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Ecosystem services to enhance sustainable forest management in the US: moving from forest service national programmes to local projects in the Pacific Northwest

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Ecosystem services are increasingly recognized as a way of framing and describing the broad suite of benefits that people receive from forests. The USDA Forest Service has been exploring use of an ecosystem services framework to describe forest values provided by federal lands and to attract and build partnerships with stakeholders to implement projects. Recently, the agency has sought placed-based applications of the ecosystem services framework to national forest management to better illustrate the concept for policymakers, managers and forest stakeholders. This framework includes describing the ecosystem services provided by forest landscapes, examining the potential trade-offs among services associated with proposed management activities, and attracting and building partnerships with stakeholders who benefit from particular services forests provide. Projects that describe objectives and outcomes using an ecosystem services framework are quickly gaining respect and could provide an optimal method of managing forests to better serve the needs of people. We describe how project-scale guidelines can be designed to address commonly recognized products such as timber and clean water, as well as critical regulating, supporting and cultural services. We present results from national programmes to forest plan assessments to project-scale applications that enhance the provision of ecosystem services and sustainable forest management at broad to local scales.

Introduction

The concept of ecosystem services has emerged as a way of framing and describing the broad suite of benefits that people receive from nature and the importance and value of ecosystem services are being recognized from global to local scales (Costanza *et al*., 1997; Daily, 1997; Kroeger and Casey, 2007; Farley and Costanza, 2010). Ecosystem services are the products of functioning ecosystems that benefit people. The Millennium Ecosystem Assessment (MEA, 2005) developed a classification for these services, and defined them as provisioning, regulating, cultural and supporting. Provisioning services are familiar commodities such as food, fresh water, timber and fibre for direct human use. Regulating services maintain a world in which it is possible for people to live, and provide benefits such as flood and disease control, water purification, climate stabilization and crop pollination. Cultural services make the world a place where people want to live and include recreational, spiritual, aesthetic and social values. Supporting services are the underlying processes that maintain the conditions for life on Earth and include nutrient cycling, soil formation and primary production.

The importance of healthy, functioning forest ecosystems is widely recognized. Forests also have high conservation value for a number of threatened and endangered species, for mitigating pollution, for flood control, and can be managed for the long-term sustainability of forest products, wildlife and other ecosystem services (Deal *et al*., 2014). Forest carbon is a particularly important ecosystem service to monitor and manage because there is interest in both maintaining current forest carbon stocks and also increasing carbon sequestration as a mitigation strategy for reducing atmospheric CO_2 (FAO, 2005; Oliver and Mesznik, 2005). Forests play a major role in the global carbon cycle through the ability of trees to withdraw or sequester carbon, and forests serve as a terrestrial carbon sink during most stages of forest development (Oliver, 2001; FAO, 2005; Oliver and Deal, 2007). Forests can sequester large amounts of carbon in several ways including as carbon sinks in the standing forest, in wood products and in avoided emissions when wood is used as a substitute for more fossil fuel-consuming structural products such as steel, concrete and brick (Lippke *et al*., 2004; Campbell *et al*., 2009; Mitchell *et al*., 2009).

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In the US, a recent Presidential memorandum (OMB, 2015) directs federal land management and regulatory agencies to include an ecosystem services framework in federal decision-making. This memorandum directs agencies to develop and institutionalize policies to promote consideration of ecosystem services in planning, investments and regulatory contexts. Regulatory agencies like the Environmental Protection Agency (EPA) have developed policies that quantify final ecosystem goods and services (Nahlik *et al*., 2012; Landers and Nahlik, 2013) while land management agencies like US Forest Service (USFS) have started incorporating ecosystem services into forest assessments and planning (USDA FS, 2012). The Presidential memorandum asserts that by incorporating ecosystem services into Federal agency planning and decision-making, government institutions will be able 'to more effectively address challenges facing the Nation and ensure ecosystems are healthy for this and future generations' (OMB, 2015). The USFS 2012 Forest Planning rule now requires the agency to include ecosystem services in assessments and forest plan revisions (USDA FS, 2012). The USFS has been evaluating the use of an ecosystem services framework to describe forest values provided by federal lands and to attract and build partnerships with stakeholders and non-government organizations to implement projects (Smith *et al*., 2011).

