

An Ecosystem Services Approach to Management of a Complex Landscape: The Marsh Project

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About This Document

This case is part of the Federal Resource Management and Ecosystem Services (FRMES) Guidebook created by the [National Ecosystem Services Partnership](#) (NESP). NESP, housed at the [Nicholas Institute for Environmental Policy Solutions](#), seeks to enhance collaboration within the ecosystem services community and to strengthen coordination of policy implementation and research at the national level. The FRMES Guidebook represents a collaborative effort by federal agencies and outside experts to develop a credible and feasible approach to incorporating ecosystem services into the decision-making processes of federal agencies.

Cases are written and approved by the author(s)' agency, but they have not been peer reviewed. They describe the decision-making context within which that agency is considering or testing an ecosystem services management framework, and they present approaches or innovations that the agency is using to incorporate ecosystem services into its planning and decision-making processes. Cases informed development of the FRMES Guidebook and could be of value to others embarking on ecosystem services planning and management efforts.

To read other federal agency explorations and applications of an ecosystem services management framework, visit www.nespguidebook.com.

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Background (Motivation and Decision Context)

The Deschutes National Forest (DNF) began exploring forest management applications of ecosystem services concepts in 2009. This work was initially prompted by interest in a management framework that addresses the broad suite of goods and services that forests provide to people. The DNF partnered with the Forest Service's Pacific Northwest Research Station to (1) describe ecosystem services provided by the forest and compare those benefits to standard Forest Service accomplishment reporting, (2) highlight connections between management activities and ecosystem services, (3) support an integrated approach to planning and management across resource specialties, and (4) encourage participatory planning and strengthen partnerships with stakeholders.¹

The first phase of this effort culminated in August 2011 with publication of *Ecosystem Services as a Framework for Forest Stewardship: Deschutes National Forest Overview*.² This report provided the foundation for the concept of an ecosystem services framework. It also articulated the framework's potential utility in management and outlined potential next steps in its application.

Later in 2011, the DNF's Crescent Ranger District launched a pilot project to test the use of ecosystem services as a framework for National Environmental Policy Act (NEPA) project planning. The Marsh project represents the DNF's first attempt to apply the ecosystem services concept to planning, decision making, and management. (A draft NEPA environmental assessment, along with maps and other Marsh project documents, was released for public comment in 2014.³)

The Marsh project area was chosen for this attempt because of its ecological complexity, importance to the public, and rich history of restoration partnerships. Although the traditional Forest Service planning model is well suited to telling the story of managing for one resource (e.g., timber, recreation) while mitigating impacts to other resources, it is less effective at integrating information about multiple, interrelated ecosystem elements, functions, and processes into public engagement, planning, decision making, and management. In the planning effort for Marsh project area, an ecosystem services framework was warranted by the diverse set of values that the Forest Service is interested in managing. Such a framework reflects interrelated human and ecological values and NEPA purpose and need.

The Marsh project presents an opportunity for robust public participation in project planning. Ecosystem services, as described in the Millennium Ecosystem Assessment, are essentially the benefits *people* derive from nature. Given the importance of the Marsh planning area to diverse constituencies, it makes for a good test of an ecosystem services framework's utility in reflecting public values in Forest Service planning. The ecosystem services framework was envisioned as a way not only to allow members of the public to express the value they attach to nature's benefits but also to offer their ideas for management early on in the planning process. Instead of bringing a NEPA proposed action to the public and asking for comments, the Forest Service is interested in asking the public for input in designing the proposed action.

The Marsh planning area has a rich history of restoration partnerships. Since acquiring the focal point of the planning area—Big Marsh—in 1982, the Forest Service and its partners, including the Oregon

¹ http://www.fs.fed.us/pnw/pubs/pnw_gtr852.pdf.

² http://www.fs.fed.us/pnw/pubs/pnw_gtr852.pdf.

³ http://data.ecosystem-management.org/nepaweb/nepa_project_exp.php?project=40231.

Hunters Association, the Rocky Mountain Elk Foundation, and the U.S. Fish and Wildlife Service, have worked to restore the natural hydrology and habitats altered through past management practices.

