

THE RESILIENT LANDS AND WATERS INITIATIVE

November 2016



A report to the Council on Climate Preparedness and Resilience and the Joint Implementation Working Group of the National Fish, Wildlife, and Plants Climate Adaptation Strategy.

ABOUT THIS REPORT

This report and the companion [website](#) were collaboratively developed by the Department of the Interior, the National Oceanic and Atmospheric Administration, the Association of Fish and Wildlife Agencies, and the numerous agencies and partners represented in the Resilient Lands and Waters Initiative. It was prepared under the leadership and direction of the Joint Implementation Working Group ([JIWG](#)) of the *National Fish, Wildlife, and Plants Climate Adaptation Strategy*, in response to a directive from the President's Interagency Council on Climate Preparedness and Resilience's *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources*.

It is intended to inform future discussions among federal, state, local and tribal agencies, private landowners, businesses and other conservation partners to help build resilience to climate change for our nation's natural resources at a landscape-scale.

Cover Photo: Sierra Nevada snowpack from the California Headwaters Partnership. Credit: Sierra Nevada Conservancy.

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EXECUTIVE SUMMARY

The President's Interagency Council on Climate Preparedness and Resilience released the *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources* ([Priority Agenda](#)) in 2014. The Priority Agenda called for federal agencies to work with states, tribes, and other partners to select flagship geographic regions and identify priority areas for conservation, restoration, or other investments to build resilience in vulnerable regions, enhance carbon storage capacity, and support management needs. It also directed the agencies and their partners to identify and map an initial list of priority areas within each of the selected geographic landscapes or regions.

In response to this directive, federal agencies worked together with states, tribes, and other partners to identify the following seven Resilient Lands and Waters Partnerships across the country: California Headwaters, California's North-Central Coast and Russian River Watershed, Crown of the Continent (northern Rocky Mountains), Great Lakes Coastal Wetlands (Lakes Huron & Erie), Hawai'i (West Hawai'i, West Maui, and He'eia (O'ahu)), Puget Sound's Snohomish River Watershed, and Southwest Florida.

These partnerships built upon existing efforts to conserve and restore important lands and waters in discrete geographies and to make them more resilient to a changing climate. This report and the companion [website](#) summarize the experiences of each of the partnerships and highlight some key challenges, successes, lessons learned, and recommendations to carry forward this method of large landscape-scale conservation planning. It also highlights many of the dynamic maps and tools that the partnerships have produced to help them identify priority conservation areas and actions in their landscapes.

The report recommends that future landscape-scale conservation planning efforts address the challenges that climate change is likely to pose in meeting conservation and restoration goals. It also suggests that the Joint Implementation Working Group of the *National Fish, Wildlife, and Plants Climate Adaptation Strategy* promotes the best practices demonstrated in this Initiative, takes the lead in transferring the lessons learned, tools, and practices from this Initiative to other areas, and works with conservation partnerships to identify and address specific tools, information, and guidance that they may need to continue to strengthen the resilience of our nation's natural resources into the future.

INTRODUCTION

The first goal of the *National Fish, Wildlife, and Plants Climate Adaptation Strategy* ([NFWPCAS, 2012](#)) is to build and maintain an ecologically connected network of terrestrial, coastal and marine conservation areas that are likely to be resilient to climate change and support a broad range of fish, wildlife and plants under changing conditions. Pursuant to this goal, the President's Interagency Council on Climate Preparedness and Resilience's *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources* ([Priority Agenda, 2014](#)), called for federal agencies to work with states, tribes and other partners to select flagship geographic regions and identify priority areas for conservation, restoration, or other investments to build resilience in vulnerable regions, enhance carbon storage capacity, and support management needs. It also directed the agencies to work with partners to identify and map an initial list of priority areas within each of the selected geographic landscapes or regions.

To realize this directive, in 2015, federal agencies working together with states, tribes, and other partners, identified seven **Resilient Lands and Waters Partnerships** across the country. These partnerships built upon existing efforts to conserve and restore important lands and waters in discrete geographies and make them more resilient to a changing climate. Each showcases the benefits of landscape-scale management approaches and serves to demonstrate diverse approaches to working with stakeholders to identify priority areas for conservation, restoration, and management actions.

This report summarizes the experiences of each of the seven partnerships during 2015-2016 and highlights some key challenges, lessons learned, and recommendations to carry forward this method of large landscape-scale conservation planning. The challenges and lessons learned from the partnerships are organized in to three major themes: building relationships and balancing competing needs; information to address the complexity of conservation needs and efforts; and resource limitations. This report also highlights many of the dynamic maps and tools that the partnerships have produced to help them identify priority conservation areas and actions in their landscapes.

The Resilient Lands and Waters Initiative was shaped by input from the Council on Climate Preparedness and Resilience's **Climate and Natural Resources Working Group**, an interagency working group that developed the *Priority Agenda*, with support from the Department of the Interior (DOI), the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Agriculture and other federal agencies. All seven of the partnerships represent existing collaborations among federal, state, tribal, local, and private partners. The partnerships were chosen for their exemplary collaborations, diverse suite of approaches to planning for climate resilience, existing resources, feasibility of meeting the charge within the timeframe, and range of scales, geographies, and ecological stressors. The Initiative is currently supported by a DOI-NOAA Steering Committee with support from the NFWPCAS Joint Implementation Working Group (JIWG). The substantial progress made thus far could not have been achieved by any single agency or organization. The range of partners that make up these landscapes have contributed greatly to the initiative's success and will continue to play a critical role in future activities.

DIVERSE APPROACHES

The Resilient Lands and Water Initiative consisted of seven partnerships that worked to increase climate resilience at the landscape scale. Just as the landscapes involved varied from the coral reefs of Hawai'i to the Rocky Mountains and Great Lakes, so too did the approaches each partnership took to meet the Initiative's goals. Some built off one agency's ongoing planning process, while others were led by multi-agency and stakeholder collaborations such as the Landscape Conservation Cooperatives (LCCs). Likewise, some partnerships used this initiative to help drive new goals and products, while others incorporated the Initiative's task into their existing planning frameworks and outcomes. The products and outcomes from this Initiative are as diverse as the landscapes themselves. While they all identified priority areas and produced science-based mapping tools, the format each took was tailored to the needs of their respective partnership.

The following sections highlight some of the challenges, lessons learned, and recommendations from across the Initiative. The partnerships have clearly demonstrated that by working together, across diverse landscapes and political boundaries, collective groups can identify and prioritize conservation actions that can help our natural resources and those who depend on them to become more resilient to a rapidly changing world. It is hoped that many of the successes and lessons learned by this Initiative will help guide future efforts, and when feasible, be incorporated into other efforts around the Nation to make natural landscapes more resilient to climate change.

CHALLENGES AND LESSONS LEARNED

Each of the seven partnerships learned a great deal about how to build climate resilience across large landscapes. These various approaches can serve as a source of inspiration for future initiatives and the lessons learned can inform and improve future large-scale collaborative efforts.

BUILDING RELATIONSHIPS AND BALANCING COMPETING NEEDS

CHALLENGES

- Balancing competing needs can be difficult and time consuming. A diversity of sometimes conflicting missions, mandates, priorities, management approaches, and science can influence the group dynamics and outcomes.
- Coming to agreement on a range of multiple conservation needs and priorities at various scales gets more complicated as the number of partners increases.
- Involving a diversity of relevant agency and organization leaders and organizing them to receive meaningful input in a timely way can be difficult.
- Clearly delineating agency and organizational boundaries and defining how the various management and jurisdictional responsibilities and priorities fit together is demanding. It can take a large investment of time to identify and assess all of the relevant existing projects and plans, and to look for gaps, overlaps, and redundancies that are relevant to a new landscape-scale initiative.
- Climate change and/or resilience planning is not uniformly understood or incorporated by every organization in a partnership.
- Some aspects of climate change are beyond the control or scope of the individual organizations and partnerships.

LESSONS LEARNED

- Involve as many relevant partners as is feasible from the start of any resilience planning process to ensure common understanding, obtain buy-in, and secure commitments.
- Maintain interactive relationships with partners throughout the process to assess needs, incorporate all the relevant input, and evaluate the effectiveness of the final outcomes and products.
- Develop a planning process that values and uses input from all parties. In many communities *how* you got to the end may be more important than the end goal or product.
- Discuss workload requirements and divide the workload appropriately and fairly. Share information in multiple forums and formats, using innovation and technology.
- In person workshops are an excellent tool for linking scientists, managers, and stakeholders together to assess needs and collaboratively develop priority outcomes. They also allow partners to build and maintain personal relationships and build trust. Webinars can also help link in partners that may be unable to meet in person.
- Cultivating trust and building working relationships among groups takes time and effort.
- There is no one “correct” way to approach climate resilience and resource conservation challenges. The geographic scale, scope of issues, number of partners and planning processes differs for each landscape and partnership.
- Landscape-scale initiatives should build upon existing collaborations to help to identify, prioritize, and implement conservation actions.
- Learn from and share successes and failures.
- Celebrate success no matter how small.
- Ensure there are staff dedicated to help foster and nurture relationships between meetings.

INFORMATION TO ADDRESS THE COMPLEXITY OF CONSERVATION NEEDS AND EFFORTS

CHALLENGES

- Climate related issues and impacts occur at different geographic scales and over different timeframes. Some of the impacts and solutions may be localized, others may be regional or even global, and they can occur over timeframes spanning months, to years, to decades.
- Sound science and data are needed to inform agency and stakeholder processes to identify priority conservation actions. However, data is not always available or at a high enough resolution or timeframe to be fully useful.
- It can be difficult to objectively and uniformly define criteria to prioritize both high value habitats and ecosystem services for people.

LESSONS LEARNED

- Determine and assess existing conservation planning efforts within a landscape early in the process. Find out who is doing what and what science and information can be brought to the discussion.
- Identify the appropriate technological tools and needs early on, including modeling applications and visualization platforms.
- Develop common geospatial templates from which all partners can work from and begin a conversation. Developing a GIS tool, such as a Storymap or layered PDF, allows all the partners to visualize areas of highest risk, assists in determining priority areas, and combines all partner projects for a given geographical area.

- A multi-year perspective is needed to reach large landscape restoration goals.
- Organizations may need to shift the traditional way of doing business to meet changing scope, complexity, and needs
- Scale is important when working on complex problems. Too large of a scale, and efforts are mired in complexity. Too small of a scale and you are not effectively assessing ecological problems.

RESOURCE LIMITATIONS

CHALLENGES

- Effective stakeholder conservation planning processes require additional resources to bring partners to meetings from throughout the geography.
- Existing private, local, state, tribal, and federal contracting mechanisms are not typically flexible and can impede collaboration rather than encourage it.
- No new resources were made available for this initiative, although it added requirements to existing partnerships. This ultimately limited the number of actions and the speed at which they could be accomplished.

