Addressing Ecosystem Services and Social and Economic Sustainability in Forest Plan Components and Environmental Analysis

An Advice Bulletin for the 2012 Planning Rule

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Contents

Introduction

The 2012 National Forest System Land Management Planning Rule requires that forest plans guide management of National Forest System lands so they are ecologically sustainable and contribute to social and economic sustainability. Ecosystem services are important considerations when evaluating a plan area's contribution to social and economic sustainability. The 2012 planning rule requirements and directives for ecosystem services in plan revision are summarized in the ecosystem services overview technical advice bulletin and not repeated here. Key points and requirements can be interpreted as follows:

- Ecosystem services, along with infrastructure and operations, are "contributions" that a forest makes to people and their social and economic conditions.
- An ecosystem service depends on underlying forest resource and ecological conditions, as well as other complementary ecosystem services (for example, hunting services rely on range conditions and provision of forage).
- Plan components for a variety of resource and program areas should be written and integrated to ensure they work together in providing ecosystem services.
- The planning team should demonstrate how alternative plan components, in aggregate, provide for alternative forest and ecological conditions, and how those conditions produce different levels or "baskets" of ecosystem services.
- The impacts of ecosystem services on social and economic conditions will be uncertain. For example, plan alternatives provide opportunities for timber services through timber suitability determinations, but local employment impacts will be a function of other factors (such as market trends) outside the control of the Forest Service. The national forest or grassland therefore contributes to social and economic conditions, but is not solely responsible for those conditions.
- The planning team should try and demonstrate how alternative levels of ecosystem services could impact or help sustain social and economic conditions over time, without committing to providing specific social or economic conditions. An exception is that plan components can commit to specific social or economic conditions within the national forest boundaries.

Planning teams have flexibility on how they demonstrate ecosystem service contributions and potential impacts to social and economic conditions during plan revision. This document provides advice that can help with those tasks.

- Section 1 of this guide demonstrates how you can account for ecosystem services in plan components.

- Section 2 discusses an iterative process for revising plan components that guide ecosystem service contributions to social and economic sustainability.
- Section 3 provides advice on conducting effects analysis for ecosystem services and social and economic conditions.

The approach outlined below requires collaboration among resource specialists in a systematic process that will benefit from an "ecosystem service coordinator". This may be a social scientist, economist, interdisciplinary team leader, or other specialist who can take on the tasks of implementing and orchestrating efforts to address ecosystem services throughout the planning process.

1. How can I account for ecosystem services in plan components?

Many plan components do not explicitly appear to target ecosystem services. In fact, some plan components may occur in various resource-specific sections of the plan not commonly associated with economic and social conditions or ecosystem services (such as fire management or infrastructure), but these plan components are still connected to key ecosystem services identified in the assessment. Some of those connections may require planning teams to demonstrate further linkages and explanations; while other connections to ecosystem services may be more self-evident. We can make connections to ecosystem services using information from the assessment on beneficiaries of ecosystem services. When these connections are established, we help reflect the integrated resource management and ecosystem services emphasis of the Planning Rule.

Plan components do not need to be designed explicitly for a specific key ecosystem service, so long as there is a linkage between each of the key ecosystem services and plan components. For instance, a plan component may directly provide a key ecosystem service (such as when a management area is created for non-motorized recreation, or lands are determined to be suitable for timber production). Or, a plan component may indirectly provide a key ecosystem service (such as when guidelines for prescribed burning help reduce impacts to air quality, or a desired condition for vegetative diversity in age classes also provides big game hunting opportunities). The only requirement is that key ecosystem services must have a linkage with plan components somewhere in the plan (FSH 1909.12, ch. 20, sec. 23.21b) or supporting documents. You can account for these links by adding descriptions:

- to the plan components themselves,
- to introductory sections of the plan such as paragraphs describing plan components for specific resource areas, and/or
- to the plan's environmental impact statement.

The examples below demonstrate how different types of plan components can be written to show how the plan area contributes to ecosystem services and social and economic sustainability.