Project Area Description

The Marsh project area encompasses an approximately 30,000-acre watershed in the southwestern portion of the Crescent Ranger District. The focal point of the planning area, Big Marsh, is one of the largest high-elevation wetland/marsh complexes in the continental United States. Beginning in the 1940s, the then-privately owned Big Marsh was converted to pastureland for cattle grazing using a system of ditches and water diversions, resulting in significant alteration and disruption of the Marsh's hydrology. In the upland portions of the planning area, the vegetation includes lodgepole pine, ponderosa pine, and mixed conifer forest types. Much of this upland area has been altered as a result of fire exclusion and timber harvest practices over the past century.

The planning area is valued for its biological diversity (which includes the largest population of the Oregon Spotted Frog), dispersed recreation opportunities, Matsutake mushroom habitat (a commercially harvested and culturally significant species), big game and fish habitat, historic and prehistoric cultural resources, and water flows into the Little Deschutes River and further downstream.

Methodology (Options Considered and Key Players)

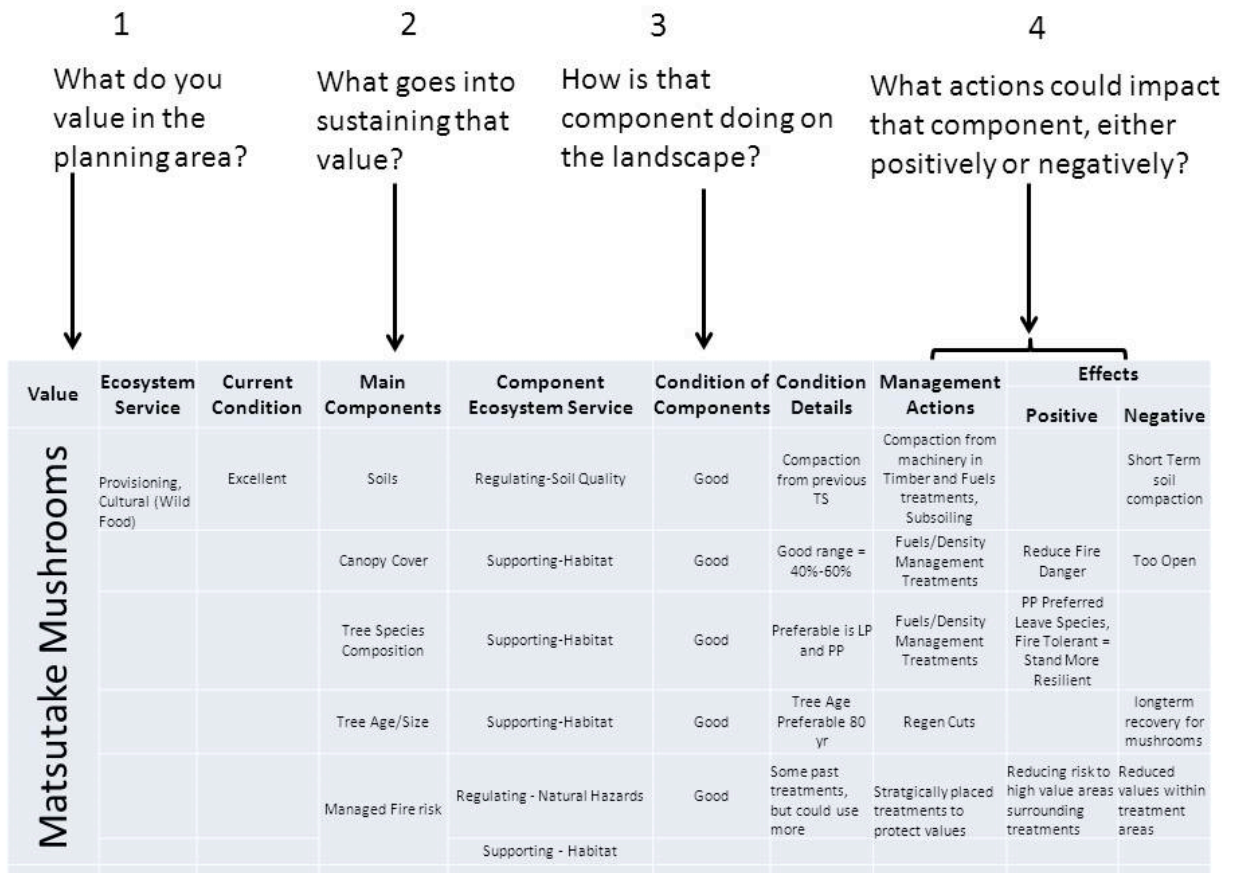
At the inception of the Marsh planning effort, the Forest Service envisioned three discrete phases in the pre-NEPA application of the ecosystem services framework. First, an education phase was necessary to introduce the concept of ecosystem services within the Crescent Ranger District and to the public. Second, a process was needed to solicit, discuss, and aggregate the perceived benefits (i.e., ecosystem services) that district staff and the public value in the project area. Finally, an organizational framework was critical to help the district translate the comprehensive and diverse set of recognized values in the planning area into a tangible NEPA proposed action to guide subsequent project planning.