LESSONS LEARNED

- Working across large landscapes is resource intensive. Dedicated funds and staff time are needed to achieve results in a timely manner.
- Look for opportunities to create awareness and raise the profile for these types of partnerships, as well as for support to achieve the desired outcomes.
- Find ways to make it easy for the partners to pool funds and share or leverage resources.
- Invest time and resources to build local capacity to ensure that the momentum of the partnership will continue once the headlines fade.

KEY TAKEAWAYS

- No single agency or organization has the capability or resources to build resilience at a landscape-scale on its own. Multi-stakeholder partnerships such as LCCS and other diverse collaboratives can serve as convening bodies to help build lasting relationships across participants, weave together existing resource management efforts to effectively address stressors and impacts that transcend jurisdictions, such as climate change, pollution, habitat loss, and invasive species.
- Resilience planning processes should include as many relevant partners as is feasible from the start to ensure common understanding, buy-in and support.
- Ensure there is sufficient expertise and resources to facilitate communication, cooperation, and actions among multiple partners, and to achieve objectives in a timely manner.
- Resource conservation that encompasses climate resilience is a long-term and iterative process. The lessons learned from successes and challenges should be used to help guide existing and future conservation efforts.
- Success is contagious and transferable. There is great potential to learn from and appropriately transfer landscape-scale conservation planning processes and decision support tools to other areas. The successes of this initiative can help jumpstart efforts in other landscapes.

RECOMMENDATIONS FROM THE INITIATIVE

While each of the seven partnerships highlighted by the Resilient Lands and Waters Initiative reflect different origins, goals, and approaches to landscape-scale conservation planning efforts, they all demonstrated success in incorporating climate resilience into their efforts by bringing together diverse stakeholders, developing and using innovative tools, and learning as they went. This Initiative has shown that a careful consideration of climate change is possible in a variety of planning efforts, and we recommend that all future landscape-scale conservation planning efforts in the United States address the challenges that a changing climate is likely to pose for meeting conservation and restoration goals. The lessons learned identified in this report provide a foundation of information and practices from which landscape planning efforts can draw. Building on these successes may necessitate the development of additional tools, information, or guidance. We also recommend that the Joint Implementation Working Group promotes the climate resilience practices demonstrated in this Initiative, takes the lead in transferring the lessons learned, tools, and practices from this Initiative to other areas, and works with conservation partnerships to identify and address specific tools, information and guidance that they may need to continue to strengthen the climate resilience of our nation's natural resources into the future.

THE CALIFORNIA HEADWATERS PARTNERSHIP

The California Headwaters Partnership is focused on restoring and enhancing function in the primary watersheds for California, the watersheds of the Sierra Nevada and Cascade Mountains, which drain into the Sacramento and San Joaquin Valleys. The partnership is building upon and unifying existing collaborative efforts in the region to identify and map areas for conservation, restoration, increased carbon storage, and maintenance needs. Another major goal is enhancing forest resilience to reduce the risk of high-severity wildfire and allow a more natural fire regime through reduction of uncharacteristic fuel loads.

A century of fire suppression and other land management practices have led to overgrown forests. When coupled with a historic five-year drought, this has produced conditions conducive to invasive insect infestation, resulting in more than 66 million dead trees in California. This crisis has shifted funding and resources from watershed restoration efforts to tree mortality response. As the number of dead and dying trees increases and expands to new areas, the region's vulnerability to fire increases. Resources at all levels of government are inadequate to address long-term restoration.



Figure 1. The California Headwaters Partnership map.

NEXT STEPS

In the future, the partnership will be focused on implementing the Sierra Nevada [Watershed Improvement Program](#) (WIP), which is a complementary effort. Implementation of the WIP will include:

- Completing watershed assessments on all lands, developing metrics, and beginning pilot watershed analyses.
- Coordinating and communicating work products and progress with all partners.
- Developing the WIP information hub and using it as a communication tool.

DELIVERABLE



Figure 2. Tree mortality in the Sierra National Forest, CA. Credit: Steve Dunskey, US Forest Service.

The California Headwaters Partnership produced a number of products over the timeframe of the Resilient Lands and Waters (RLW) Initiative to showcase the collaborative efforts in the region that are addressing climate impacts at the landscape scale. These products include websites hosted by the U.S. Forest Service (USFS) and the Sierra Nevada Conservancy (SNC), a webinar, handouts, and an Esri [Story Map](#). All RLW products developed and described above are available on the [USFS](#) and [SNC](#) websites. The process used to identify and quantify forest and watershed restoration opportunities will continue to be organized through the WIP. Additional products have been developed through the WIP, including watershed assessments across all ownerships and a WIP regional strategy.

CHALLENGES

- Scale and scope of the need for watershed restoration.
- Lack of operational infrastructure, including wood processing plants and biomass energy plants, to process material from forest management and restoration activities.
- Lengthy, inefficient environmental planning process to address current needs. Lack of capacity, expertise, and agreement to shift to contracted National Environmental Policy Act (NEPA) planning to meet increased demand.
- Development of standardized metrics for forest and watershed restoration across all lands.
- Managing for resiliency in landscapes prone to threat of large, intense wildfires and associated risk to water supplies, carbon storage, air quality, infrastructure, and habitat.
- Lack of agreement on management approaches, objectives, and science among diverse stakeholders with different organizational missions and processes.

LESSONS LEARNED

The California Headwaters Partnership values collaboration and coordination among partners and the public. Engagement of private landowners, tribes, nongovernmental organizations, and agencies must be a continuing emphasis in large landscape restoration. Communication is crucial, and how we say things can be as important as what we say. Other lessons learned include:

- A multi-year perspective is needed to reach large landscape restoration goals.
- Organizations may need to shift the traditional way of doing business to meet changing scope, complexity, and needs of forest and watershed management.
- Funding new approaches, implementing new contracting mechanisms, and building local capacity are essential to increasing the pace and scale of restoration across all land ownerships.

BEST PRACTICES

Co-leading large landscape restoration efforts creates the best products and the best outcomes. Other best practices include:

- *Use Lessons Learned:* Coordinate and collaborate early in areas where forest and watershed health are vulnerable to climate change and other disturbance threats. For example, establish tree mortality taskforces in counties susceptible to future mortality. In addition, use all management tools, including managed fire, to reduce fuel loads, decreasing the risk of large, intense wildfires.
- *Training Opportunities to Improve “Soft” Skills and Build Expertise:* Provide training to respond to changing needs. Examples include the Forest Service “Leaders as Conveners” training for natural resource managers

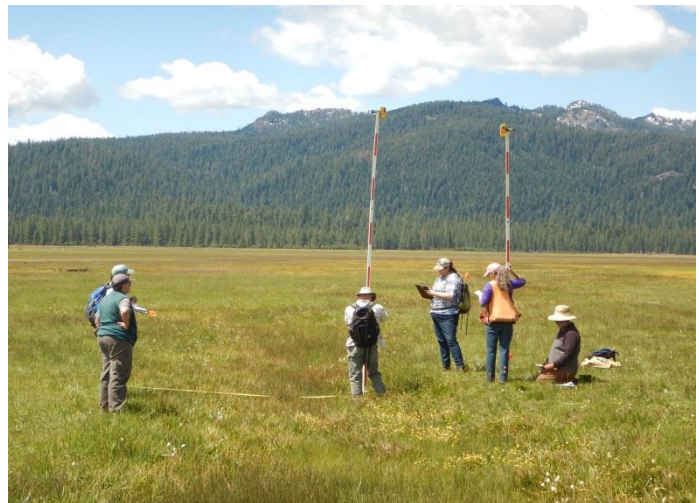


Figure 3. Meadow Restoration Training hosted by American Rivers, Plumas Corp., and the USFS, with support from the National Fish and Wildlife Foundation and Bella Vista Foundation. Credit: American Rivers.

and partners, and the Forest Service and National Fish and Wildlife Foundation American Rivers Meadow Restoration Training, which teaches technical and soft skills to increase and leverage additional work through partnerships.

- *Tell the Story*: Share information in multiple forums and formats, using innovation and technology. The Esri Story Map tool was used to develop the [California Headwaters Partnership Story](#) to describe the current situation and efforts underway to increase the pace and scale of restoration.

CALIFORNIA'S NORTH-CENTRAL COAST AND THE RUSSIAN RIVER WATERSHED

Partners in California's North-Central Coast and the Russian River watershed are working to provide data and tools to enhance resiliency to climate and extreme events. NOAA, USGS, and Point Blue Conservation Science have developed a sea level rise/storm model and an interactive web-based tool which provides sea level rise scenarios to be used by private, local, state, and federal partners. This data helps to identify low lying and potentially vulnerable communities and resources within Marin, Sonoma and Mendocino Counties, including the Russian River Estuary. This data is being used for multiple purposes including development of California's first comprehensive, prioritized adaptation implementation plan for the coast and ocean within the Greater Farallones National Marine Sanctuary (GFNMS).



Figure 4. Russian River in Northern California. Credit: Sonoma County Water Agency.

The Climate-Smart Adaptation project for the North-central coast of California, led by GFNMS, was driven in large part by the work of the Sanctuary Advisory Council, which has been the primary agent for collaborating across agencies and organizations to reach the Sanctuary's RLW outcomes. The Sanctuary Advisory Council formed a working group composed of representatives from 20 different agencies and organizations to provide management recommendations for vulnerable habitats along the coast. GFNMS used additional input from the 2016 [Ocean Climate Summit](#), staff, modeling results on flooding and inundation from the USGS Coastal Storms Modeling ([COSMOS](#)) effort, and

the web-based tool Our Coast Our Future ([OCOF](#)) from partners at Point Blue Conservation Science, to select priority areas for implementing the Council's recommendations. A similar process was used for the Russian River estuary in that data from the COSMOS model and OCOF tool were presented to local stakeholders and the public for feedback into the use and practice of identifying key areas and climate-smart strategies as they advance with their Local Coastal Plan updates. As part of the outcomes from the planning process, water conservation demonstration strategies were applied in the middle reaches of the watershed.

Westminster Woods, a year-round camp, outdoor school, and retreat center located in Occidental, California, along Dutch Bill Creek, is an important stream for coho and steelhead. This site was identified as a priority due to the presence of endangered species, willing landowners, and many partners that have been working on improving the habitat already. Westminster Woods had previously relied on Dutch Bill Creek to irrigate its playing fields during the summer. The resilience project, implemented in fall 2015, reduced overall irrigation demand and allowed the timing of water diversion to be shifted to the winter rainy season. Overall, the project improved efficiency by reducing withdrawal from the creek from 600,000 to 1.4 million gallons (dependent on the year) down to 250,000 gallons; then provided them with storage tanks which will replace the withdrawal of 250,000 gallons from the creek. This project was led by Gold Ridge Resource Conservation District and Trout Unlimited and supported and partially funded by NOAA's Habitat Blueprint.