There is now a need to integrate national policy and programmes for the evaluation of ecosystem services into the USFS National Forest planning process and for local project implementation. In particular, forest managers and planners want to demonstrate how an ecosystem services framework can be used in national forest assessments and forest plans revisions, and to address ecosystem services in local projects. In this paper, we identify opportunities and needs to integrate ecosystem services into national USFS policy and operations and summarize current efforts to address this potential. We further describe how USFS national forest plans can use an ecosystem services framework to both meet the requirements of the USFS planning rule (USDA FS, 2012) and help the agency identify and clarify relationships between the conditions of forest ecosystems and the quality of services they provide. Finally, we provide some examples of how an ecosystem services framework could be implemented into stand prescriptions at the project scale and how this framework can help the agency meet its mission at the national, forest and local levels.

Applying ecosystem services at national scales in the US

In the US, national policy has directed agencies to incorporate ecosystem services into federal decision-making to promote consideration of ecosystem services in planning, investments and regulations (OMB, 2015). A crucial step to empower implementation of ecosystem services into management of USFS lands was the establishment of the 2012 land management planning rule (USDA FS, 2012) to implement National Forest System planning as required by the National Forest Management Act (USDA FS, 1976; Table 1). The rule explicitly requires the Forest Service to include ecosystem services in the assessment phase of forest planning (USDA FS, 2012). The term ecosystem services is frequently mentioned with regard to 'ecosystem services and multiple uses', a reference to the Multiple Use Sustained Yield Act (MUSYA, 1960; Table 1) which calls for national forests and grasslands to be managed for 'outdoor recreation, range, timber, watershed, wildlife and fish purposes'. The MUSYA further defines multiple uses as 'management of all the various renewable surface resources of the national forests'. Although there is substantial overlap between provisioning services and multiple uses as defined by the MUSYA, the addition of ecosystem services in the 2012 planning rule further supports the concept of multiple uses by including supporting, regulating and cultural services. The 2012 rule emphasizes the importance of cultural heritage values and specifically mentions services important for maintaining cultural use, special forest products and services of particular value for Native American tribes (USDA FS, 2012). However, it has been challenging for the USFS to describe, quantify and value all of the potential ecosystem services that forest and public lands provide. To address this challenge, the USFS Directives (USDA FS, 2015) which guide implementation of the 2012 planning rule now require that forest plan revisions focus on 'key' ecosystem services. These key services are important in the broader landscape outside of the plan area and are likely to be influenced by the land management plan (USDA FS, 2015). The inclusion of key ecosystem services allows some flexibility and specific focus for individual national forests. Most forest plan assessments include 10–15 key ecosystem services which may vary from common provisioning services (timber, water, fish and wildlife habitat) to highly specific regulating or cultural values (special forest products, endangered species habitats, scenic views, carbon sequestration or flood control, among others).

The 2015 Presidential memorandum (OMB, 2015) directs all federal agencies in the US to develop and institutionalize policies to promote consideration of ecosystems services in planning, investments and regulatory policy (Table 1). The goal of this memorandum was to better integrate into Federal decision-making the full range of benefits and trade-offs among ecosystem services associated with Federal actions. Some regulatory agencies such as the EPA and US Fish and Wildlife Service (USFWS) developed assessment protocols relevant to their particular contexts (Davis, 2014; Maillett and Scarlett, 2014). The EPA has also developed a process for valuing final ecosystem goods and services (Landers and Nahlik, 2013) that is being considered by other federal agencies for quantification and valuation of ecosystem services. Other land management agencies such as the National Resource and Conservation Service (NRCS), the Bureau of Land Management (BLM) and the USFS have developed specific responses on how they would consider and report ecosystem services in management contexts (Collins *et al*., 2014; Moore *et al*., 2014; USDA NRCS, 2016; Table 1). The NRCS developed a response based on their work with private landowners and farmers and included conservation plans and a valuation methodology that met EPA's stringent requirements (Nahlik *et al*., 2012; USDA NRCS, 2016).