District leaders engaged a Forest Service ecosystem services specialist and representatives of The Nature Conservancy (TNC) in a one-day workshop to introduce the concept of ecosystem services and lead district team members through a values collection process based on a methodology developed by TNC for the Fire Learning Network. The values collection process is simply a series of facilitated group and individual brainstorming activities and conversations related to the perceived values people derive from a planning area. Participants then develop detailed lists of attributes associated with each value, which are used to evaluate the current condition of each value as well as potential or existing threats to it, such as overuse, wildfire, or insects and disease. The desired outcome of the process is to impart understanding of the linkages among public values, nature's benefits, and the condition of the ecosystem that generates those benefits as well as of the relationship between management and positive or negative impacts on the provision of ecosystem services.

For the Marsh project, this methodology resulted in a list of values that could be roughly organized into six categories: (1) wildlife and botany resources and habitats; (2) forest products, or extractive uses for cultural or economic reasons, including mushroom harvesting; (3) water quality, quantity, and flow timing; (4) cultural values and sense of place; (5) recreation, with a focus on opportunities and activities; and (6) uniqueness, including existence value. The Crescent Ranger District also identified threats to the continued provision of these ecosystem services, including stand-replacing fire, beetle infestations, and unmanaged recreation impacts. Recognized in the discussion of fire and beetle risk was the role of a changing climate.

At the conclusion of the workshop, district team members recognized that additional thought and internal discussion was required to translate the list of values into tangible management actions. To that end, the Crescent Ranger District outlined a three-month process. Figure 1 depicts the results of this process for one value: Matsutake mushroom picking. The goal was to break each value down into its components and think about how each could be affected (positively and negatively) by potential management actions. In other words, the process was intended to force thought and discussion about cause-and-effect relationships and management in terms of benefits and detriments to the provision of ecosystem services.

Figure 1. Snapshot of Pre-NEPA Values Mapping Exercise: Matsutake Mushroom Picking



Concurrently with the internal Crescent Ranger District values collection process, district team members engaged the public and partners in an ecosystem services learning and values collection exercise. A two-day workshop was convened with scientific and resource experts, local citizens familiar with the Marsh planning area, and Forest Service partner organizations: the U.S. Fish and Wildlife Service (USFWS), the Oregon Department of Fish and Wildlife, the Oregon Hunters Association, the Walker Rim Riders Snowmobile Club, the Rocky Mountain Elk Foundation, The Nature Conservancy, Oregon State University, and the Northwest Forest Workers Center. Once again, the workshop included an introduction to ecosystem services by a Forest Service ecosystem services specialist and a values collection process led by The Nature Conservancy. Exercises helped participants make connections among values, ecological process and functions, components of the Marsh landscape that support those values, and issues of scale in ecosystem services management. The Forest Service also hosted a public field trip to the planning area to discuss the concept of ecosystem services, to explore the resource

values in the planning area, and to offer members of the public an opportunity to share their perspective on the Marsh landscape.

Throughout the workshop and field trip, members of the public were encouraged to present their knowledge of the planning area and their desires for management as well as to think about how that input could be expressed in relation to the ecosystem services framework that was being collaboratively developed. The input enabled the Crescent Ranger District to validate, refine, and expand the list of values, components, threats, and management actions generated through its own values collection process and to ensure that the planning process was capturing the full suite of values associated with the Marsh project area.