Lastly, the Forecast Informed Reservoir Operations ([FIRO](#)) is making progress. FIRO is an effort that is evaluating whether data from watershed monitoring and improved weather and water forecasting, particularly for intense events related to Atmospheric Rivers (ARs), can be useful to help water managers selectively retain or release

water from reservoirs (as appropriate and consistent with authorized project purposes and water control manuals that govern reservoir operations). FIRO is being developed and tested as a collaborative effort focused on Lake Mendocino that engages experts in civil engineering, hydrology, meteorology, biology, economics and climate from several federal, state and local agencies, universities and others. The preliminary viability assessment work plan recently completed describes an approach for testing whether detailed modeling and improved weather forecasting tools could benefit operations at Lake Mendocino. This proof-of-concept FIRO viability assessment uses Lake Mendocino as a model. If successful, the lessons learned here could have applicability to other water reservoirs in California.

NEXT STEPS

The [Storymap](#) of priority areas for conservation will be presented to the appropriate entities in the region (federal, state, tribal, and local government staffs as well as private landowners). Presentations will illustrate the most vulnerable areas and potential solutions, and engage partners in selecting 2-3 pilot projects along the coast for implementation. After securing the appropriate partnerships, project staff will convene site teams for each pilot project to develop conceptual implementation plans including conceptual design components and steps, goals and objectives of the adaptation project, roles and responsibilities, schedule, and communication strategies.

Potential partners that have already expressed an interest in working with the project teams within the Greater Farallones National Marine Sanctuary include: Marin County Planning Department, San Mateo County, Federated Tribes of Graton Rancheria, California Department of Fish and Wildlife, and the Bureau of Land Management. During this time, overlapping and complementary efforts will be identified throughout the region to leverage partnerships and resources. Using the Storymap as an outreach tool, funding will be sought for the development of conceptual implementation plans. Initial conceptual review will be conducted by a living shorelines expert and project engineer.

For work conducted in the Russian River Watershed, efforts like the NOAA Habitat Blueprint and other complementary initiatives will pursue identifying priority areas for coastal resiliency, water conservation and will realize the FIRO work.

DELIVERABLE

The California North-central Coast and Russian River Watershed Resilient Landscape has multiple products to help build and maintain an ecologically connected network of terrestrial, coastal, and marine conservation areas. The



Figure 5. California's North-Central Coast and Russian River Watershed Partnership map.

products are linked and described through a [Storymap](#). The Storymap describes the landscape, the priority issues, vulnerable species and species of concern, identifies priority areas for climate adaptation, and describes milestones accomplished. With the Storymap, users can access the Our Coast Our Future ([OCO](#)F) online sea level rise decision support tool to map vulnerable areas and areas of concern for coastal storms and sea level rise in communities as well as access adaptation strategies proposed and implemented in the landscape.

The most notable success of the RLW partnership was the increased communication and collaboration across various planning efforts and projects. Many common interests and needs, as well as opportunities for leveraging expertise and resources, came to the fore that we might not have taken advantage of if not for the impetus provided by having this new platform for partnerships. For example, to create the story map of priority locations for implementing selected adaptation strategies, NOAA has worked closely with our local agency partners (Sonoma, Marin and San Mateo counties, Sonoma County Water Agency), federal partners (BLM, USGS, CA LCC, Army Corps of Engineers) and local NGOs (Point Blue Conservation Science, BAECCC, Greater Farallones Association, Trout Unlimited, Resource Conservation Districts). We also had success in leveraging the 4th Ocean Climate Summit, held in San Francisco in May 2016, to inform the selection of priority sites and identification of appropriate management responses.

In addition, products like the FIRO viability assessment required support from multiple agencies at state and federal levels to begin discussions over how to improve weather and climate forecasting so that they provide useful and actionable information to water resources decision-makers.

CHALLENGES

The main challenge was bringing all necessary partners and stakeholders together to share information about all relevant efforts in the region. This landscape deals with two very different areas from watershed to coastal/open ocean. Both areas in some cases had the same partners and in others they were very different. The partners are also dealing with a variety of climate related issues at different time scales. For coastal issues, some of the solutions may be years to decades out. Within the watershed, some immediate benefits through water storage are occurring today.

LESSONS LEARNED

Involve as many relevant partners as is feasible from the start of any adaptation planning process to ensure common understanding and buy-in; ensure sufficient staff and expertise in order to provide the necessary resources for planning decisions to be made and to facilitate communication and cooperation among multiple partners. Additionally:

- Developing a GIS tool, such as a story map or layered PDF, allows all the partners to visualize areas of highest risk, assists in determining priority areas, and combines all partner projects for a given geographical area.
- This type of mapping tool works best when multiple partners are involved in a discrete geographical area.
- Communication between partners, sharing information, ideas, and lessons learned is critical. Bring the community together to speak about their concerns and how federal, state and local entities can pull in the adaptation strategies and solutions. Value the information and perspectives provided by the partners and stakeholders who bear the responsibility for different missions.



Figure 6. Black Oystercatcher, the species identified as most vulnerable to climate change through vulnerability assessments. Credit: Steve Lonhart, NOAA MBNMS.

CROWN OF THE CONTINENT

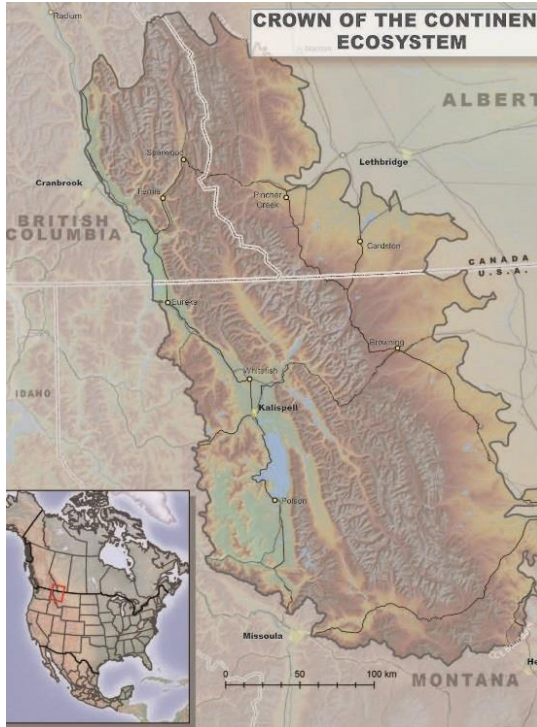


Figure 7. Crown of the Continent Partnership map.

The *Crown Managers Partnership (CMP)* is a voluntary transboundary partnership of state, federal and provincial agencies, universities, Tribes and First Nations in Montana, Alberta and British Columbia in the Crown of the Continent Ecosystem. The partnership formed in 2001 to address common ecological challenges across jurisdictional boundaries in the Crown of the Continent. Recognizing that no single agency has the mandate or resources to address landscape-scale environmental issues, the CMP and its partners are working to address stressors that transcend jurisdictions, such as climate change, invasive species, and land use, to conserve iconic species and the landscape processes that support them in the Crown of the Continent. Over time, the CMP has developed a Crown-wide [transboundary geospatial database](#) to inform management for ecological integrity in the Crown of the Continent.

In 2014, the CMP joined forces with the Crown Conservation Initiative (an NGO collaboration), the U.S. Forest Service's Northern Rockies Adaptation Partnership and The Wilderness Society to form the *Crown Adaptation Partnership (CAP)* to implement coordinated climate change adaptation strategies

across the Crown of the Continent ecosystem. The goals of the *Crown Adaptation Partnership* are to:

- Identify shared adaptation strategies that build resilience to current and projected climate change impacts to the forests and watersheds, wildlife and fish of the Crown of the Continent;
- Coordinate strategies at multiple scales to achieve borderless outcomes across the Crown;
- Identify and replicate examples of successful climate adaptation actions across the landscape; and
- Develop landscape-scale learning networks and adaptive management frameworks that identify and fill key information gaps.

A Crown-wide Climate Adaptation Workshop was held March 19-24, 2014 in Missoula, Montana where participants identified shared priorities at the landscape scale within the Crown.

Six climate change conservation priorities were identified at the end of the workshop including:

- Aquatic invasive species
- Five needle pine restoration
- Cold-water adapted native salmonids
- Terrestrial invasive plants
- Prescribed fire in mixed severity fire regimes
- Meso-carnivores and landscape connectivity

Since 2014, three workshops have been held, focusing on 1) Bull Trout and Westslope Cutthroat Trout, 2) Terrestrial Invasive Plants and 3) Five Needle Pine. Outcomes and on the ground actions from each workshop are listed below.

[Cold Adapted Native Salmonids](#)

- Crown-wide identification of native salmonid conservation populations most likely to benefit from adaptation actions.
- Focus on re-founding west-slope cutthroat trout in areas of climatically suitable habitat.
- Testing the strategy of native salmonid translocation to areas of potential climate refugia.
- Geospatially explicit Conservation Population Assessments for Native Salmonids (led by Muhlfeld, et al, USGS).

[Terrestrial Invasive Plants](#)

- Develop a common metric and protocols for inventory and detection.
- Prioritize hotspots for action based on a Crown-wide management strategy.
- Develop a data base of crown wide distribution of key invasive weeds and climate scenario projections for their populations.
- Develop external and internal communication strategy to increase awareness.
- Provide proven mitigations to control and reduce spread through common vectors and corridors.

[Restoring Five Needle Pine Forests](#)

- Establishing a multi-stakeholder Crown-wide five needle pine working group.
- Implement a multi-jurisdictional monitoring network and database.
- Communicate broadly to raise awareness and appreciation of the species.
- Develop standardized approaches for the use of fire in five needle pine forests.

[Landscape Connectivity](#)

In partnership with the University of Montana the CMP supported the work of a graduate student to locate the gaps in the physical landscape that prevent wildlife movement including grizzly bears, wolverines, Canada lynx and wolves in the Crown of the Continent as well as gaps in capacity for completing connectivity oriented conservation. This work is on-going.



Figure 8. View from Waterton Lakes National Park, Canada looking across the international boundary into Glacier National Park, USA. Credit: Ian Dyson.

NEXT STEPS

Canada lynx and wolverines and prescribed fire in mixed severity fire regimes are the two remaining natural resource targets identified for collaborative climate adaptation work at the scale of the Crown during the initial CAP workshop on March 2014.

A phased approach will be used to address meso-carnivores. In December of 2015, CAP collaborated with the National Forest Foundation and other partners in organizing a meso-carnivore monitoring workshop for the states of Montana, Idaho, Wyoming and Washington to better understand what we know about current distributions, status and jurisdictional priorities for meso-carnivores regionally. Planning for a meso-carnivore workshop will begin in 2016 with the workshop to take place in mid-2017. Collaborative work to establish Crown-wide learning networks around the use of prescribed fire in mixed severity fire regimes will commence in 2017. Coordinated work on prescribed fire will be coupled with efforts to identify successful regional strategies for applying this management tool in the face of a changing climate.

Many of the models that have been developed for the CMP could be applied to any region especially regions that are transboundary in nature. For more information visit: www.crownmanagers.org.

