals and, again, the tourism infrastructure by locals is hugely important, thus the demand can then come from locals providing tourism activities.

Reflection

Partnerships provide unlimited opportunities for local communities and corporations that want to increase sustainability and conservation. The goal of a partnership is not to take over or replace, but to rather enhance and then leave both parties with sustainable tools of their own. For Native communities that are being diminished by tourism, partnerships orchestrate positive internal support and nurturing guidance. They work to determining the conservational value of local land, then providing the proper infrastructure projection for protecting local lands. Partnerships foster trust through similar visions, because their combined passion allows them to connect effectively. With strong trust from both sides, policies can be made through local government on their own, which leads to preservation with locals standing by the decision. Once a firm infrastructure has solidified, locals aim for sustainability and able to lead local preservation projects and policies on their own. Partnerships with corporations provide corporations to benefit through logo licensing, consulting, and sponsoring. Consulting corporations offer how they can increase biodiversity, conservation, and eco-friendly, recycling, and carbon off-setting. Nonprofits acquire nine percent of their income from corporate partnerships, which keeps them under the ten percent of income that would make them dependents.

49

Managing Wildlife and Human Behavior to Address Human–Wildlife Interactions

Shane Whiting

The National Park Service is constantly adapting to providing a good experience for their visitors as well as allowing the local wildlife to thrive. As the human visitation numbers rise, the NPS adapts to the desire to provide a pleasurable experience for the visitors, while educating them to an extent sufficient enough to deter them from harming the environment that they are visiting. As we learn more about the importance of our protected areas, park staff is faced with new information that changes the motives of their work.

The first speaker, Keith Benson, from the Redwood National and State Parks, has worked in effort to protect a rare species of ocean bird, the marbled murrelet, which has recently been found to nest exclusively in the old growth redwood forests that he protects. He was involved in costly research that studied the threats to the unique nesting bird. They concluded that the eggs were being poached by invasive birds, consisting of mostly Steller's jays. The birds are attracted to the area by extra food brought in by the campers that visit the area. After the research was conducted, and they found out that this was the issue, they pushed for informing the visitors about how the threats that the marbled murrelet face should be significant to them. Unfortunately change was not occurring, so they knew that they needed to change their approach. They changed the way of protecting the marbled murrelet, they created the slogan, "Keep it Crumb Clean" in order to inform people that by leaving their food out attracted the Steller's jays that threatened the endangered marbled murrelet. The more direct education was proven to be much more effective.

The second speaker, Kristen Leong, from the Biological Resources Division of the NPS, spoke about "Managing Human-Wildlife Interactions: The Principles of Animal Behavior Change and Learning." She stated that "in the absence of active management, wildlife may learn that people are not a threat." She made it clear that there is a difference between habituation and conditioning. Conditioning stimulates a positive or negative consequence for the animal, causing a response is usually intensified over time is nothing changes. She suggested that while attempting to manage a behavior, first you select the behavior, and then you identify the attractants and deterrents, followed by developing a strategy, plotting a strategy, implementing it broadly, then finally evaluating thoroughly.

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The final speaker, Sara Melena, from the NPS in Colorado, also spoke about managing human-wildlife interactions, with a focus on the principles of human behavior change and learning. She stated that "Wildlife management is 10% managing wildlife and 90% managing people." She touched on community-based social marketing to educate the public. She also talked about the benefits and barriers that have been found to have a strong effect on the public's opinion and how much they understand the importance of being gentle when entering our protected areas and adapting practices that promote the wellbeing of visitors and wildlife for generations.

Reflection

Speakers discussed that in the last 50 years, the total population has risen in the United States from just under 195 million people, to just shy of 320 million in 2015. This growth in population has caused a heightened demand for visitors to enjoy the parks and protected areas that we cherish. As we continue to study these areas and evolve with them, we learn more about how important they are, how fragile and important the environment is, as well as how fragile the relationship is between the wildlife and the ever increasing influence of humans. We also face the issues of not creating a negatively-conditioned relationship between the wildlife and the humans because it can be bad for both. For example, when bears become conditionally trained to eating garbage and food from campsites and dumpsters in protected areas, actions often have to be taken, and there are instances where the bear has to be killed because it becomes an issue of safety for the human visitors. It is a constant battle with the desire to maintain a civil relationship with wildlife, while offering a way for park visitors to enjoy the areas as much as possible.

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