The final product of this pre-NEPA effort was a comprehensive Microsoft Excel™ workbook detailing potential management actions for the project and corresponding positive or negative impacts on the values associated with and the ecosystem services provided by the landscape. This enabled the District to develop a NEPA purpose, need, and proposed action (see below) representing the greatest perceived net positive benefit across the landscape and across the range of identified ecosystem services. The NEPA purpose and need are based on a set of benefits that emerged from the internal and external values collection processes. Although the suite of ecosystem services identified by the public was not identical to that identified by the Crescent Ranger District, a core set of values emerged that could be positively affected through management. This set of values is driving the Marsh project's purpose, need, and proposed actions.

Project Purpose and Need

The purpose of the Marsh project is to address natural and human threats (stand-replacing fire, beetle infestations, and unmanaged recreation impacts) to the ecological and cultural benefits provided by the Marsh planning area and to enhance the ecosystem's capacity to sustainably provide a diverse set of benefits in the future. The following ecosystem services were identified as a priority by the public and the Crescent Ranger District and thus provide the focus for this project:

Provisioning Services

- Hydrology: Maintain and enhance a clean, functioning, free-flowing water source that provides habitat connectivity within Big Marsh and that contributes to the hydrologic system of the Deschutes River basin.
- Matsutake mushroom harvesting: Maintain the socially and economically important mushroom harvesting experience through maintenance of high-quality mushroom habitat, particularly along the Matsutake Ridge portion of the project area.
- Forest products: Provide opportunities for timber harvest, firewood gathering, and post and pole harvest to support the local communities and economies of Crescent Lake Junction, Crescent, Gilchrist, and beyond.

Supporting Services

- High-quality plant and animal habitat: Maintain and enhance marsh and upland habitats in the project area for an abundance and diversity of plant and animal species, including species classified as threatened, endangered, or sensitive, such as the Oregon Spotted Frog.

Cultural Services

- High-quality dispersed recreation opportunities: Maintain and enhance the diverse recreation experience unique to the Marsh area (opportunities for hiking, snowmobiling, hunting, fishing, paddling, ATVing, and more), characterized by an accessible, semi-

primitive (both motorized and non-motorized) recreation experience that invokes a sense of remoteness

- Scenic views: Restore and enhance the expansive views of both the upland portions of the project area and Big Marsh, returning them to a pre-grazing viewscape

Summary of Proposed Actions

Four categories of management actions are proposed:

- Natural water flow restoration: ditch closure, culvert removal, and instream wood placement
- Riparian vegetation restoration: Lodgepole pine removal within areas of meadow and riparian encroachment and hardwood planting
- Recreation and access management: dispersed camping improvements, user-created trail restoration, marsh access improvements, and scenic overlook maintenance
- Upland fuels and density management: vegetation thinning and prescribed underburning

Analysis and Tradeoffs

The next step in the process for the Marsh project is to write the environmental assessment, which will contain analysis for the usual suite of resources covered therein (wildlife, botany, soils, fisheries, hydrology, roads, heritage, potential wilderness, fuels, vegetation, scenery, recreation, and so on). This document will also discuss the effects of project alternatives in relation to production of the key ecosystem services that defined the purpose and need for the project: high-quality dispersed recreation opportunities; Matsutake mushroom habitat; a clean, functioning water source for the hydrologic system; high-quality habitat for a variety of plant and animal species, including some species classified as threatened or endangered; scenic views; and forest products such as timber, firewood, and post and poles.