The USFS manages about one-fifth of the forested area in the US with national forest land area of over 78 million ha (USFS, 2008). The National Forest Management Act of 1976 (USDA FS, 1976) and the National Environmental Policy Act (NEPA, 1969; Table 1) are the primary laws and regulations that

Table 1 US natural resource legislation with examples of federal agency responses and applications of ecosystem services for agencies

Legislation	Intent of legislation	Examples of US federal agency responses
Multiple Use Sustained Yield Act (1960)	Promote sustainable management of natural resources to meet the growing needs of an increasing population and expanding economy	**U.S. Forest Service (USFS)** and **Bureau of Land Management (BLM)** directed to manage timber, range, water, recreation and wildlife with equal importance
National Environmental Policy Act (1969)	Encourage harmony between people and the environment, enrich the understanding of the ecological systems and natural resources important to the Nation, and establish a Council on Environmental Quality	**Any federal**, state, or local project that involves federal funding, work performed by the federal government, or permits issued by a federal agency must take a multidisciplinary approach to decision-making, including consideration of alternatives
Federal Land Policy and Management Act (1976) and National Forest Management Act (USDA FS, 1976)	Establish policy of inventory and planning in accordance with the Multiple Use Sustainable Yield Act	**USFS** and **BLM** develop land management plans in collaboration with the public to determine appropriate multiple uses, develop strategies for resource management and protection, and establish systems for inventory and monitoring to evaluate the status of resources and management effectiveness
National Forest System Land Management Planning Rule (USDA FS 2012)	Regulation developed by the USFS to implement planning required by the National Forest Management Act	Rule explicitly requires **USFS** managers to address ecosystem services in planning to ensure that forests have the capacity to provide people and communities with a range of social, economic and ecological benefits for the present and into the future. Staff across the agency develop and apply tools to address ecosystem services in land management efforts
Presidential Memorandum: Incorporating Ecosystem Services into Federal Decision-Making (OMB, 2015)	Directs federal agencies to incorporate natural infrastructure and ecosystem services into decision frameworks	**National Oceanic and Atmospheric Administration** uses ecosystem service valuation to assess benefits of dam removal and coastal rehabilitation, among other projects **Natural Resources Conservation Service** applies ecosystem service quantification tools to its programmes, including watershed rehabilitation and flood mitigation **U.S. Fish and Wildlife Service** incorporates consideration of ecosystem services into wildlife refuge management **Environmental Protection Agency** makes ecosystem services the focus of determining adversity to public welfare in review of air quality standards **BLM and U.S. Geological Survey** collaboratively assess alternative methods and quantification tools for evaluating ecosystem services through a case study in the San Pedro River watershed

specify how USFS manages the national forests. The recent 2012 planning rule (USDA FS, 2012) further expands public participation in the planning process in several important ways. Specifically, the planning rule states that plans will guide the management of National Forest System (NFS) lands so they have the capacity to provide people and communities with ecosystem services and multiple uses that offer a range of social, economic and ecological benefits for the present and into the future (USDA FS, 2012). The USFS developed the most extensive response to the Presidential memorandum including how the agency has been integrating ecosystem services and multiple uses (MUSYA, 1960; OMB, 2015; Table 1), applying an ecosystem services framework in the adoption of the 2012 Planning rule (USDA FS, 2012) in forest assessments, and for developing new tools to assess ecosystem services provision such as I-Tree (Nowak *et al.*, 2008). The application of an ecosystem services framework is occurring across all types of lands (public and private) and different Deputy Areas of the USFS (e.g. National Forest System, Research & Development and State & Private Forestry).