Desired Conditions

In general, desired conditions are described in terms that are specific enough to allow progress toward their achievement, but do not include completion dates. Most desired conditions concerning social, cultural, and economic elements reflect contributions to communities and economies outside the plan area in the broader landscape. Therefore, these desired conditions should be written to clarify how the plan area will contribute to those communities and economies through land management, without explicitly stating desired social and economic conditions for the communities themselves. For example, here is a desired condition statement that is not consistent with the 2012 Planning Rule:

> The local economy and communities surrounding the Smokey Bear National Forest are vibrant, with a strong presence of timber and tourism industries, providing year-round and high-paying jobs for the local workforce.

The Forest Service as an agency may very well support the above statement, but it creates a perception that the agency will provide for certain economic conditions, which is not practical given the inherent capabilities and authorities of the agency. It is more consistent with the Planning Rule for desired conditions to focus on the *contributions* of National Forest System land management to local communities and economies (FSH 1902.12, ch. 20, sec. 23.22).

Desired condition statements that incorporate social and economic considerations should describe the intended level or nature of the contributions from land uses, resources, multiple uses, and key ecosystem services of the plan area. Desired conditions can also describe how those intended contributions may affect social and economic conditions in the broader landscape. For example:

> The provisions of sustainable forest goods and services contribute to the well-being of local communities through recreation opportunities (including fishing and hunting), commodities (including timber, forage, and minerals), and jobs and income for both local and regional economies.
>
> The gateway communities surrounding the national forest provide a vital link to the natural and cultural resources. The Smokey Bear National Forest aims to expand and strengthen partnerships with these communities, specifically focused on water and dispersed recreation resources. Forest managers will contribute towards their sense of community by providing opportunities for decisions to reflect the national forest's unique character and identity and support local, cultural events.

Other than the relatively all-encompassing example statements above, desired conditions can also be tailored to focus on a specific resource area:

> The plan area contributes to the social and economic sustainability of rural communities dependent on forest resources and natural amenities by providing ample and wild-ranging recreation opportunities, thereby fostering a robust tourism sector and related industries.

There will also be desired conditions concerning social and economic elements and/or ecosystem services within the plan area itself. Those desired condition statements describe specific ecosystem or social and economic characteristics of the plan area (or a portion of it) toward which land and resource management should be directed. They may include the type of public uses and social environment that the plan area can provide, cultural and community aspects and activities, and the types of employment opportunities that could occur within the plan area. Here is an example:

> The plan area connects people, including youth, with nature across the national forest by providing a wide range of opportunities such as volunteering, education, and scientific learning.

When incorporating ecosystem services, desired condition statements should describe the intended level or nature of the key ecosystem services provided by the plan area, and may include the intended contribution of those services to the broader landscape. The following examples demonstrate how key ecosystem services (carbon, water quality, and livestock grazing) that were identified in the assessment are incorporated into desired condition statements:

> Carbon sequestered in forest vegetation is maintained or increased as compared to current levels.
>
> Carbon is sequestered in forest vegetation and wood products and the rate of sequestration is increased in the growth of younger forest stands.
>
> The water provided from the national forest maintains a quality that can be used with minimal treatment as a water source for adjacent communities.
>
> Grazing of livestock (through the provision of forage) on the national forest is maintained on land areas appropriate for such use and complements adjacent ranching communities that are dependent on national forest range for summer use.

As stated previously, connections between plan components and ecosystem services reflect the integrated resource management and ecosystem services emphasis of the Planning Rule. This becomes particularly apparent in the design of plan components such as objectives, standards and guidelines.

Objectives

Objectives in forest plans are concise, measurable, and time-specific statements of a desired rate of progress toward a desired condition or conditions, based on reasonably foreseeable budgets (36 CFR 219.9(e)(1)(ii)). Therefore, objective statements featuring ecosystem services and social and economic elements should describe priority achievements or outcomes intended during the plan period (10-15 years) related to the plan area contributions of multiple uses, key ecosystem services, infrastructure, and management operations of the National Forest System land. If needed, further clarifications can be made to describe how

those intended contributions may affect social and economic conditions in the broader landscape. The objectives should be measureable and written so that it's clear as to whether or not they are achieved. In the first two examples below, quality water and livestock grazing are the key ecosystem services linked to the objective:

> Provide for replacement of 150 undersized culverts in the next 10 years to improve water quality and other aquatic health benefits. Water quality is important to downstream communities including two adjacent municipal watersheds.
>
> Maintain transitory early seral conditions for grazing on 5 percent of lands suitable for livestock grazing throughout the planning period. Favorable forage conditions support an economically viable livestock industry and contribute to rural agricultural community lifestyles, traditions, and culture.
>
> Maintain [some other conditions] on 50 percent of land suitable for livestock grazing. Diverse rangeland conditions provide for [specific ecosystem service] while still sustaining contributions to the livestock industry.