DELIVERABLES

1. [Transboundary Geospatial Datasets and Maps](#)

- Climate models of occupancy and distribution for a suite of priority invasive plants in the Crown of the Continent (Beltran, November, 2016)
- Human Modification Index layer for the Crown of the Continent (Blackadder, April, 2016)
- Conservation Population Assessments for Native Salmonids for the Crown of the Continent (Muhlfeld, Jones, Fall, 2017)
- Occupancy models for Whitebark pine and Limber pine in the Crown of the Continent (Blackadder, October, 2016)
- Monitoring locations and distribution of Eurasian Water Millefoil in the Crown of the Continent (Hanson, April, 2016)
- High risk lakes for Eurasian Water Millefoil in the Crown of the Continent (Hanson, April, 2016)
- Snowpack Analysis for the watershed units of the Crown of the Continent (Broberg, Chernoff, in review)
- NPScapes Crown of the Continent, Landscape Dynamics Trend Analysis for the Crown of the Continent (January, 2017)

2. [Conservation Strategies, Publications and Toolboxes:](#)

- A Crown Adaptation Toolbox for the Crown of the Continent (Carlson, April, 2016)
- We Need the Needles: Coordinating Action to Conserve 5-Needle Pine Forests in the Crown of the Continent (Nelson, et al. May, 2016)
- Crown-wide Management Strategy for Detection, Response and Containment of Aquatic Invasive Species; Eurasian Water Millefoil, Zebra and Quagga Mussel (in review, November, 2016)
- Using Historical Climate Data to Rank Watershed Climate Change Resilience (Broberg, Chernoff, In Review)
- Taking Action on Climate Change in the Crown of the Continent, Elsevier's Encyclopedia of the Anthropocene (Nelson, et al., In Review)
- Modelling Whitebark Pine across the Crown of the Continent Ecosystem (Blackadder, et al. In Review)

During the Resilient Lands and Waters Initiative the CMP has successfully engaged with other agencies in the US (EPA and BLM), has formed partnerships and is engaged in collaborative projects with the Great Northern Landscape Conservation Cooperative, NGO's and other groups throughout the Crown of the Continent

CHALLENGES

Challenges for completing many of the landscape scale efforts in the Crown of the Continent came via three forms: funding, capacity, and commitment. Funding for projects and workshops limited the resources that were available to complete priority outcomes and actions. Capacity of current partnership members is limited in a voluntary partnership ultimately impacting the progress and speed of the identified actions. The CMP seeks to formalize the transboundary work in this ecosystem by developing an MOU that would be signed by federal, provincial, state agencies with local universities that commits funding and ongoing participation. Efforts are continuing to address this.

LESSONS LEARNED

Workshops are an excellent tool for linking scientists, managers and stakeholders together to collaboratively develop priority outcomes. Greater capacity is needed to ensure follow-through on workshop action items and ultimately for the development of Crown-wide working groups to develop action plans and deliver on out-comes. Other lessons learned include:

- Develop common geospatial templates from which all partners can work.
- Communicate often with all partners involved in the partnership.
- Have in person meetings to re-connect and build relationships.
- Value input from all parties and divide workload appropriately.
- Be prepared to invest time to develop institutional comfort levels.
- Look for opportunities to raise profile and seek support.
- Celebrate and share successes.
- Learn from and share failures.

GREAT LAKES - LAKES HURON AND ERIE COASTAL WETLANDS

Coastal communities in the Great Lakes region require resilient coastal natural areas that can withstand natural and human-caused stressors, including a changing climate. Coastal wetlands support valuable benefits such as flood abatement, nutrient processing, and nursery habitat for fisheries. Historical settlement patterns in the 19th and 20th Centuries compromised some coastal processes including a dramatic reduction in both extent and quality of Great Lakes coastal wetlands. Now, in the face of a changing climate, it is more important than ever to invest in the conservation of coastal wetlands to ensure these areas continue to provide their valued benefits into the next century. However, major challenges to conserving coastal wetlands include understanding their condition, identifying the valuable benefits they provide, and developing a process to guide actions that result in a connected system of coastal wetlands resilient to future changes.



Figure 9. Great Lakes. Credit: MoDIS - NASA/NOAA.

The Upper Midwest and Great Lakes Landscape Conservation Cooperative's (LCC) Coastal Conservation Working Group (CCWG) is supporting coastal wetland conservation by informing strategic wetland investments through a process called Landscape Conservation Design (LCD). This collaborative approach establishes regional conservation goals and generates products, including spatially explicit decision support tools, that guide on-the-ground conservation projects towards activities that attain the goals.

For the Resilient Lands and Waters Initiative, the LCC CCWG selected its priority landscape based on the high level of importance of this coastal area to the Great Lakes region's people and natural resources. The area extends across 30 counties from Saginaw Bay in central Lake Huron to Old Woman Creek in central Lake Erie. The project area is bounded land-ward and lake-ward by elevations that encapsulate the long-term high and low Great Lakes water levels. This allows the work to accommodate the dynamic and ever changing nature coastal wetland areas have because of their direct linkage with changes in Great Lakes water levels.

The geography includes two Great Lakes and a connecting corridor comprised of Lake St. Clair and the St. Clair and Detroit Rivers. The area contains both some of the most environmentally stressed and some of the highest quality coastal habitats in the Great Lakes basin. Being one of the most human-altered landscapes, it contains multiple formally-designated "areas of concern" and includes major urban centers, such as Detroit, Michigan, and Toledo, Ohio. Upwards of 10 million people reside in the immediate vicinity and benefit from access to clean drinking water and some of the most valuable commercial and recreational fishing in the Great Lakes.

NEXT STEPS

In addition to the decision support tools described below, the LCC is supporting a new ecosystem services valuation study and tool informed decision making through Great Lakes Restoration Initiative implementation efforts. The LCC CCWG and NOAA's Office for Coastal Management are funding a project aimed at understanding and quantifying human benefits provided by coastal wetlands throughout the selected geography and the tradeoffs associated with current and future management decisions. The project will result in a Great Lakes Coastal

Wetlands Ecosystem Services Assessment (GLCWESA) with the goal of better informing land use planning and coastal natural resource management decisions to maximize resilience and reduce conflict associated with the decision-making process. The LCC CCWG has also initiated a cross agency implementation team that will use the deliverables from this initiative to make on-the-ground coastal wetland conservation decisions.

DELIVERABLES

The LCC CCWG worked with partners to develop two decision support tools, the Great Lakes Coastal Wetland Decision Support Tool (1a below) and the Great Lakes Coastal Wetland Restoration Assessment (1b below).

Additionally, the CCWG initiated a Landscape Conservation Design Process (2 below). The online mapping tools support the identification and prioritization of conservation actions for both existing Great Lakes coastal wetlands and areas that historically supported coastal wetlands.

In order to produce the maps, scientists compiled physical and biological data and analyzed them using geospatial analysis and geographic information systems.

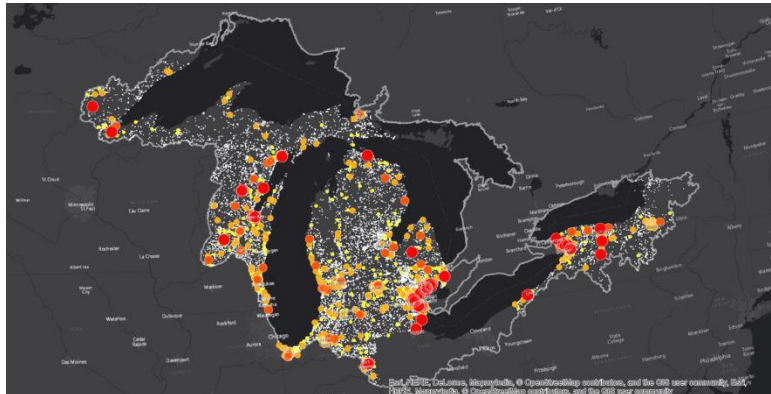


Figure 10. Great Lakes Decision Support Tool. Credit: NOAA Office for Coastal Management/Coastal Change Analysis Program, Brandon Krumwiede.

1. Decision Support Tools

- a. [Great Lakes Coastal Wetland Decision Support Tool](#): This tool was developed by partners at Northland College, Central Michigan University, the University of Minnesota-Duluth, and LimnoTech. The primary functions include data aggregation and viewing as well as interactive prioritization of wetlands for potential protection, restoration, or enhancement. Much of the data behind the prioritization tool are being generated by a Great Lakes basin-wide wetland monitoring program sponsored by US EPA through the Great Lakes Restoration Initiative.
- b. [Great Lakes Coastal Wetland Restoration Assessment \(Western Lake Erie / Connecting River Systems / Saginaw Bay – Lake Huron\)](#): The tool's layers and viewers were developed by an experienced team from the U.S. Geological Survey Great Lakes Science Center, U.S. Geological Survey Web Informatics and Mapping program, and New College of Florida. The tool is a web-based geospatial application that supports the identification and prioritization of potential coastal wetland restoration activities in the pilot area identified by the LCC CCWG. Funding was received from NOAA, USGS, the LCC, and the Great Lakes Restoration Initiative to aid in the tool's development.

2. Landscape Conservation Design (LCD): This collaborative approach is an iterative process that establishes regional goals and produces information, analytical tools, spatially explicit data, and best management practices to help make conservation decisions toward attaining regional goals.

CHALLENGES

We have learned a lot about multiple stressors that test our ability to effectively conserve Great Lakes coastal wetlands. The challenges we face and will continue to face include:

1. Working within a dramatically altered environment with legacy infrastructure and degradation;

2. Invasions of non-native species (e.g., *Phragmites australis* – common reed) and increased nutrient loading in Great Lakes watersheds;
3. Uncertainty associated with the impacts of climate change (e.g., water levels, flooding, temperatures); and
4. Restoring and enhancing an ecosystem that is managed at multiple scales and across state and international boundaries.



Figure 11. Tawas Point, MI Coastline. Credit: H. Stirratt.

Urbanization and other stressors create urgency for action as reflected by the coastal wetland conservation emphasis under the Great Lakes Restoration Initiative. Yet, even with this urgency and capacity, resource managers still need to identify where to take action to get the biggest return on investment.

There are still many questions relating to the conservation of coastal wetlands. For example, how many wetlands do we need to conserve in order to declare success? We know that each wetland provides a unique set of functions and services, depending on its condition and history. So, what are the appropriate measures of success and what are the best strategies to attain our goals?

The LCC is committed to convening interagency partners to answer these questions through the collaborative coastal wetland LCD process. The substantial progress made thus far could not have been achieved by any single agency. The partners that make up the LCC CCWG have made all this possible and will play a critical role in our future success. Together we can accomplish much!