Another critical effort for incorporating ecosystem services into USFS national policy and operations developed from the National Ecosystem Services Strategy Team (NESST). NESST was chartered by the USFS leadership (NESST, 2013) to collaboratively

develop national strategy and policy around ecosystem services and integrate them into USFS programmes and operations. In particular, there was a need to develop a common understanding of ecosystem services in order to explain the relevance of an ecosystem services framework for the agency and to provide better communication across agency Deputy Areas by formalizing information sharing and reporting mechanisms. Major NESST objectives included articulating and demonstrating the relevance of an ecosystem services framework across the agency; developing formal policy and informal guidance to support an ecosystem services framework for federal, state, private and tribal forest lands; building capacity and infrastructure across USFS Deputy Areas to manage forests for the enhancement of ecosystem service benefits; designing inventory methodologies and data management solutions to improve reporting and evaluating ecosystem service benefits; and fostering two-way communication inside and outside the USFS regarding how an ecosystem services framework can better support management objectives and improve outcomes (Deal *et al.*, 2017).

There is now a need to move from national programmes and policy to regional and local scales to assess how an ecosystem services framework can be used in national forest assessments and forest plans, and to implement and evaluate ecosystem services into projects. The following section describes how USFS forest plans can use this framework to (1) meet planning rule requirements, (2) help the agency identify and communicate why particular management actions are needed and (3) clarify relationships between the conditions of forest ecosystems and the quality of services they provide.

Applying ecosystem services at forest and project scales

Prior to adoption of the 2012 planning rule, some Forest Service researchers, national forest system planners and managers developed an ecosystem services framework on the Deschutes National Forest in central Oregon (Smith *et al.*, 2011). This effort included (1) defining and describing the ecosystem services provided by the forest, (2) investigating how an ecosystem services framework could support an integrated management approach across programme areas to sustain ecological functions and processes, (3) assessing the potential trade-offs among different ecosystem services following specific management actions, (4) using the ecosystem services framework to collaboratively plan and implement projects with stakeholder and cooperators and (5) developing tools and models for managers to assess the potential trade-offs among ecosystem services following management plans. This report enabled managers to explore how an ecosystem services framework can be applied operationally to guide stewardship of national forests and to support restoration of functions and processes characteristic of healthy and resilient forest ecosystems (Quine *et al.*, 2013). Place-based application brings the ecosystem service framework to a new level and highlights the connections between public benefits and ecosystem condition, and addresses management challenges by considering the range of services that are affected by projects and the potential trade-offs that result from particular actions. This effort led to the development of a project-level management plan based on ecosystem services (Smith *et al.*, 2011) and although this framework has not been directly used in assessments and forest plan revisions it has been used to evaluate smaller scale projects (Marsh and Drink planning areas) described in the following sections.

The project scale is where forest management is applied. Ecosystem services can add particular value at this level of decision-making and implementation. We provide some examples of using ecosystem services at the project scale in stand prescription guidelines. We assess the use of the ecosystem services framework with three examples of projects in Pacific Northwest region of the US, two on the Deschutes National Forest in central Oregon (OR) and one on the Willamette National Forest in western OR.

The Marsh Project on the Deschutes National Forest

The Marsh planning area is a 12 000 ha watershed just south of Crescent Lake that encompasses the Big Marsh and Refrigerator Creek Drainages on the Deschutes National Forest. The ecology of the area is extremely complex with high biological diversity. The Crescent Ranger District engaged in intensive planning in Big Marsh, one of the most expansive high elevation wetland/marsh complexes in the continental US (Figure 1). The marsh supports the largest Oregon Spotted Frog (*Rana pretiosa*) population in the state and provides habitat for two rare graminoids: *Scirpus subterminalis* (Torr.) T. Koyama and *Carex lasiocarpa* Ehrh. Other major resource considerations include matsutake (*Tricholoma magnivelare*) mushroom habitat (a commercially harvested and culturally significant species), two Late Successional Reserves (LSRs), threatened and endangered species like the great grey owl (*Strix nebulosi*) and northern spotted owl (*Strix occidentalis*),

Figure 1 Big Marsh, the focal point of the Marsh Project is the headwaters of the Deschutes River. It provides habitat for many wildlife species including beaver, river otter, elk, marten, Oregon Spotted Frog (*Rana pretiosa*), migratory birds and rare graminoids (*Scirpus subterminalis* and *Carex lasiocarpa*). The water is used downstream for irrigation. Matsutake mushrooms, a cultural and commercially valued species in the uplands of the project area.