Suitability

Specific lands within a plan area will be identified as suitable or not suitable for various multiple uses or activities based on the desired conditions applicable to those lands. Through suitability analyses of various resources or uses, suitability may determine what services could occur on those lands, and on what lands certain uses or activities cannot occur to provide for or protect other ecosystem services. Suitability, in a general sense, is expressed in terms of "yes" or "no." A "yes" is further conditioned by standards and guidelines to achieve desired conditions and objectives. For example the plan may designate:

- Areas suitable for off-highway vehicle recreation (thus providing a certain recreation experience or cultural service in these areas).
- Areas not suitable for road construction to protect watersheds, or areas not suitable for motorized recreation to provide quality nonmotorized recreation (thus not able to provide access and motorized recreation experiences in these areas).

In many cases a suitability determination, by nature, implies contributions to one or more ecosystem services while in other cases making connections to ecosystem services will require additional explanation. Clearly identifying and connecting those relationships is key, as it reflects the integrated resource management and ecosystem services ideal set forth by the Planning Rule.

Standards and Guidelines

A standard is a mandatory constraint on project and activity decisionmaking, established to help achieve or maintain specified desired conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements. A guideline is the same as a standard except that there is flexibility as to how it is followed so long as the purpose of the guideline is met. Therefore, standards and guidelines apply constraints to projects and activities so that the quantity or quality of multiple uses, key ecosystem services, infrastructure and the management operations of National Forest System lands is maintained or increased.

Standard examples (note the "must" language here)**:**

Prescribed fire projects must provide for clear perimeters that are effective in preventing fire spread into riparian management zones for the protection of water quality, water filtration and soil protection services.

Allotment management plans for livestock must include effective methods to prevent livestock encroachment in areas with populations of plant species of conservation concern.

Guideline examples (note the "should" language here)**:**

To protect water quality, new roads should not be constructed across riparian zones.

To provide for ecotourism opportunities and recreation, no harvest units should exceed the opening sizes for the following scenery management zones.

To provide for scenic quality and related cultural services, no harvest units should exceed the opening sizes for the following scenery management zones.

Other Contents of the Plan

Other plan components include distinctive roles and contributions, priority watersheds, proposed and possible actions, and the monitoring program. Management approaches and strategies, partnership opportunities, or coordination activities are optional components. These components may also have direct or indirect relationships with social and economic elements or key ecosystem services. For instance:

- **Proposed and possible actions** may describe vegetation management and their contribution to key provisioning ecosystem services.
- **The monitoring program** may identify certain questions and indicators related to multiple uses for monitoring and evaluation. Generally these consist of commodity output and visitor use.

- **Management approaches and strategies, partnership opportunities, or coordination activities** may describe how the plan intends to, either by itself or in partnership with others, achieve desired outcomes related to agency operations, infrastructure, or key ecosystem services.
- **Priority watersheds** may be used to highlight contributions to water and related key ecosystem services, linking specific beneficiaries such as municipal water districts.

2. How can plan components provide ecosystem services that contribute to social and economic sustainability?

The Forest Service Handbook (FSH 1909.12.23.21) provides the following considerations to help you build plan components that provide levels of ecosystem services that contribute to social and economic sustainability:

- What contributions are needed or desired from the plan area to contribute to social, cultural, and economic conditions?
- Will the plan area (under the management of the plan) be able to sustain these contributions?
- How will the plan components influence the contributions of the plan area to social and economic sustainability?
- How will the plan affect social, economic, and cultural conditions in the plan area and area(s) of influence and the broader landscape? Will the plan adversely affect or benefit minority or low income populations?
- Will the plan be able to sustain the plan area's contributions to social, cultural, and economic conditions under the reasonably foreseeable risks and uncertainties affecting the plan area, the area of influence, and the broader landscape?
- Are the plan components related to social and economic sustainability well integrated with the plan components that provide for ecological sustainability, including those that provide for ecosystem integrity and species diversity?

