

Chapter 15: Conclusions

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The Intermountain Adaptation Partnership (IAP) provided significant contributions to assist climate change response in national forests and national parks of the region. The effort synthesized the best available scientific information to assess climate change vulnerability, develop adaptation options, and catalyze a collaboration of land management agencies and stakeholders seeking to address climate change. The vulnerability assessment and corresponding adaptation options provided information to support national forests and national parks in implementing respective agency climate change strategies described in the National Roadmap for Responding to Climate Change (USDA FS 2010a), Climate Change Performance Scorecard (USDA FS 2010b) (Chapter 1), and National Park Service (NPS) Climate Change Response Strategy (NPS 2010). The IAP process allowed all forests in the U.S. Department of Agriculture Forest Service (USFS) Intermountain Region to respond with “yes” to element 6, Assessing Vulnerability, and element 7, Adaptation Actions, on their Climate Change Performance Scorecard. This, in turn, helped all forests to reach a minimum level of accomplishment of “yes” in 7 of 10 elements, with at least one “yes” in each of four dimensions. The IAP process also enabled participating national parks to make progress toward implementing several components (communication, science, adaptation goals) of the NPS Climate Change Response Strategy (NPS 2010).

Relevance to Agency Climate Change Response Strategies

In this section, we summarize the relevance of the IAP process to the climate change strategy of Federal agencies and the accomplishments of participating national forests, national grasslands, and national parks. Information presented in this report is also relevant for other land management agencies and stakeholders in the IAP region. This process can be replicated and implemented by any organization, and the adaptation options are applicable in the USFS Intermountain Region and beyond. Like previous adaptation efforts (e.g., Halofsky and Peterson 2017; Halofsky et al. 2011, 2018, in press; Raymond et al. 2014), a science-management partnership was critical to the success of the IAP. Those interested in utilizing this approach are encouraged to pursue this partnership as the foundation for increasing climate change awareness, assessing vulnerability, and developing adaptation plans.

Communication, Education, and Organizational Capacity

Organizational capacity to address climate change, as outlined in the USFS Climate Change Performance Scorecard, requires building institutional capacity in management units through training and education for employees. Training and education were built into the IAP process through workshops and webinars that provided information about the effects of climate change on water and soil resources, fisheries, forest and nonforest vegetation, disturbance, wildlife, recreation, infrastructure, cultural resources, and ecosystem services. The workshops introduced climate tools and processes for assessing vulnerability and planning for adaptation (Morelli et al. 2012).

In both the webinars and workshops, efforts were made to have a balanced mixture of scientists and land managers presenting together. This approach was also taken during the workshop panels that answered and discussed questions posed by participants. The number of workshop attendees was an average of 50 participants at each of the five 2-day events. The average partner attendance was 30 percent, which facilitated the development of an interdisciplinary and interorganizational network for this complex topic.

The general structure of the 2-day workshops was to share climate change information on the first day and to develop adaptation options in breakout groups on the second day. These workshops helped to develop a common foundation and understanding of information among groups of participants. In turn, this understanding helps to facilitate integration of climate change into thoughts, plans, and actions for resource managers. The entire process helps build organizational capacity to learn, adapt, and possibly even thrive in a changing climatic environment.

The NPS Climate Change Response Strategy challenges NPS staff to increase climate change knowledge among employees and to communicate this information to the public. Although communication about climate change with the public was beyond the scope of the IAP, knowledge generated through this process can be used for outreach and interpretive materials.

Partnerships and Engagement

The IAP science-management partnership and process were as important as the products that were developed, because these partnerships are the cornerstone for successful agency responses to climate change. We built a partnership that included 12 national forests, 22 NPS units, the USFS

Intermountain Regional Office, the USFS Pacific Northwest and Rocky Mountain Research Stations, and the University of Washington. This partnership will remain relevant for ongoing plan revision and restoration conducted by the national forests in collaboration with several stakeholders.