Wild & Scenic River values, riparian reserves, and big game and fish habitat.

Due to the complexity and uniqueness of this watershed, the USFS incorporated an ecosystem services framework into the project analysis as a way to communicate the goods and services supported by sustaining a functioning, resilient landscape. The ecosystem services framework provided a platform for integrating forest management and restoration actions with public benefits such as clean water, cultural values and wildlife habitat. Although this project-level assessment was not directly related to forest plan revision, it reflects the intent of the 2012 planning rule to support forest restoration and conservation, watershed protection and wildlife conservation; as well as the sustainable provision of benefits, services, resources and uses of Forest Service lands, including sustainable recreation (USDA FS, 2012).

In order to identify the key values associated with the ecological, economic and social benefits or services of this landscape, USFS staff designed workshops with The Nature Conservancy to engage stakeholders, constituents and subject-matter experts in discussion. Public engagement include dialogue regarding where active management and restoration were needed to sustain ecological function and reduce risks to those values. Once the key ecosystem services were identified, the challenge was to ensure they were clearly linked to the project purpose and need as defined by the National Environmental Policy Act (NEPA, 1969). Metrics were developed to quantify differences between management alternatives and monitor outcomes (Foley *et al.*, 2014). The ecosystem services framework provided a more comprehensive understanding of the benefits of active forest management, potentially enhancing collaborative partnerships and supporting restoration activities.

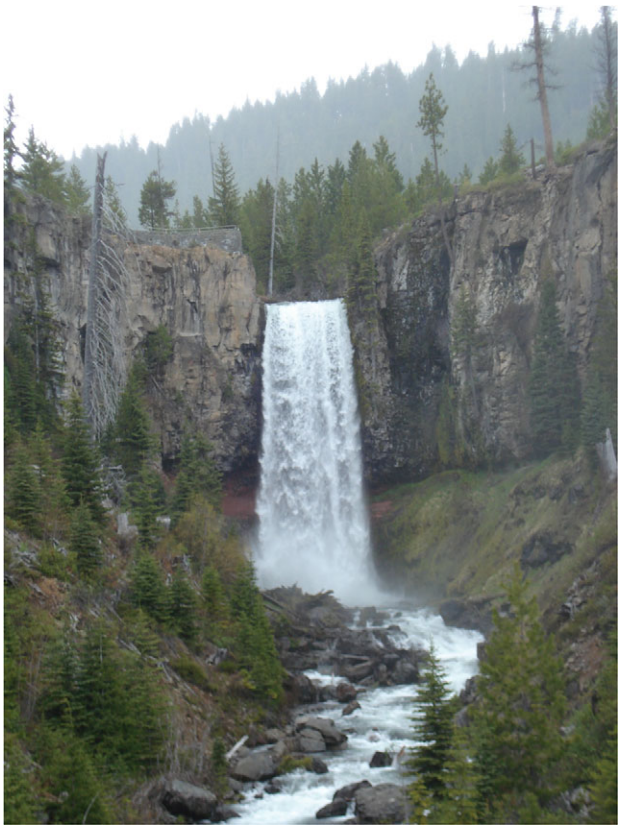

Figure 2 The water supply for the city of Bend, Oregon originates on the Drink planning area of the Deschutes National Forest. The forest is valued for many other reasons as well including recreation opportunities, wildlife habitat, timber and scenery such as this view of Tumalo Falls.