These considerations build on one another and help guide the process for revising plan components. Questions overlap; that is, the answers to some questions shed light on answers to other questions. In addition, these questions frame the relevant dimensions of social, cultural, and economic considerations that not only facilitate plan component development but also effects analysis (see next section). The figure below demonstrates how these considerations build on one another and can be conceptualized as an iterative process for evaluation of plan components.

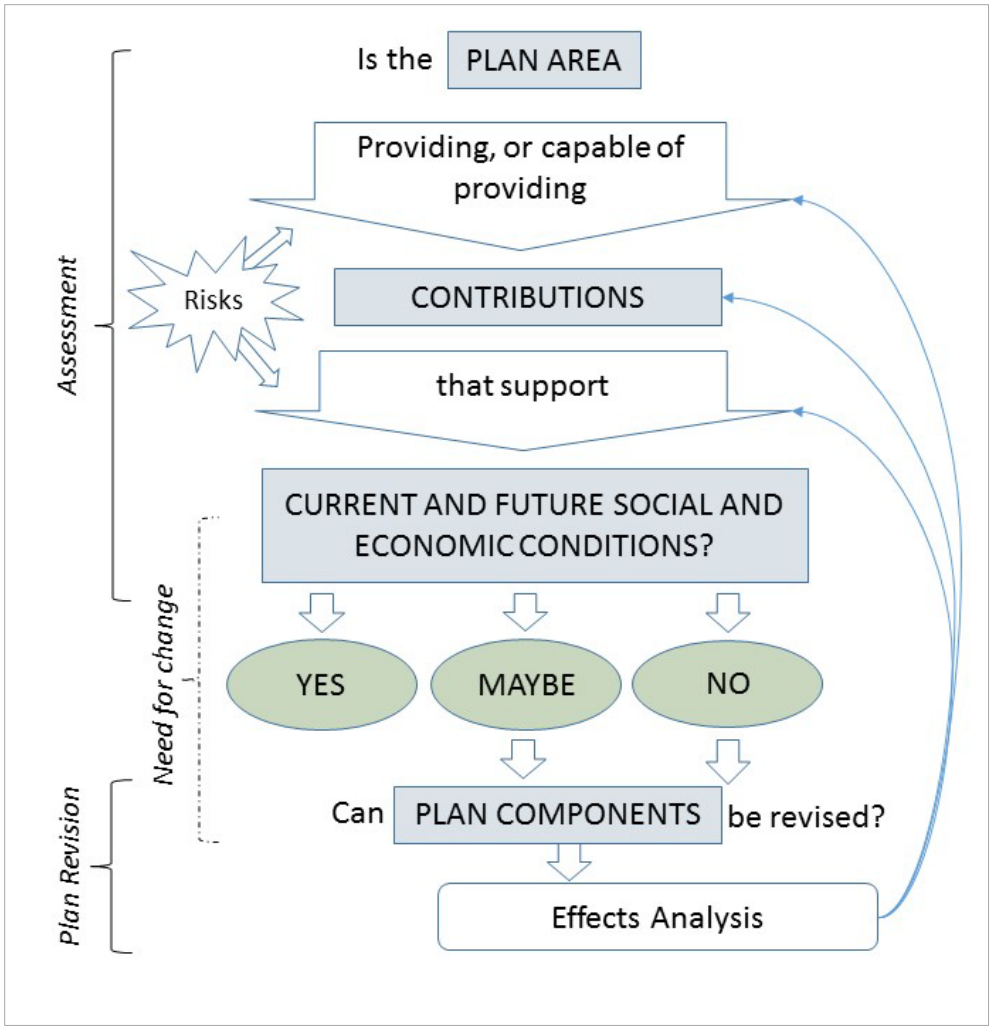

Figure 1. Iterative process of identifying contributions

Figure 1 represents the six considerations listed on the previous page in the form of a decision tree. The decision tree shows how you can ask the question "is the plan area providing or capable of providing ecosystem service contributions that support current and future social and economic conditions?" Answers to this question should be available in the plan assessment. If the answer is "No" or "Maybe", then the flow chart asks "Can plan components be revised" in order to better provide those contributions? "Need for Change" documentation helps answer this question[2]. If plan components can be revised, the bottom of the decision tree shows how the planning team can conduct "Effects Analysis" to demonstrate how revised plan components might change the plan area's