LESSONS LEARNED

In this context, we learned that:

1. Managers and natural resource practitioners should be involved early and often in the development of shared goals (outcomes), decision support tools (outputs), and conservation strategies (means) for implementation purposes;
2. Quantifiable metrics to evaluate success are critical to track progress towards the desired outcomes;
3. It's important to consider spatial scales at all levels, so as to empower the "right" partners to employ the tools/strategies developed, where and how appropriate;
4. Change should be anticipated and planned for through adaptive decision making and feedback loops as part of the process;
5. Strategies will inevitably be under resourced to address scope and magnitude of large landscape issues - thus the importance of assessing return on investment; and

6. Science, tools, and data assist decision making, but ultimately decisions are human value based. This underscores the importance of social science and ecosystem services valuation studies going forward.

Other complex coastal geographies can incorporate these lessons learned in supporting restoration and enhancement activities. There is great potential for the coastal wetland LCD approach to be transferred and applied at multiple scales and in other regions. The same is true for deployment and use of the decision support tools that were developed as part of this initiative.

HAWAII

The Hawai'i Resilient Lands and Waters Partnership encompasses three discrete locations across the Hawaiian Islands, including West Hawai'i, West Maui, and the He'eia Watershed of O'ahu. It is led by the Pacific Islands Climate Change Cooperative (PICCC).

This project aimed to demonstrate the benefits of landscape-scale approaches to conservation and management that contribute to climate resilience by building upon existing collaborative inter-agency partnerships on three of the main Hawaiian Islands. These robust partnerships have been working to protect and restore ecosystems by reducing threats such as invasive species, land-based pollution, and wildfire. The goal under this Initiative was to further develop a federal partners' toolbox from the PICCC, NOAA, and EPA, aiming to coalesce collective products and services to augment the on-the-ground efforts already occurring.

The first step in articulating what needs to be done to enhance the resilience of Hawai'i's landscapes was identifying key organizations and partnerships working in the selected areas, followed by visually organizing past and current conservation and scientific efforts. More than 130 individuals from organizations working throughout Hawai'i's RLW sites were contacted in an effort to document past and ongoing resilience activities. Approximately 50 people from over 40 organizations provided information regarding their respective organizations, such as their goals, plans, actions, partnerships, and publications, as well as the consideration of climate change in their operations. Using data available online and through personal communication, initial base maps were created using the DataBasin platform, outlining RLW boundaries, the organizations functioning within these boundaries, and the activities being carried out related to climate change resilience.

The second step in the Hawai'i RLW project involved reviewing current climate change science for each of the three RLW sites, and utilizing this information to outline potential modifications to conservation work already being done, which would create greater resiliency across the land and ocean environments. A list of specific climate change impacts was developed for each site, accompanied by a list of organizations currently considering these impacts in their conservation and management efforts. Next, a list of potential modifications to current actions was drafted and accompanied by current scientific findings pertaining to each climate change impact. Lastly, examples of actions and strategic plans being implemented across the globe were compiled to illustrate the feasibility of implementing modifications. Completing this product required an extensive literature review detailing current research and findings pertaining to the impacts of climate change in and around islands, with specific focus on the Hawaiian Islands. This review led to the identification of the main environmental areas impacted by climate change in the three RLW sites. For the categorization of impacted areas, the literature review was again utilized to identify specific impacts resulting from climate change for each area in the landscape. With this information,



Figure 12. Production of sustainable, culturally-significant food such as taro (*Colocasia esculenta*) in Hawai'i is vulnerable to rising sea levels, which can salinize groundwater and inundate coastal lo'i kalo (taro fields). These fields are also essential habitat. Credit: Lucas Fortini, USGS & PICCC.

strategic plans for partnerships and organizations working in each of the three RLW sites were reviewed to note which were currently addressing any of the listed climate change impacts in the delineated areas. The results of this review, included climate change impacts, potential modifications to management actions, and exemplary remedies for climate change issues were shared with the partnerships working in the landscapes for their review. Many organizations and partnerships provided feedback in the form of updated reports, strategic plans, scientific studies, outreach material, and mapping data.

The RLW project identified over 10 key partnerships composed of federal, state and non-profit organizations working within the Hawai'i RLW sites on natural resource management and conservation. Besides identifying the key players across the landscapes, mapping their efforts was a strategic tool that will be used for years to come to highlight gaps in knowledge and potential areas for combining efforts.

Whether through research and monitoring of an ecosystem or species, collaboration between organizations with common goals, measuring efficiency of an ecosystem service, or education of human inhabitants to enhance understanding and awareness of their surroundings, this mapping tool is and will continue to be an invaluable asset when it comes to building climate change resilience in Hawai'i.

Another significant product from the RLW project in Hawai'i is an up-to-date list of scientific findings across the Hawaiian landscapes to demonstrate the current knowledge regarding each issue, from coral reef health to anchialine pool species composition to invasive species removal. By identifying who is working across the RLW sites, what they are doing specifically, how operations can be improved to increase resilience, and distributing this information far and wide, organizations and partnerships will be able to communicate best practices and efforts locally and between the islands.

NEXT STEPS

By identifying current efforts outlined in conservation actions plans, partnership agreements, community outreach programs, etc., leaders within the respective communities whether scientific, governmental, or grass roots may learn how to improve upon their own entities efforts towards enhancing resilience. The information provided in the Storymap also demonstrates examples of resilience activities in specific ecosystems and regions that may be mimicked and potentially implemented in like circumstances elsewhere. The Hawaiian Islands are immensely variable not only between islands but even within each individual island; microclimates and subregions create very different issues with unique consequences and solutions. In light of this, landscape scale solutions that may often work for a landscape in the contiguous United States may be less relevant at the small scales seen in Hawai'i or other island regions. The Storymap offers a platform where organizations and partnerships can learn from others' successes and mistakes.

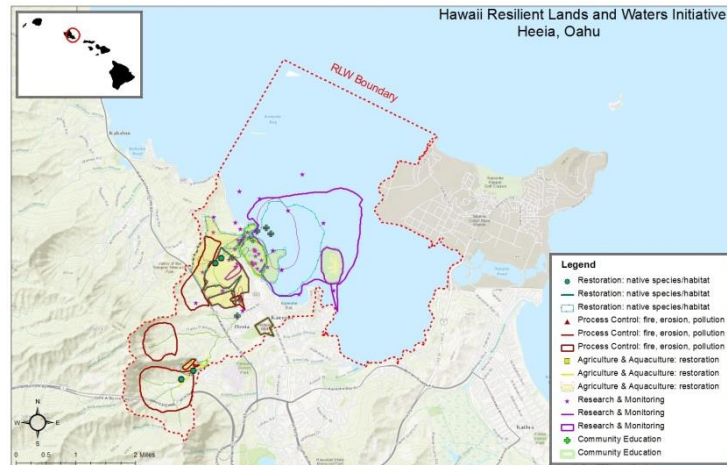


Figure 13. He'eia is located on the island of O'ahu just north of Kaneohe. The RLW Initiative site spans the watershed from the mountains to the ocean, with numerous organizations working in areas such as natural resource management, sustainable food production, and ancient fish pond restoration. Credit: Oliva Schubert, PICCC.

DELIVERABLE

The Hawai'i Storymap was created so that the information gathered and generated throughout the RLW Initiative in Hawai'i will live on past the completion of the project for organizations and partnerships to utilize and build upon. The Storymap offers information about resilience on a nationwide level and at the local scale. Pages within the Storymap detail the current efforts across the islands to enhance resilience not only in the landscapes but throughout the community. The key deliverables of this project are:

- An overall [report](#) of the Hawai'i RLW initiative and results.
- An online ESRI [Storymap](#) which details the nature of the RLW nationwide and highlights the specific efforts in Hawai'i.
- [Current scientific findings](#) regarding climate change, and suggested actions which partnerships can take to increase resilience, for each of the three RLW sites.
- [Maps and accessible data files](#) of resilience activities throughout the three sites.

CHALLENGES

Challenges throughout this process included: making contact with organization leads; timely and complete information requests; delineating organization boundaries/duties and overlaps; attempting to engage each and every partnership working in the RLW sites and identifying all projects and plans currently being enacted in these areas.

LESSONS LEARNED

- Organizations may be doing resilience activities without knowing it
- Many organizations have not yet integrated climate change into their plans
- Even within a small geography like Hawai'i, organizations are often unaware of others doing similar activities
- Based on proximity and project type, organizations may be able to combine efforts to increase impact and potentially decrease costs
- Many organizations are already performing actions across the landscapes that are addressing one or more impacts of climate change
- Some of the climate change impacts are beyond control or scope of the organizations/partnerships
- Many existing organizational/partnership plans are not up-to-date with scientific findings
- There are numerous areas where efforts to address climate change impacts are overlapping, however there are also areas where they aren't being addressed at all

BEST PRACTICES

- Face-to-face meetings with organization leads
- Site visits to understand the breadth of work being done
- Simple and easy survey questions
- Reaching out to collaborators already working with partnerships in the RLW sites to initiate contact with partnership leads
- Maintaining constant and clear contact with collaborating agencies (EPA, NOAA)

SNOHOMISH RIVER WATERSHED

NOAA is cultivating partnerships in Snohomish County to organize diverse agency resources to speed local conservation efforts that sustain water supply, restore fisheries, reduce flood risks, and support agricultural production. The crux of this approach involves designing floodplains that support diverse values, including support for rural economies and protection of tribal treaty rights, while anticipating the effects of climate change. Lessons learned in the Snohomish will be applied to other watersheds in Puget Sound.



Figure 14. Salmon smolts depend on the weight gain from estuarine rearing to increase survival, and strengthen future returns, buffering the population for climate impacts. Credit: Long Live the Kings

Puget Sound recovery planning accelerated following proposed listing of Chinook salmon under the Endangered Species Act in 1999. Salmon recovery, the continued work of the National Estuary Program, implementation of the Clean Water Act, and a diversity of interrelated federal and state efforts have produced a deep “paper trail” of plans, reports, analyses, and priorities. Under the Puget Sound Partnership, agencies identified shared goals, described in the [Puget Sound Vital Signs](#). But climate change and rapid development threaten the ecosystem services that have supported communities in the Salish Sea for 5,000 years.

The Resilient Lands and Waters initiative weaves together new trends in Puget Sound ecosystem management to improve local implementation. The cornerstone is the

[Snohomish Sustainable Lands Strategy \(SLS\)](#) which brings together tribes, agencies and farmers to develop a vision for sustainable land management in floodplains. This work is stimulated by [Floodplains by Design](#), a new state funding source to support the kinds of multi-benefit projects SLS aims to develop. The resurgence of tribal activism under [Treaty Rights at Risk](#) pressures local, state, and federal agencies to defend the fisheries promised under U.S. treaty—fisheries now threatened by development and climate change. Treaty Rights at Risk prompted federal and state agencies to examine their business practices. NOAA, EPA and the Puget Sound Partnership convened an experiment labeled [Coordinated Investment](#) to organize agency resources so they better empower local initiative. This work builds on “Lean Management” ideals already being propagated in state government to reduce waste.