The Drink Project on the Deschutes National Forest

The Drink Planning Area, a 7056 ha area located on the eastern slopes of the Cascade Range in the Deschutes National Forest provides a number of key ecosystem services including drinking water for the city of Bend, OR (Figure 2) and habitat for a threatened wildlife species, the Northern Spotted Owl (NSO) and a number of important recreational services (Smith *et al.*, 2011). This project analysed the effects of fuel treatments designed to reduce fire hazard on ecosystem services that were identified as the most important values of this study area. Trade-offs between the provision of the ecosystem services of water quality, NSO habitat protection and fire hazard reduction were assessed using mathematical models that integrated all these values. Study results in this project area (Kushch-Schroder *et al.*, 2016) showed that management activities planned in areas of high ecological importance, such as NSO habitat and municipal watersheds, affect the important ecosystem services these areas provide. In the short term, fire hazard reduction led to increases in sedimentation and reduced water quality and some loss of potential NSO habitat. However, over the longer term, analysis showed that the loss of water quality and NSO habitat in stands that were thinned to reduce tree density prior to subsequent wildfire would be 30–50 per cent less than without any treatments to reduce wildfire hazard. These results provide alternative strategies where various objectives are prioritized differently; thus they present a wide range of choices to meet different requirements and public demands. The knowledge of forest managers can further refine the suggested management plans, creating well-informed and effective management strategies.

The Cool Soda Project on the Willamette National Forest

The Cool Soda Project occurred on the westside of the Cascade Range of Oregon where the fire regime is a combination of mixed severity and stand replacement (Perry *et al.*, 2011). This project area included an ~4200 ha 'checkerboard' of USFS lands and private lands where universities, tribal members and a number of government agencies collaboratively engaged in an all-lands framework to assess the broad suite of ecosystem services provided by the landscape (Furtwangler *et al.*, 2012). The intent was to improve management of USFS lands to achieve ecosystem resiliency, while providing direct socio-economic benefits to local communities and stakeholders. A number of key services were addressed in the planning process including changes in the volume and quality of timber sold, changes in water quality, sustainable recreation, the provision of special forest products including beargrass *(Xerophyllum tenax* (Pursh) Nutt.) and huckleberry (*Vaccinium* spp.) valued by tribes, and restoration of fish and wildlife habitat, among others. This project was an outstanding example of cross jurisdictional,

public–private management as well as consultation with tribal governments to sustain cultural resources, and has been cited as one of the best examples of an all-lands management approach to provide multiple ecosystem services for diverse stakeholders and partners (Smith, 2014).

Stand ecosystem services prescriptions

Silvicultural prescriptions are site specific plans that describe a series of planned treatments in forested stands that are designed to meet specified management objectives. Prescriptions provide direction as how to move the current stand condition to some desired future condition which meets some predefined set of objectives, conditions or outcomes. Typical silvicultural guidelines include a number of essential management elements including: (1) defining the setting, size and context of the stand to which prescriptions will be applied, (2) existing conditions for soil, geology, elevation, aspect, (3) resource objectives including the compelling reasons for treating the stand, (4) management directions or land management plans, (5) desired future condition including clearly describing what the stand should look like using measurable silvicultural objectives, (6) operational capabilities or limitations, (7) alternatives including comparing the existing stand to desired future conditions to develop treatment alternatives, (8) appropriate economic cost comparisons for treatments, (9) decision rationale for selecting treatments, (10) implementation and monitoring plan including details for marking or treating a stand and (11) literature review, citations and any necessary appendices.

The ecosystem services framework could incorporate stand level management prescriptions and may be a highly effective way to demonstrate the provision of important ecosystem services included in forest assessments and plans. We provide an example of a modified approach that integrates this concept with typical silvicultural guidelines (Table 2). A traditional (commodity based) silvicultural prescription can be modified to accommodate non-commodity-based ecosystem services components that are not commonly addressed in traditional silvicultural prescriptions. The stand description could also be modified to encompass treatments in non-forested stands or to provide special forest products such as mushrooms or floral boughs (Table 2). This is done by adding specific ecosystem services objectives to the short- and long-term objectives section. The planned activities section then needs to be expanded to accommodate any additional associated off-site impacts.