[2] In the context of NEPA, significant issues generated from scoping will also inform revisions of plan components.

capacity to contribute ecosystem services that better support current and future social and economic conditions. Multiple iterations of this process may occur[3].

The flow chart also shows how risks, including stressors or drivers, can influence the plan area's ability to provide ecosystem services that support social and economic conditions; risks should therefore be accounted for when revising or modifying plan components to help ensure ecosystem service contributions are sustainable.

Basically, the interdisciplinary team is expected to examine plan components and impacts to ecosystem services internally and ask:

- Are consequences to social, cultural and economic conditions acceptable, now and into the future?
- Are ecosystem services sustainable, in the context of uncertain risks, stressors, and drivers?

These examinations may require collaboration among specialists to adequately describe ecosystem services as a function of resource and program conditions. If answers to these questions are "no" (or "maybe"), then plan components may be revised or added within the authority of the agency, the inherent capability of the land, and the fiscal capability of the planning unit. In this manner, the Handbook considerations above help with an iterative analysis of plan components for characterizing effects in the environmental impact statement and during plan component development.

Plan components need to consider sustainability, demonstrating that contributions can be provided to current populations while still ensuring sufficient levels of opportunities are made available to future generations; this is consistent with the definition of social and economic sustainability in the 2012 Planning Rule.

Plan component language is often drafted for resource areas in response to the need-for-change documentation, as well as significant issues identified from scoping comments. The need-for-change documentation builds on the plan assessment, which contains information on the national forest's or grassland's contributions to social, cultural, and economic sustainability, or the underlying resource conditions necessary to maintain or restore contributions. Because of this, it would be easy to assume that contributions to sustainability have been included in the development of plan components. To be sure, have a social scientist or economist involved in cross-examining specific plan components, relative to the six considerations. See the technical advice bulletin on "Economic

[3] Effects analysis is adopted as a means to inform revision or design of plan components, in addition to its traditional role as a summary of effects of the final set of alternatives in the environmental impact statement.

Sustainability in Forest Planning Under the 2012 Planning Rule" for more information on frameworks for analysis of sustainability.

Approaches for addressing considerations about minority and low income populations, and integrating social and economic sustainability with ecological sustainability include using a beneficiaries-based framework to link contributions to social and economic conditions (such as affected populations, communities, or lifestyles). Knowledge of beneficiaries helps reveal the social and economic consequences of plan components. Beneficiaries include those people, groups, or communities impacted by key ecosystem services (see the "A Brief Guide to Assessing Ecosystem Services for Forest Plan Revision" and associated tools). Other beneficiaries should be considered, such as beneficiaries from physical infrastructure, Environmental Justice populations and other communities benefiting from resources not characterized during the identification of key ecosystem services but relevant to social and economic considerations. Other approaches are detailed in the following discussion of effects analysis.

3. How can I analyze ecosystem service effects?

The effects of plan components on ecosystem services have two dimensions:

- Provision or supply: What amount, quality, scale of an ecosystem service is provided over time?
- Social or economic effects: How well are ecosystem service supplies meeting social or economic needs, preferences, desires, or demand?

Ecosystem services are defined as the benefits that people get from the forest ecosystem, and benefits depend on how much of something there is being supplied and how well those supplies are meeting the needs of people and communities. This section therefore approaches effects analysis from these two dimensions.