Elements 4 and 5 of the USFS Climate Change Performance Scorecard require units to engage with scientists and scientific organizations to respond to climate change (element 4) and work with partners at various scales across all boundaries (element 5). Similarly, the NPS Climate Change Response Strategy emphasizes the importance of collaboration and building relationships, in addition to products that support decisionmaking and a shared vision. The IAP process therefore allowed both agencies to achieve unit-level compliance in their agency-specific climate responses.

The IAP process encouraged collaboration between the USFS and NPS, strengthening the foundation for a coordinated regional response to climate change. Working with partners enhances the capability to respond effectively to climate change. This collaboration is especially valuable in supporting the use of an all-lands approach, which was an important context for the assessment.

Climate change is a relatively new and evolving aspect of land management, and the workshops provided an opportunity for participants to effectively communicate their professional experiences with climate change and resource management in a collaborative and supportive environment. Because the IAP process covered a broad range of topics, the multidisciplinary large-group discussions resulted in conceptual breakthroughs across disciplines by otherwise isolated specialists who typically do not participate in the same meetings or training.

In August 2016, the Intermountain Region and USFS Rocky Mountain Research Station launched a “Science Partners” program that brought small groups of USFS scientists and land managers together to help bridge the gap between research and National Forest System (NFS) needs for planning and implementation. This program builds on the premise that each can work more effectively through regular communication, leading to collaboration that fosters research designs better suited to address the needs of NFS land managers. Climate change knowledge and implementation in management practices will benefit from this integrative program.

Assessing Vulnerability and Adaptation

Elements 6 and 7 of the USFS Climate Change Performance Scorecard required units to identify the most vulnerable resources, assess the expected effects of climate change on vulnerable resources, and identify management strategies to improve the adaptive capacity of the national forest lands. The IAP vulnerability assessment described the sensitivity of multiple resources in the Intermountain Region. Adaptation options developed for each resource area can be incorporated into resource-specific programs

and plans. The identification of key vulnerabilities and adaptation strategies can also inform the national forest plan revision process.

The science-management dialogue identified management practices that are useful for increasing resilience and reducing stressors and threats. Although implementing all options developed in the IAP process may not be feasible, resource managers can still draw from the menu of options as needed. Some adaptation strategies and tactics can be implemented on the ground now. Others may require changes in policies and practices or can be implemented when management plans are revised or as threats become more apparent.

In assessing vulnerability and planning for adaptation, the IAP process used many of the principles and goals identified in the NPS Climate Change Response Strategy, which calls for units to implement adaptation in all levels of planning to promote ecosystem resilience and enhance restoration, conservation, and preservation of resources (NPS 2010). It specifically requires developing and implementing adaptation to increase the sustainability of facilities and infrastructure, and preserve cultural resources.

Science and Monitoring

Monitoring is addressed in Element 8 of the USFS Climate Change Performance Scorecard and in the NPS Climate Change Response Strategy. Where applicable, the IAP products identified information gaps or uncertainties important to understanding climate change vulnerabilities to resources and management influences on vulnerabilities. These identified information gaps could help determine where important monitoring and research would decrease uncertainties inherent in management decisions. In addition, current monitoring programs that provide information for detecting climate change effects, and new indicators, species, and ecosystems that require additional monitoring, were identified for some resource chapters. Working across multiple jurisdictions and boundaries will allow IAP participants to increase collaborative monitoring and research on climate change effects and the effectiveness of implementing adaptation options that increase resilience or reduce stressors and threats. Scientific documentation in the assessment can also be incorporated into large landscape assessments such as forest or grassland planning assessments, environmental analysis for National Environmental Policy Act (NEPA) projects, or project design and mitigations.

Implementation

Although challenging, implementation of adaptation options will gradually occur with time, often motivated by extreme weather and large disturbances, and facilitated by changes in policies, programs, and land management plan revisions. It will be especially important for ongoing restoration programs to incorporate climate change

adaptation to ensure effectiveness. A focus on thoroughly vetted and feasible strategies will increase ecosystem function and resilience while minimizing implementation risk. Landowners, management agencies, and Native American tribes will need to work together for implementation to be effective.