Salmon recovery exposes a “wicked problem,” meaning it is complex and that there is no obvious solution. The grave state of salmon largely results from 100 years of landscape modification. Solutions in the Snohomish include both big river engineering projects, and citizens working at a parcel scale. There are no quick fixes. Priorities are most meaningful when they describe first steps in a sustained strategy. Effective early actions restore acres, but also build social networks that strengthen future work.

The Resilient Lands and Waters Initiative helped partners focus on Snohomish County as a “sand box” where we could work on institutional innovation. Snohomish County is on the cutting edge of population growth, with a strong but struggling agricultural economy, and significant but depressed wild salmon populations—the kind of place where Puget Sound salmon recovery will critically succeed or fail.

Governance experiments in Snohomish happen at two discrete levels. Within Snohomish County, the Sustainable Lands Strategy forges a shared local vision. The Sustainable Lands Strategy was convened by the Snohomish County Council to create a table for agricultural, tribal, and environmental leaders to share information and goals for ecosystem management. For locals, coordinated investment provides a “bottom-up” forum for collaboration, and to organize state and federal agency resources to support on-the-ground needs. Agency executives convened the “top down” coordinated investment work group to improve agency business practices so they empower local ecosystem efforts. This push and pull between bottom-up and top-down governance drives the Snohomish effort. Regional agencies challenge local leaders to design an exemplary local response to wicked problems. In exchange, local leaders challenge regional agency executives to align and organize their assets to empower implementation.

Dedicated staff move between local and regional arenas carrying information, questions, and ideas—interviewing agency program managers and local project developers to identify and clarify opportunities for improvement. We looked to the existing flow of resources to identify *de facto* priorities. We organized existing documents about fish, clean water, flooding, and agriculture, and brought together teams that cross traditional stovepipes. Through this process we have identified a set of “situations” where integrated teams not only increase ecosystem services, but also test ideas, and improve practices (see map).

In this model, opportunities are not invented at big meetings, and are often too messy to appear in agency reports that promote program budgets. Our strength has been on identifying local needs in on-the-ground situations, and finding the staff and resources to launch practical collaborations to fill those gaps. This is not a criteria-based analysis, and does not ask individual institutions to reduce their autonomy to a centralized planning, but rather mobilizes diverse partners toward shared goals. The strength of an effort comes by defining an obvious opportunity to do something of shared value—clear forward steps that advance a sustained local strategy. This opt-in process is propelled by the weight of local consensus.

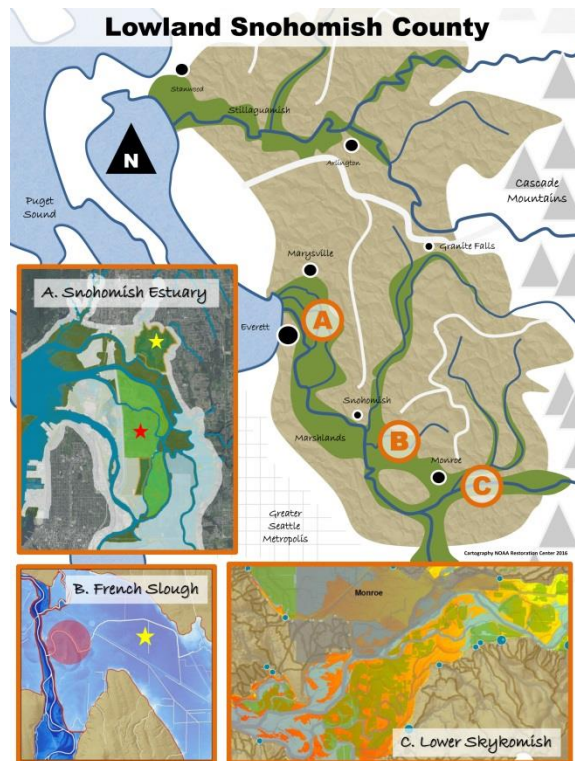


Figure 15. Integrated Snohomish teams are developing multiple landscape efforts: A) Continuing restoration in the estuary, where Qwuloolt (yellow), will be followed by Smith Island (red), to restore large portions of the historic delta (white), and expanding remaining Chinook salmon rearing habitat (green); B) French Slough is a target for regulatory coordination where subsidence threatens farm viability and requires pumping (star), while system modification creates recurring water quality problems (red); and C) Lower Skykomish where reach-scale planning creates designs that integrate habitat, flood (blue), agriculture (green), and energy infrastructure projects to restore salmon and sustain farming communities in an uncertain future.

NEXT STEPS

- **Snohomish Estuary Restoration.** Large scale restoration will continue on subsided lands that are least valuable for agriculture. Monitoring is currently cobbled together by local staff of the Tulalip Tribes, NOAA, Snohomish County, and USGS to evaluate fish response and verify restoration hypotheses.

- **On-the-ground Interagency Teams.** To accelerate the rate of project implementation will require organizing agency labor in alignment with local vision. We are exploring ways to build both capacity and strategies for sustaining interagency teams, where our labor is focused on changing ecosystems, rather than writing reports.
- **Integrated Project Development in the Lower Skykomish.** Our next focus area is the Tualco Valley, upstream of the Snoqualmie-Skykomish confluence. This “reach-scale plan” reflects the convergence of a variety of efforts to protect agricultural lands, restore fish habitats, and develop shared objectives for landscape management (*see map inset C*)
- **Regulatory Coordination in Agricultural Floodplains.** We are building shared regulatory strategies among NOAA, US Army Corps of Engineers, State Ecology, and Fish and Wildlife, to increase dialog, and empower local conservation. These efforts are supported by increased analysis of sea-level rise impacts to low lying farm lands (*see map inset B*).
- **Collaborative Community Engagement** - Most citizens in the county don’t know much about natural resource management. We are building our collective capacity to produce and share stories that capture the imagination and energy of communities that values rural economies and natural resources, but often feel excluded from government.

DELIVERABLES

- **National Recognition** - There was a psychological effect of the Resilient Lands and Waters designation and its implicit support for long term, whole systems thinking. Local partners believed that they might be recognized and rewarded for their willingness to take on wicked problems. Sustaining and rewarding that effort is important.
- **Snohomish Estuary Restoration** - A key milestone in the restoration of the Snohomish River Estuary was met with the inundation of the [Qwuloolt restoration site](#) (meaning “marsh” in the Lushootseed language). Qwuloolt is the first in a series of projects that will meet the 10-year estuary restoration goal for Snohomish Chinook salmon (*see map inset A*). The RLW initiative helped secure the funding package for [Smith Island Restoration](#), the next step in estuary restoration.
- **Ecosystem Recovery Story Maps** - Conversations about multi-benefit restoration have led to development of [regional story maps by NOAA](#) and a [Snohomish Estuary story map by SLS partners](#) to begin telling the multi-faceted stories of landscape restoration.
- **Climate Change Analysis** - The resilience designation has amplified work by the University of Washington Climate Impacts Group ([Mauger et al 2015](#), [Mauger et al 2016](#), [Whitely Binder and Morse 2016](#)) and ongoing coastal [resilience efforts led by Washington Sea Grant](#). The Tulalip Tribes in turn hosted a two day sea level rise summit, resulting in a pending proposal to explore climate change threats to low-lying farms in the Snohomish and Stillaguamish estuaries.
- **Coordinated Investment** - Sustainable Lands Strategy has been invigorated by the opportunity to engage [the Coordinated Investment team](#). A proposal for agency “improvement projects” developed through local collaboration, are making their way to regional executives, including the new CEQ supported [Puget Sound Task Force](#).
- **Non-traditional Partnerships** - The agency commitment to the Snohomish Sustainable Land Strategy has increased interaction between agricultural leaders and agency staff, strengthening understanding about tribal rights, salmon recovery, and agency impacts on farming. This dialog culminated in [a “Farm to Table” dinner in the Snohomish estuary](#) attended by agency leadership and hosted by diverse factions of the Snohomish agricultural community, invigorating our next steps.

LESSONS LEARNED

1. **Collaborative solutions to wicked problems may require tension between local and regional actors.** Local governments understand the on-the-ground situation, but many not have the political will or capacity to

tackle ecosystem management. Indian nations have the will, but lack the authority of state and federal governments. State and federal agencies have resources, but weak local intelligence, and have little incentive to collaborate. Effective efforts will leverage these relative strengths and weaknesses to stimulate coordination action.



Figure 16. State, federal and tribal agencies piece together resources to collaborate in monitoring fish populations, while providing paid internship opportunities for returning veterans. Credit: Long Live the Kings.

2. **A strong, loud, coordinated, local voice is vital** in maintaining focus among state and federal partners. The strength of that voice comes from a clear understanding of common purpose among diverse partners. This has the potential to cause a feedback loop, where strong local consensus yields strong agency engagement, which encourages strong local consensus. However, local groups may not have the clearly articulated objectives that can cohere into a sustained strategy for action.

3. **Scale is important when working on wicked problems.** Too large a scale, and efforts

are mired in complexity. Too small a scale and you are not effectively grappling ecological problems. While watershed planning is vital, the county is where government, land use, and community values collide, and is a critical scale for institutional organization. Planning naturally occurs at a sub-basin scale, where you can accurately identify problems and barriers, but still gather the key players in a room and have a conversation.

4. **Dedicated staff laboring between meetings is essential.** Big ideas, innovation, and opportunities are found through many small conversations at all levels of government and community. Ideas need to be identified and cultivated through interviews, conversations, and the maintenance of networks. Agencies left alone can find themselves in small orbits, endlessly reframing old problems.
5. **Agencies don't have incentive systems that reward collaboration and information sharing** at the level necessary to solve wicked ecological problems. Maintaining high levels of information flow requires consistent effort and dedicated staff. Agencies are conditioned to frame problems in a way that supports their institutional requests for budget or authority. To drive agencies into collaboration may require external forces to redefine ecosystem management problems in a way that demands agency collaboration.
6. **We face an essential problem of maintaining agency attention** in an institutional landscape punctuated by legal crises and competition for one or two year budgets. Transformative efforts require consistent direction and momentum over time. We work to identify and cultivate dedicated individuals within agencies, and build redundancies that can survive the inevitable shifting of leadership.
7. **Solving problems is a very personal affair**, requiring consistent participation by skilled and motivated individuals. Workgroups of three to five strong players can be stable while remaining nimble. It is a challenge for a community with many institutions to trust a small workgroup to protect their interests, however big tent committees cannot innovate or do project management. Cultivating trust requires demonstrating trustworthiness, which takes time.

SOUTHWEST FLORIDA

The landscape conservation design and mapping of priority resources for Southwest Florida will be the foundation framework to determine where to focus various voluntary and non-regulatory conservation incentives in the future. The strong partnerships involved will provide the needed interagency coordination and landowner and stakeholder involvement to apply incentives to meet the conservation targets for this region and provide resilience from future threats.