Presnall et al. (2015)[4] surveyed over 500 Forest Service employees about the usefulness of the ecosystem services approach in describing environmental impacts to the public. Many thought that analyzing ecosystem services would be useful in decisionmaking, but most indicated it would also lengthen the process. One respondent encapsulated these collective sentiments (p.33):

> "I think many of my colleagues would like to consider ecosystem services in NEPA so long as it did not create even longer and more convoluted analyses with . . . more opportunity for blunders that become appeal points and then litigation. Forest Service NEPA has

[4] Presnall, C., L. López-Hoffman and M. L. Miller. 2015. Adding ecosystem services to environmental impact analyses: More sequins on a "bloated Elvis" or rockin' idea? Ecological Economics, Volume 115, July 2015, Pages 29-38, ISSN 0921-8009, http://dx.doi.org/10.1016/j.ecolecon.2014.02.001.

become like Elvis in his later years—bloated, with a fancy outfit, but basically not very functional."

The advice below attempts to strike a balance between characterizing effects that inform decisionmaking early in the process (preemptively addressing potential conflicts later in the process) and placing demands on time and planning resources.

How do I describe effects on ecosystem provision (or supply)?

We recommend that analysis of ecosystem services be built around or rely on common or established measures or indicators. Indicators can be explicitly stated in plan components or used in resource area effects analysis pertinent to ecosystem services.

Begin by identifying the resource or program areas that provide for a given ecosystem service. You can then rely on the indicators used to track effects or significant issues for those resource or program areas to describe effects on the relevant ecosystem services (for example, use or build on indicators for range, wildlife, or recreation (access) to describe overall provision of hunting recreation services). The advantage of this is that you can rely on and be consistent with work already done by other resource specialists.

Some indicators of change may be qualitative in nature, which may be the best you can do. Or you may be able to augment or expand those indicators to better characterize changes in ecosystem service provision across alternatives. In general, it is helpful to work from information that is already being used, and augment that information if needed to tell a better story about potential changes in the provision of ecosystem services.

If you feel significant gaps remain in being able to describe effects on an ecosystem service, you can flag the plan components that contribute to the ecosystem service and use or build on indicators of resource or program outcomes associated with those components. Indicators may be explicitly stated within components, or implied by the language of the component. See the examples that follow the next paragraph.

It is helpful to compile components affecting comparable ecosystem services, thereby providing opportunities to show how differences in some components might alter provision of ecosystem services across alternatives. It is likely that various plan components throughout the plan will contribute to a common ecosystem service. For instance, the following types and examples of plan components could address flood control:

- [Objectives] Description of a planned restoration program to enhance the ability of existing streams and wetland buffers to retain water in large precipitation events.

- [Standards] Restrictions on any modifications of stream or watercourses that would lead to increased runoff during major precipitation events.
- [Guidelines] Limitations on grazing activities that could contribute to additional runoff.
- [Guidelines] Limitations on motorized recreational uses that could contribute to soil compaction.

From these examples, it is evident that various plan components contribute to the provision of ecosystem services, even when those plan components apply to different resource and program areas within the forest plan (such as soil productivity, hydrology, motorized recreation, or other ecosystem services-related sections). Individual resource areas will analyze their respective effects, and ecosystem services other than flood control benefits (like recreational fishing) may be impacted by these same components. Therefore, systematically organizing related plan components that affect common ecosystem services will aid in the evaluations of their effects.

Following the examples above, indicators used in effects analyses by resource specialists might include the probabilities of flood events, sediment loadings downstream, or other indicators to compare among alternatives. Indicators or measures relevant to ecosystem services can also be characterized as qualitative conclusions and include statements such as "under this alternative, the absence of motorized use restrictions would increase sediment loadings downstream." Some of the connections between ecosystem services and indicators from other resource sections may require explanation of their linkages.

Discussion of key ecosystem services and potential tradeoffs with the interdisciplinary team early in the analysis process may reveal if and how resource specialists can modify their indicators or analytical methods to facilitate evaluations of ecosystem services linked to respective resource areas. In some cases, traditional resource indicators or measures (like animal unit months for grazing or volume for timber) may be sufficient for characterizing ecosystem services. In other cases, collaboration among resource specialists may be needed to explore options for modifying or developing indicators that help clarify how a resource (like soils or wildlife) contributes to ecosystem service benefits, as well as social and economic conditions.

How do I describe the effects of ecosystem services on social and economic conditions (and beneficiaries)?