One of the crucial pieces of the NEPA document will be a tradeoffs analysis. With the interconnectedness of values in the project area, designing a project to enhance one ecosystem service without affecting the benefits provided by another is difficult to accomplish. However, the Crescent Ranger District recognizes that some short-term negative effect may be warranted and necessary to generate more sustainable, long-term provision of a broader suite of desired ecosystem services. For example, thinning lodgepole pine encroachment in riparian areas to improve hydrology and restore resilient riparian habitat will also likely reduce the project area's sense of remoteness in the short term. However, the short-term impact may be worthwhile in the long term, when hydrology and habitat are enhanced and sense of remoteness is restored. The goal of the project is to balance positive and negative impacts in such a way that the values most at risk are addressed without substantially reducing the long-term capacity of the landscape to provide the full suite of benefits/ecosystem services into the future. Site-specific management recommendations serve this objective. For example, rehabilitation of dispersed camping opportunities will be focused on moving campsites away from riparian areas to reduce impacts on hydrology and habitat. Co-benefits of actions, such as early seral wildlife habitat created by fuels treatments, will also be highlighted. The environmental assessment will reflect this analysis of tradeoffs (including the temporal dimension of short-term versus long-term impacts); the preferred alternative will be the one with the greatest positive benefit to ecosystem services provision.

To begin this assessment of tradeoffs during pre-NEPA planning, the Crescent Ranger District team captured potential positive and negative effects of each management action under consideration. In parallel, participants in the external workshop described above engaged in an exercise to characterize relationships between individual management actions and ecosystem services under consideration across program areas. These relationships were described in terms of the general direction and strength of trends (strongly positive, slightly positive, neutral, slightly negative, strongly negative). Information

was synthesized in a pivot table to determine the range of effects on each ecosystem service and the management actions that would result in the greatest positive outcomes.

In some cases, priority setting and site specificity helped inform (and will continue to inform) tradeoff decisions. For example, given the importance of Big Marsh for rare species like the Oregon Spotted Frog, restoration of habitat and hydrology will be prioritized in sensitive areas. The relationship between the Marsh area and local and regional economies, particularly with regard to mushroom harvesting and recreation, is another important consideration.

Project Insights

Resources

Support for the Marsh project has come from programs typically used to fund the Forest Service planning process: timber management and hazardous fuels reduction. A significant organizational constraint faced by the Forest Service is a budgetary structure that inadvertently creates “siloed” approaches to resource management and accomplishment reporting by establishing separate budgets for individual resource programs (timber, recreation, aquatics, and so on). An ecosystem services approach can both support and be supported by integrated, outcomes-based budgeting and performance measures. This approach would require articulating and quantifying the goods and services provided by ecological *systems* and coordinating management across resource program areas to maintain and enhance delivery of those services through integrated management. It would also require that additional resources be devoted to monitoring to document outcome-based measures of management effectiveness (e.g., measures of ecosystem function or socio-economic impact) as opposed to output-based measures (e.g., acres treated).

Other resources crucial to developing the Marsh project were partners. The Crescent Ranger District used the ecosystem services expertise of the Forest Service Pacific Northwest Regional Office and The Nature Conservancy. For the implementation stage of the Marsh project, the district is interested in leveraging the resources of partners. It believes that involving partners in project planning and designing projects that those partners feel invested in are essential to maximizing the value of Forest Service planning and implementation dollars.

Another valuable resource in project planning has been light detection and ranging (LIDAR) mapping as a means to gather and analyze information on existing conditions. This mapping has been especially useful in documenting changes in vegetation when compared with older aerial photos of the area.

Organizational Capacity

The Forest Service leadership’s interest in the potential of an ecosystem services approach to add value to public land management is a primary driver of the Marsh project. The Regional Office and Forest Supervisor’s Office have allowed the Crescent Ranger District team the freedom to develop this approach and have provided support for the effort.

One element of that support is education. Although the concept of ecosystem services is not entirely new to the agency, Forest Service employees need help in understanding its practical application to project planning. In particular, they need help in understanding how the concept aligns with and differs from the way the Forest Service currently plans projects. They also need assistance in describing the rationale for ecosystem services management to the public.

Many specialists within the Crescent Ranger District were in the unique position of designing a project to address a suite of interrelated resource values and outcomes, as opposed to developing mitigations for proposed actions. This is a surprisingly difficult task because it is fundamentally different from the

historical norm in the Forest Service. In addition, the ecosystem services approach to project planning required more pre-NEPA agency staff time than a traditional project approach. However, it also encouraged project team members to develop a proactive vision for the resources they manage—for example, potential habitat enhancements or recreation opportunities—rather than to operate with a mitigation mindset. Getting the team members invested in the project, the process, and the eventual outcomes was essential to the success of the planning phase.