These ecosystem services prescriptions could include both common ecosystem services provided such as sustainable timber supply, wildlife habitat, water quality or reduced wildfire risk but could also include some services that are undervalued or not typically included in stand prescriptions such as special forest products, cultural values, aesthetics and recreation use. These services are often overlooked or undervalued in typical management plans but including them in an ecosystem services prescription is an innovative way to address the protection of

Table 2 A general set of guidelines for writing a site prescription

Site information
- Site level information which generally controls management direction or options and are not likely to change over the project time lime, both biotic and abiotic; e.g. location, site label, management area, land suitability class, site productivity, hydrologic unit, soil type, ecological classifications, threatened, endangered, sensitive species habitat designations, geomorphology and so on.

Site description
- Site conditions that are likely to change as a result of implementing the proposed treatments or will likely be used to evaluate success of the treatment.
- Information about temporal site conditions; e.g. species composition, vertical and horizontal structure, fuel loading, special features, health and vigour, snags and down wood, water yield, quality, timing and so on.

Desired condition
- Detailed information as to what the site would look like upon successful completion of the treatments; e.g. species mix, structure, snags, dens, health, vigour, stocking, size distribution, layer composition, visual quality parameters, carbon pool levels, quantity, timing, quality of water yields, recreational opportunities, facilities and so on. Include metrics for evaluating success of the treatments or improvements.

Short- and long-term objectives
- Implementation of this prescription will contribute to meeting what objectives? What will be changed, how much will it be changed and over what time span will this occur; e.g. over the next 10 years increase the amount and condition of edible huckleberries available for harvest by 50%.

Implementation guide
- Detailed description on how to implement the initial treatment; describing how to determine what is to be treated and what is not to be treated.

Operational limitations
- List any operational limitations, mitigation or project design criteria that need to be addressed while implementing any planned activities.

Planned activities summary

Year	Name of treatment	Provide a reference or detailed prescription of the activity
0		
1		
10		

Adopted from a format suggested for use by USFS silviculturists for silviculture certification.

some key ecosystem services identified in forest assessments, and develop management plans that could enhance or preserve these services. Identifying these key services in the desired future condition would be a suitable starting point from which silviculturists could develop specific management plans to ensure these services will be maintained into the future.

Conclusions

Worldwide, the ecosystem services framework has emerged as a way of framing and describing the comprehensive set of benefits that people receive from nature including commonly recognized goods like timber and fresh water, as well as processes like climate regulation, water purification and cultural and aesthetic benefits. In the US, recent regulations including a Presidential memorandum and the USFS 2012 Forest Planning rule now require the agency to include ecosystem services in assessments and forest plan revisions. The USFS manages about one-fifth of the forested area in the US and the agency has sought placed-based applications of the ecosystem services framework to national forest management to better illustrate the ecosystem services concept for policymakers, managers and stakeholders. In particular, forest managers and planners want to demonstrate how an ecosystem services concept can be used in national forest assessments and plan revisions, and to implement ecosystem services in local projects.

The USFS has been exploring the use of an ecosystem services framework to describe forest values provided by federal lands and to attract and build partnerships with stakeholders to implement projects. This framework includes describing the ecosystem services provided by forest landscapes; examining the potential trade-offs among services associated with proposed management activities; and attracting and building partnerships with stakeholders who benefit from particular services the forest provides. We describe how an ecosystem services framework can provide added value to agencies like the USFS to support management objectives while better connecting the agency to stakeholders and community members. We summarize applications of an ecosystem services framework from national policy to forestand project-scale implementation including the modification of silvicultural prescriptions into ecosystem services prescriptions that include key ecosystem services that are a central part of forest plans and assessments. An ecosystem services framework will not only help transform the agency into a more effective and relevant organization, but it will bolster external relationships by strengthening the public's investment in USFS activities and articulating a management vision in terms of social values.

Conflict of interest statement

None declared.

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