The southwest region of Florida consists of a number of diverse habitats including coastal mangroves, sea grasses, oyster reefs, Everglades wetlands, pine flatwoods, and rivers/estuaries. The area hosts a variety of endangered species including the iconic Florida panther. Public lands include the western side of the Everglades, Big Cypress National Preserve, Panther and Everglades Headwaters National Wildlife refuge, as well as other state and local parks. Threats include rapidly increasing urbanization, increased land use changes, invasive species, sea level rise, and changing patterns of precipitation and temperature. Florida has over 20,400,000 people and the population is predicted to reach 36,000,000 by 2060 with the southwest part of the state being one of the fastest growing areas. The Cooperative Conservation Blueprint for Florida (CCB) and Peninsular Florida Landscape Conservation Cooperative (PFLCC) have both designated this area as a focal zone and have developed strong partnerships with private land owners, federal and state agencies, the Southwest Florida Regional Planning Council and NGOs such as The Nature Conservancy.

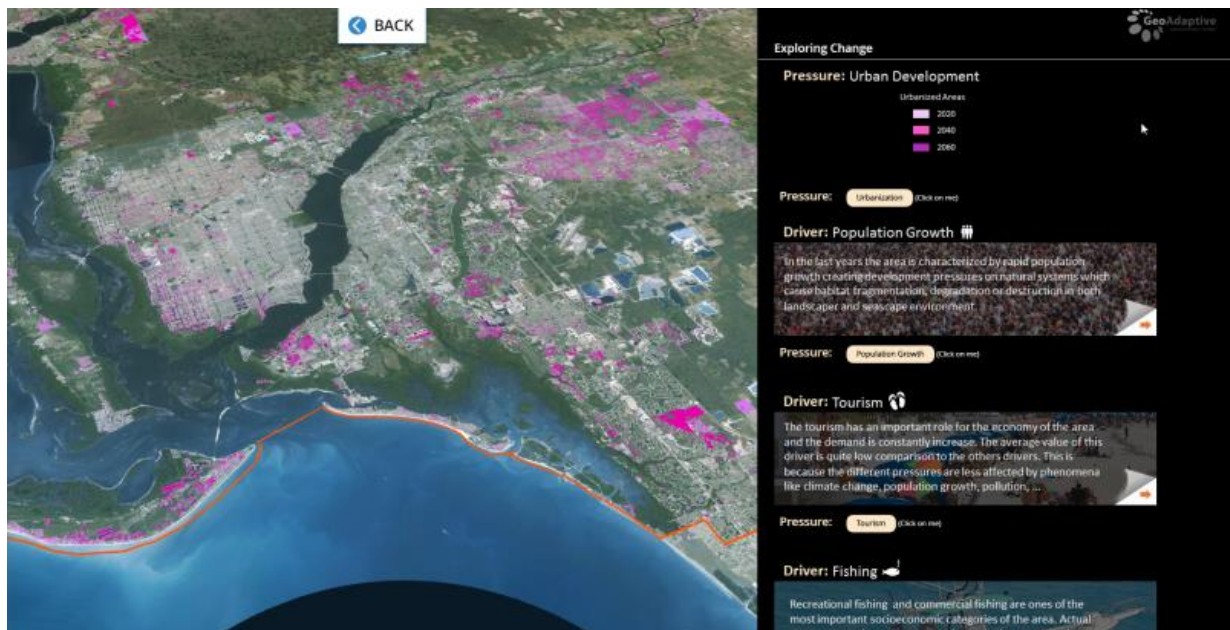


Figure 17. Interactive visualization exploring drivers and pressures associated with development and climate change through 2060. Credit: GeoAdaptive.

This process of evaluating the vulnerability and resiliency of southwest Florida’s natural resources has built upon numerous existing partnerships and a series of recent conservation planning projects in the region. In particular, the following efforts and collaborators have been essential in the identification of essential ecosystem services and their contribution towards the resilience of these landscapes:

Project Title	Focus	Organizations
Impact Assessment for the Florida Panther National Wildlife Refuge Contextual Landscape	Evaluation of the implications of land use change and future growth on lands surrounding the Florida Panther Refuge to support managers in updating their Comprehensive Conservation Plan	USFWS, FL Fish and Wildlife Conservation Commission (FWC), GeoAdaptive, GeoDesign Technologies
Impact Assessment & Landscape Conservation Design: Peninsular Florida Landscape Conservation Cooperative (PFLCC)	Development of a spatiotemporal impact assessment and conservation target model methodology for selected species in the central and northern extent of the PFLCC region	USFWS, FWC, GeoAdaptive, GeoDesign Technologies
Implementation of a Scenario-based Model of Adaptation Planning for the South Florida Marine Environment (KEYSMAP2)	An evaluation of the choices and effectiveness of potential management actions, triggered by climate-induced environmental changes, to minimize or prevent negative impacts to coastal marine species across a range of urbanization and climate change scenario conditions.	FWC, GeoAdaptive, GeoDesign Technologies
Southeast Resilience Project	Identification of resilient areas with a diversity of habitats and heightened connectivity, which represent potential conservation priorities	The Nature Conservancy
Comprehensive Southwest Florida/Charlotte Harbor Climate Change Vulnerability Assessment	Examination of future climate change scenarios and their effects on biophysical and human systems in southwest Florida	Southwest Florida Regional Planning Council (SWFRPC), Charlotte Harbor National Estuary Program (CHNEP)
Florida’s State Wildlife Action Plan	Outline of species and habitats in need and the strategies that will be required to protect them	FWC, Florida’s Wildlife Legacy Initiative (FWLI)
NOAA/COCA ecosystem services and valuation project	Linking ecosystem services to risk and resilience	NOAA’s Coastal and Ocean Climate Adaptation Program
City of Punta Gorda Adaptation Plan	Identification of alternative adaptations to address climate change vulnerabilities	City of Punta Gorda, SWFRPC, CHNEP
Critical Lands and Waters Identification Project (CLIP 3.0)	Spatial prioritization of the lands and waters in most critical need of preservation	Florida Natural Areas Inventory (FNAI), University of Florida GeoPlan Center

The outcomes of these previous efforts have been integrated into the process of selecting the most impactful driving forces and pressures generating changes to the region’s natural environment, their potential effects on important regional ecosystem services, and the spatial analysis of projected impacts of urbanization, sea level rise, and habitat loss through 2060. An additional analysis of coastal vulnerability, considering the protective capacity of

coastal ecosystems, was implemented using the Natural Capital Project’s InVEST model to evaluate impacts of storm surge on coastal communities. Conservation priorities were identified based on the results of these assessments, coupled with habitat areas previously indicated as resilient or otherwise critical for preservation.

Building on the robust and diverse range of prior scenario assessments and natural resource prioritizations has been one of the most significant successes of this project. Without the expert input and collaborative analysis of future changes to the natural and built environment of southwest Florida, it would not have been possible to effectively consider the climatic and human development pressures on the region’s biophysical assets. Previous partner’s efforts have already been incorporated into local management plans and other planning efforts. In addition, the creation of a story-driven visualization tool (Figure 17) provides an effective outreach tool for an audience that encompasses resource managers, policymakers, regional planners, and the general public.

NEXT STEPS

The prospects for future work stemming from this project include expanding the range of ecosystem services to include more complex topics such as water and nutrient regulation, aesthetic value, and recreation, as well as considering more localized impacts on specific habitat types and indicator species. This analysis could also be expanded to cover the entire Gulf region, which is subject to many of the same climatic and development pressures, while encompassing different ecosystems and additional natural and human-induced threats. Final reports and data sets will be included on the [PFLCC Conservation Planning Atlas](#).

DELIVERABLE

	Ecosystems Function and Services (Worldwide)	Description	Number of Studies
SUPPORTIVE	Nutrient cycling	Storage, processing, and acquisition of nutrients within the biosphere	☆☆
	Net primary production	Conversion of sunlight to biomass	☆☆
	Pollination and seed dispersal	Movement of plant genes (considered terrestrial, but marine systems may facilitate dispersal for some coastal species)	☆☆
	Habitat	The physical place where organisms reside	☆☆☆☆
REGULATING	Hydrologic cycle	Movement and storage of water through the biosphere	☆☆
	Gas regulation	Regulation of the chemical composition of the atmosphere and oceans	☆☆
	Climate regulation	Regulation of local climate processes	☆☆☆☆
	Disturbance regulation	Dampening of environmental fluctuations and disturbance	☆☆☆☆
	Biological regulation	Species interactions	☆☆☆☆
	Water regulation	Flow of water across the planet surface	☆☆☆☆
	Soil retention	Erosion control and sediment retention	☆☆☆☆
PROVISIONING	Waste regulation	Removal or breakdown of non-nutrient compounds and materials	☆☆☆☆
	Nutrient regulation	Maintenance of major nutrients within acceptable bounds	☆☆☆☆
	Water supply	Filtering, retention, and storage of fresh water	☆☆
	Food	Provisioning of edible plants and animals for human consumption	☆☆☆☆
	Raw materials	Building and manufacturing, fuel and energy, soil and fertilizer	☆☆☆☆
CULTURAL	Genetic resources	Genetic resources	☆☆
	Medical resources	Biological and chemical substances for use in drugs and pharmaceuticals	☆☆☆☆
	Ornamental resources	Resources for fashion, handicraft, jewelry, pets, worship, decoration, and souvenirs	☆☆☆☆
	Recreation	Opportunities for rest, refreshment, and recreation	☆☆☆☆
	Aesthetic	Sensory enjoyment of functioning ecological systems	☆☆☆☆
	Science and education	Use of natural areas for scientific and educational enhancement	☆☆☆☆
	Spiritual and historic	Spiritual or historic information	☆☆☆☆

The final product of this effort is an interactive [website](#) that integrates Storymaps, graphics, and written descriptions of the Southwest Florida region and the anticipated changes to natural and built areas through 2060. The site introduces visitors to environmental and development-driven stressors, ecosystem services, and implications for resilience. This tool provides a visual overview of the distribution and function of important natural resources, an analysis of how they help to mitigate the effects of climate change, and an assessment of the impacts of two different development scenarios.

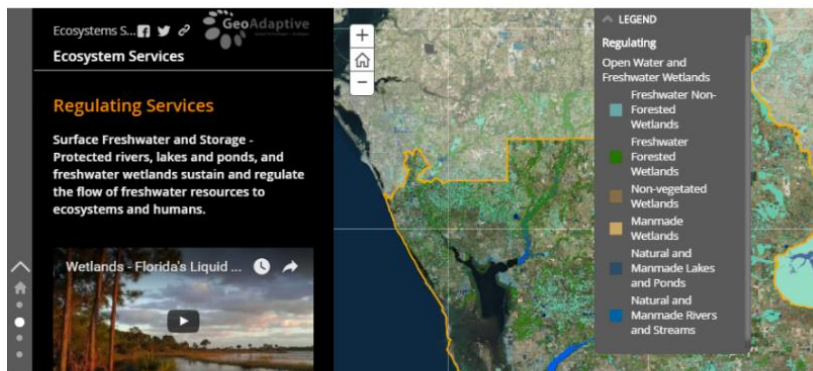


Figure 18. Summary of ecosystem services introducing a Storymap with examples from Southwest Florida. Credit: GeoAdaptive.