After properly identifying, modifying, and compiling relevant information or indicators about ecosystem service provision, the ecosystem services lead should try to evaluate how ecosystem service provision contributes to social and economic sustainability. It is helpful to begin by describing the beneficiaries affected by indicators of provision. Information from the assessment on beneficiaries, as well as social and economic conditions, helps establish this link.

As an example of how indicators relate to beneficiaries, consider how an increase or decrease of flood probability affects the health and safety of downstream resident populations, communities, or agricultural water users? How would the increase or decrease of sediment loadings affect municipal water users?

There may be many relationships between ecosystem services indicators and beneficiaries. The key is to identify potential effects in the broader landscape (such as effects to municipal water supplies) and not only those effects to users on National Forest System lands (such as effects to recreational settings or resource extraction). Recall during the assessment stage, one of the two criteria for determining key ecosystem services is the importance to people outside the plan area. Logically, during the effects analysis, importance in the broader landscape would be evaluated as context for effects on beneficiaries across alternatives.

The effect (or benefit) of an ecosystem service on beneficiaries depends on how many people are affected by, use, or otherwise benefit from an ecosystem service, and how are they affected (for example, numbers of recreational fishing visits, levels of fishing satisfaction, or willingness to pay). Answers to these questions are a function of the quantity and quality of an ecosystem service provided, as summarized in the section regarding provision effects above.

Effects analysis should try to capture the key elements affecting people's needs for or satisfaction with ecosystem services to more fully describe how plan alternatives are guiding ecosystem service contributions to social and economic sustainability. The needs and desires for ecosystem services will change over time as a function of evolving demographics and ecological or environmental conditions; key trends in these areas may help drive revision of plan components affecting ecosystem services.

Provision of ecosystem services is frequently linked to indicators or measures of underlying forest resource and ecological conditions that interdisciplinary teams and planning teams may be more familiar and comfortable with (like AUMs, CCF or recreation visits). In contrast, descriptions of needs, desires, or preferences for ecosystem services rely on other social and economic measures or attributes, including discussions of values.

Do I need to attach a value to ecosystem services?

The 2012 Planning Rule does not require or preclude placing a value on ecosystem services. Just because values can be monetized or quantified does not imply that they should be monetized or quantified for a given decision or action. Staff with social science or economic expertise should be consulted when evaluating the validity of valuation methods.

If valuation is considered, the analyst should recognize and acknowledge the complexities and uncertainties associated with valuation of ecosystem services. These complexities are compounded by changing demographics and preferences,

quality attributes of goods and services, availability of alternative or substitute services, and broader landscape factors. Further, the feasibility and defensibility of ecosystem service valuation is highly dependent on how Forest Service contributions to ecosystem services are characterized within a specific management decision context and landscape. See “For More Information” below for link to additional advice on valuation.

How do I describe ecosystem service tradeoffs?

If forest plan components are to be effectively implemented within the inherent capacity of the landscape, then their creation depends on some understanding of how changes to plan components affect forest resources and production of associated ecosystem services. It may be helpful to describe the potential tradeoffs of these effects in terms of increases in ecosystem services achieved at the expense of decreases in other services (what is given up to gain something else).

A variety of methods and templates for considering tradeoffs and consequences to ecosystem services are available and may be helpful when developing plan components, or to identify indicators of ecosystem services that could be used to facilitate discussions of tradeoffs during effects analyses. In addition, examining tradeoffs can help the team develop alternative management scenarios for environmental effects analysis. Tradeoffs can also help analysts reveal the complexities and uncertainties associated with ecosystem services effects within a broader landscape over time, and the role of National Forest System lands in contributing to ecosystem service production. The “Ecosystem Services Tradeoffs” Technical Advice Bulletin (under construction) provides approaches to adapting a tradeoff analysis framework, or a structured decision framework that uses ecosystem services information and concepts. See “For More Information” below for link to additional advice on tradeoffs.

For More Information

Additional advice and tools for addressing ecosystem services in planning, including valuation and tradeoffs are available through the ecosystem services link at the Forest Service Economics Center website: http://fsweb.wo.fs.fed.us/economics/index.shtml.