As federal budgets and staffing levels decrease, the Forest Service needs to pursue efficient and cost-effective approaches to build its capacity for ecosystem services assessment. Strategies include (1) organizing a mobile training team comprised of agency and outside experts; (2) training key regional and forest staff within natural resource specialties (e.g., hydrology, soils, wildlife, fish, vegetation); (3) developing targeted and standardized methods for monitoring management outcomes in terms of key ecosystem services for use in future planning, analysis, decision-making, and communication with the public; and (4) coordinating training across other federal agencies to reduce duplication and promote consistency in the application of the ecosystem services approach.

A crucial aspect of this capacity building is efficiently and effectively incorporating public input. Under an ecosystem services approach to project planning, the Forest Service will be asking the public for input in the design of proposed actions. This type of engagement requires a much greater level of effort on the part of agency staff than bringing proposed actions to the public and asking for comments. This initial time investment has the potential to streamline later implementation phases of projects by engaging stakeholders and building trust early in the process.

Conclusion

An ecosystem services approach to project planning led to two significant efficiencies for the planning phase of the Marsh project. First, using ecosystem services terminology and concepts in concert with the TNC values collection methodology helped to clarify benefits people derive from the project area, ensuring that the complete suite of services (even hard-to-define services, such as sense of remoteness) were considered at the outset of planning. Moreover, using that methodology ensured that all values were considered in relation to potential management actions and that those selected for analysis in the proposed action would lead to the greatest net positive benefit to ecosystem services on the landscape.

Second, using the ecosystem services approach led to substantive public involvement in the planning process. Members of the public responded positively to requests to share their values and to opportunities to learn from one another and experts about the breadth of benefits derived from national forest lands. These discussions highlighted the necessity of making tradeoffs in managing a landscape for a complex and diverse suite of values. Allowing these discussions about trade-offs to occur early in the planning process could reduce appeals, objections, and litigation in the long run.

In sum, using an ecosystem services approach to project planning resulted in a robust assessment of values and their current condition within the planning area and helped the Crescent Ranger District frame the purpose and need for the Marsh project in terms of the diverse set of goods and services that the Marsh planning area provides. The engagement of stakeholders in the project development phase helped Forest Service staff gain a better understanding of the importance of the area to the local community, set the stage for partner involvement in project implementation, and increased transparency about the agency's decision-making process. Rather than framing objectives in terms of one or two program areas (e.g., timber harvest or fuel reduction) and mitigating impacts of those actions, the district incorporated multiple values at the outset as project drivers. This process increased employee buy-in across resource areas and encouraged active participation in the process. By making connections among public values, underlying ecological characteristics, and management actions, the ecosystem

services approach promoted a systems-based methodology to maintain and enhance the full suite of benefits provided by a healthy, functioning ecosystem within the Marsh planning area.

Cover photo: Carina Rosterolla, Crescent Ranger District

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About the National Ecosystem Services Partnership

The National Ecosystem Services Partnership (NESP) engages both public and private individuals and organizations to enhance collaboration within the ecosystem services community and to strengthen coordination of policy and market implementation and research at the national level. The partnership is an initiative of Duke University's Nicholas Institute for Environmental Policy Solutions and was developed with support from the U.S. Environmental Protection Agency and with donations of expertise and time from many public and private institutions. The partnership is led by Lydia Olander, director of the Ecosystem Services Program at the Nicholas Institute, and draws on the expertise of federal agency staff, academics, NGO leaders, and ecosystem services management practitioners.

About the Nicholas Institute for Environmental Policy Solutions

Established in 2005, the Nicholas Institute for Environmental Policy Solutions at Duke University improves environmental policymaking worldwide through objective, fact-based research in the areas of climate change, the economics of limiting carbon pollution, emerging environmental markets, oceans governance and coastal management, and freshwater management. The Nicholas Institute is part of Duke University and its wider community of world-class scholars. This unique resource allows the Nicholas Institute's team of economists, scientists, lawyers, and policy experts not only to deliver timely, credible analyses to a wide variety of decision makers, but also to convene decision makers to reach a shared understanding of this century's most pressing environmental problems.

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