CHALLENGES

Some of the key challenges encountered in this process have been integrating data produced by projects that addressed a variety of topics and geographic scales. Objectively defining prioritization criteria that consider both high value habitats and more anthropocentric ecosystem services also proved difficult in a region with resources valued for many reasons. Among the lessons learned from this process were, the need to identify the appropriate technological tools early on, including modeling applications and visualization platforms, as well as reaching out to partners throughout the process to collect all the relevant inputs and evaluate the utility of the products.

LESSONS LEARNED

Each phase of the analytical approach implemented through this effort has strong potential to be applied in other regions with differing conservation priorities. Through the evaluation of drivers and pressures, as well as the ecosystem services prioritization, the approach can be customized to the specific issues and habitat types present in other study areas. The use of scenarios to evaluate anticipated changes also has universal applicability, though the specific expertise required and driving forces will be unique to the project area.

Some of the methods applied, particularly the InVEST coastal vulnerability model, are most appropriate for populated coastal areas subject to tropical storms and wave activity. Lastly, the visualization tool and its use of a storytelling approach can be readily adopted by similar efforts in the future, in order to provide a hands-on tool for sharing some of the critical concerns about resilience and the value of natural landscapes.

APPENDIX. PARTICIPANTS IN EACH PARTNERSHIP

CALIFORNIA HEADWATERS

- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service
- Bureau of Land Management
- U.S. Department of Agriculture
- National Oceanic and Atmospheric Administration
- National Park Service
- California Air Resources Board
- California Environmental Protection Agency
- California Natural Resources Agency
- California Department of Water Resources
- California Department of Forestry and Fire Protection
- California Conservation Corps
- California Department of Fish and Wildlife
- California Tahoe Conservancy
- Department of Parks and Recreation
- State Lands Commission
- Strategic Growth Council
- Placer County Resource Conservation District
- Rural County Representatives of California
- Association of California Water Agencies
- California Forestry Association
- CA Farm Bureau Federation
- The Nature Conservancy
- American Rivers
- Sierra Forest Legacy
- California Association of Resource Conservation Districts
- Mountain Counties Water Resources Association
- National Fish and Wildlife Foundation
- California State Association of Counties
- National Forest Foundation
- Sierra Business Council
- Pacific Forest Trust
- Sierra Water Working Group

CALIFORNIA'S NORTH-CENTRAL COAST AND THE RUSSIAN RIVER WATERSHED

- U.S. Army Corps of Engineers
- NOAA
- Federal Emergency Management Agency
- U.S. Geological Survey
- Natural Resource Conservation Service
- U.S. Fish and Wildlife Service
- U.S. Fish and Wildlife Service – Landscape Conservation Cooperative
- National Park Service
- Bureau of Land Management
- Bureau of Reclamation
- California Department of Fish and Wildlife
- California Coastal Commission
- California Coastal Conservancy
- California Department of Parks and Recreation
- Department of Water Resources
- Sonoma Resource Conservation District
- Gold Ridge Resource Conservation District
- Mendocino Resource Conservation District
- Ocean Protection Council
- Sonoma County Water Agency
- Sonoma County Permit and Resource Management District
- Sonoma County Agricultural Preservation and Open Space District
- Marin County Planning Agencies
- Mendocino County Russian River Flood Control and Water Conservation Improvement District
- San Mateo County Parks Department
- San Mateo County Planning
- San Mateo County Resource Conservation District
- Dry Creek Rancheria Band of Pomo Indians
- U.C. Berkeley
- U.C. Davis Cooperative Extension (Sonoma and Mendocino)
- U.C. Davis Bodega Marine Laboratory
- U.C. San Diego SCRIPPS Institution of Oceanography
- U.C. Sea Grant
- Stanford University
- Sonoma County Wine Grape Commission
- Sonoma and Mendocino County Farm Bureaus
- Point Blue
- Point Blue Conservation Science
- Bay Area Ecosystems Climate Change Consortium
- Greater Farallones Association
- EcoAdapt

- Trout Unlimited
- The Nature Conservancy
- National Fish and Wildlife Foundation
- Russian Riverkeeper
- Center for Ecosystem Management and Restoration
- Federated Indians of Graton Rancheria
- Stewards of the Coast and Redwoods

CROWN OF THE CONTINENT

CROWN MANAGERS PARTNERSHIP-MEMBER AGENCIES:

- United States Forest Service, Flathead National Forest
- United States Forest Service, Lewis and Clark National Forest
- National Park Service -Glacier National Park
- NPS, Rocky Mountain Cooperative Education Studies Unit
- Parks Canada/Waterton Lakes National Park
- U.S. Fish & Wildlife Service
- U.S. Geological Survey
- U.S. Fish & Wildlife Service
- U.S. Environmental Protection Agency
- Great Northern Landscape Conservation Cooperative
- Natural Resources Conservation Service
- Blood Tribe Land Management
- Confederated Salish and Kootenai Tribes
- Blackfeet Tribe
- Ktunaxa First Nation
- Blackfoot Confederacy
- Alberta Cows and Fish
- Alberta Parks and Environment
- Montana Department of Natural Resources and Conservation
- Montana Department Fish, Wildlife and Parks
- Flathead Basin Commission
- Government of Alberta
- British Columbia Ministry Forests Lands and Natural Resources
- Lethbridge Northern Irrigation District
- Cardston County
- City of Lethbridge
- MD of Pincher Creek
- MD of Ranchland
- Powell County Weed District/Blackfoot Challenge
- Regional District of East Kootenay, British Columbia
- University of Calgary, Canada
- University of Montana, Montana
- Flathead Lake Biological Station
- Miistakis Institute of Calgary
- Mount Royal University
- Montana State University
- University of Lethbridge
- University of Alberta
- Canadian Council on Invasive Species
- The Wilderness Society
- Blacktail Resources
- Chimney Rock Bed and Breakfast
- CoolPro Solutions Environmental Consulting
- Land Wise
- Working Dogs for Conservation
- Burt Riggall Environmental Foundation
- Canadian Parks and Wilderness Society - Southern Alberta
- Castle Crown Wilderness Coalition
- Center for Large Landscape Conservation
- Crown of the Continent Conservation Initiative (CCCI)
- Crown Adaptation Partnership
- Crown Roundtable
- East Kootenay Invasive Plant Council
- Heart of the Rockies
- Flathead Lakers
- Helen Schuler Nature Conservancy
- Kresge Foundation
- National Parks and Conservation Association
- Nature Conservancy of Canada
- Rocky Mountain Front Weed Round Table
- The Nature Conservancy
- Yellowstone to Yukon Conservation Initiative
- Wildlife Conservation Society
- Wilburforce Foundation
- Wildsight
- Waterton Biosphere Reserve Association

GREAT LAKES - LAKES HURON AND ERIE COASTAL WETLANDS

- National Oceanic and Atmospheric Administration
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- National Park Service
- Bureau of Indian Affairs
- U.S. Environmental Protection Agency
- Wisconsin Department of Natural Resources
- Minnesota Department of Natural Resources
- Illinois Department of Natural Resources
- Michigan Department of Natural Resources
- Ohio Department of Natural Resources
- Illinois Natural History Survey
- Upper Midwest and Great Lakes Landscape Conservation Cooperative
- Great Lakes Restoration Initiative Habitat Committee
- Great Lakes Wetlands Consortium
- Environment and Climate Change Canada
- Sault Tribe of Chippewa Indians
- Saginaw Chippewa Indian Tribe
- Ontario Ministry of Natural Resources
- Great Lakes Commission
- The Nature Conservancy
- Ducks Unlimited
- Audubon
- National Fish and Wildlife Foundation
- Association for State Flood Plain Managers
- University of Minnesota
- University of Wisconsin
- University of Michigan
- Oregon State University
- Grand Valley State University
- University of Notre Dame
- Lake Superior State University
- State University of New York
- University of Windsor
- Central Michigan University
- Northland College
- New College of Florida

HAWAII

PICCC CHARTER MEMBERS

- American Bird Conservancy
- Bishop Museum
- Hawai'i Conservation Alliance
- Pacific Birds Habitat Joint Venture
- Kamehameha Schools
- National Park Service Inventory and Monitoring
- National Park Service Pacific West Region
- National Oceanic and Atmospheric Administration
- Office of Hawaiian Affairs
- Pacific Science Association
- State of Hawai'i Department of Land and Natural Resources Division of Aquatic Resources
- State of Hawai'i Department of Land and Natural Resources Division of Forestry and Wildlife
- The Nature Conservancy of Hawai'i Office
- Trust for Public Lands Hawai'i
- U.S. Army Garrison Hawai'i Natural Resource Program
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- University of Hawai'i at Mānoa
- University of Hawai'i at Hilo

SNOHOMISH RIVER WATERSHED

COORDINATED INVESTMENT STEERING COMMITTEE:

- Environmental Protection Agency
- Federal Emergency Management Agency
- National Oceanic and Atmospheric Administration
- U.S. Fish and Wildlife Service
- U.S. Army Corp of Engineers
- Natural Resource Conservation Service
- Puget Sound Partnership
- Washington Dept. of Ecology
- Washington Dept. of Fish and Wildlife,
- Washington Dept. of Natural Resources, Recreation and Conservation Office
- Washington Conservation Commission
- Washington Dept. of Agriculture
- Washington Office of The Governor

SNOHOMISH SUSTAINABLE LANDS STRATEGY:

- Snohomish County
- Tulalip Tribes of Washington
- Stillaguamish Tribe
- Futurewise
- Ducks Unlimited
- Snohomish Conservation District
- The Snohomish Agriculture Caucus

OTHER PARTNERS

- U.S. Geological Survey
- The Nature Conservancy
- U. of Washington Climate Impacts Group
- National Fish and Wildlife Foundation
- Snohomish Farm Bureau

SOUTHWEST FLORIDA

PENINSULAR FLORIDA LCC STEERING COMMITTEE

- U.S. Fish & Wildlife Service
- U.S. Geological Survey
- National Park Service
- National Oceanic and Atmospheric Administration
- Department of Defense
- Florida Fish & Wildlife Conservation Commission
- Florida Department of Agriculture and Consumer Services
- Florida Department of Transportation
- Southwest Florida Water Management District
- The Nature Conservancy
- Florida Wildlife Federation
- Florida Forestry Association
- Florida Farm Bureau Federation
- Wildlands Conservation
- Plum Creek
- Breedlove, Dennis & Associates, Inc. (Florida Land Council)
- Ken Passarella, and Associates, Inc.
- Family Lands Remembered, LLC
- Florida State University, Florida Natural Areas Inventory
- University of Florida, Center for Landscape Conservation
- South West Florida Regional planning council
- Charlotte Harbor National Estuary Program
- Nature Coast Biological Station - University of Florida
- Private Landowners