In many cases, similar adaptation options were identified for more than one resource sector, suggesting a need to integrate adaptation planning across multiple disciplines. Adaptation options that yield benefits to more than one resource are likely to have the greatest benefit (Halofsky et al. 2011; Peterson et al. 2011; Raymond et al. 2014). However, some adaptation options involve tradeoffs and uncertainties that need further exploration. Assembling an interdisciplinary team to tackle this issue will be critical for assessing risks and developing risk management options. Scenario planning may be a useful next step.

Integration of the information in this assessment in everyday work through “climate-informed thinking” is critical, and can be reflected in resource management and planning (USDA FS 2010c), as well as in management priorities such as safety. Flooding, wildfires, and insect outbreaks may all be exacerbated by climate change, thus increasing hazards faced by Federal employees and the public. Resource management can help minimize these hazards by reducing fuels, modifying forest species composition, and restoring hydrological function. These activities are commonplace, demonstrating that much current resource management is already climate smart. This assessment can improve current management practice by helping to prioritize and accelerate implementation of specific options and locations for adaptation.

Putting adaptation on the ground will often be limited by insufficient human resources, insufficient funding, and conflicting priorities. However, the likelihood of changes occurring in the near future are relatively high for resources such as water, and for disturbances such as wildfire—and some adaptation options may be precluded if they are not implemented soon. This creates an imperative for timely integration of climate change as a component of resource management and agency operations.

The climate change vulnerability assessment and adaptation approach developed by the IAP can be used by the USFS, NPS, and other organizations in many ways. From the perspective of Federal land management (USDA FS 2015, 2016), this information can be integrated into the following aspects of agency operations:

- **Resource management strategies:** The vulnerability assessment and adaptation strategies and tactics can be used to incorporate IAP science into forest resilience and restoration plans, conservation strategies, fire management plans, infrastructure planning, and State Wildlife Action Plans.
 - **Project NEPA analysis:** The vulnerability assessment provides best available science for documentation of resource conditions, analysis of effects, and development of alternatives. Adaptation strategies and tactics provide mitigation and design tactics at specific locations.
 - **Monitoring plans:** The vulnerability assessment can help identify knowledge gaps that can be addressed by monitoring in broad-scale strategies, plan-level programs, and project-level data collection.
 - **National forest land management plan revision process:** The vulnerability assessment provides a foundation for understanding key resource vulnerabilities caused by climate change for the assessment phase of forest plan revision. Information from vulnerability assessments can be applied in assessments required under the 2012 Planning Rule (USDA FS 2012), describe potential climatic conditions and effects on key resources, and identify and prioritize resource vulnerabilities to climate change in the future. Climate change vulnerabilities and adaptation strategies can inform forest plan components such as desired conditions, objectives, standards, and guidelines.
 - **Project design and implementation:** The vulnerability assessment provides mitigation and design tactics at specific locations.
- We are optimistic that climate change awareness, climate-informed planning and management, and implementation of adaptation in the IAP region will continue to expand. We anticipate that within a few years:
- Climate change will become an integral component of Federal agency operations;
 - The effects of climate change will be continually assessed on natural and human systems;
 - Monitoring activities will include indicators to detect the effects of climate change on species and ecosystems;
 - Agency planning processes will provide opportunities to manage across boundaries;
 - Restoration activities will be implemented in the context of the influence of a changing climate;
 - Management of carbon will be included in adaptation planning;
 - Institutional capacity to manage for climate change will increase within Federal agencies and local stakeholders; and
- **Landscape management assessments and planning:** The vulnerability assessment provides information on departure from desired conditions and best science on effects of climate change on resources for inclusion in planning assessments. The adaptation strategies and tactics provide forest or grassland desired conditions, objectives, standards, and guidelines for land management plans and general management assessments.

- Resource managers will implement climate-informed practices in long-term planning and management.

This assessment provides the foundation for implementing adaptation options that help to reduce the negative impacts of climate change and facilitate transition of resources to a warmer climate. We hope that use of the assessment by existing partnerships will foster collaborative climate change adaptation in resource planning and management throughout the IAP region.

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