Forest Management Unit Scale Sustainability Monitoring: Application to Forest Planning

Introduction

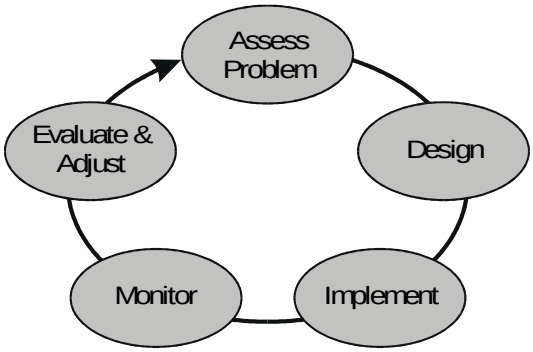
The purpose of the USFS Local Unit Criteria and Indicator Development (LUCID) Project was to conduct a pilot study that would appraise the feasibility of monitoring sustainable systems at the forest management unit (FMU) scale. As a result of the test projects LUCID participants from Forest Supervisors to Forest Team members concluded that systems-based monitoring for FMU-scale sustainability is feasible and can make significant contributions to improving Forest Service management. In particular, FMU scale sustainability monitoring can provide forest managers and collaborators with feedback that can be used: to improve Forest Land Management Plans; to enhance collaboration between National Forests and other governmental agencies; and to relate forest plan outcomes with regional and national C&I trends.

In this short paper we excerpt the findings from the LUCID Project that relate primarily to the potential application of FMU scale sustainability monitoring for forest planning and monitoring.

Monitoring & the Adaptive Management Feedback Loop

Monitoring at the FMU scale is one of the primary mechanisms to provide feedback to inform management about progress towards sustainability and is consistent with an adaptive management, ecosystem management approach. In adaptive management managers systematically and rigorously learn from specific actions so that they can accommodate change (see Figure 1). In this context monitoring is not independent from the larger management process but rather an integral component.

Figure 1. The role of monitoring within an adaptive management approach



Within an adaptive management context, monitoring can be used both to help answer questions about the outcomes of management activities and to inform the next phase or round of planning and management decision-making. Monitoring provides feedback to forest managers and collaborators about the state of ecological, social, and economic systems to facilitate dialogue and to inform the application of needed management on the ground. The analysis of monitoring information, the sustainability assessment, becomes the core, the essential feedback loop, of managing for sustainability.

Forest Planning, Management and Monitoring

Current Forest Plan monitoring is guided by the National Forest Management Act (NFMA) and includes minimum legally required monitoring activities supplemented by other additional monitoring items relevant to the Forest. Currently, there is a great deal of inconsistency between monitoring activities on National Forests and Grasslands but most have a dominant focus on Forest Plan implementation monitoring and a tendency to focus on short-term outcomes.

Generally, Forest Plan monitoring is neither systems-based nor systematic in nature. It typically focuses on the presentation of data for individual resources instead of the synthesis of components to encourage understanding of complex systems. As a result, the utility of Forest Plan monitoring to management is misleading and inadequate.

Systems-based sustainability monitoring provides a common framework to help organize and frame monitoring activities that can be applied consistently across the National Forest system. The LUCID Project recommended that FMU-scale sustainability monitoring can be used to support a collaborative approach to forest plan revision and can serve as the core of Forest Plan monitoring activities (see figure 2). Specifically, FMU-scale sustainability monitoring can be used as a process and set of tools to help identify a need for forest plan amendment or revision; to analyze the existing FMU condition, identify critical issues and serve as a source of information; to evaluate alternatives using a common format; to coordinate monitoring activities; and to monitor and assess the outcomes of the plan. This sustainability assessment can be used to inform short-term management decision-making, to inform upward level reporting assessment requirements, and to assess the progress towards sustainability that may indicate need for plan revision or amendment.

Assessing the State of Systems
A sustainability assessment using a suite of C&I can provide a comprehensive way of looking at the state of systems, as well as the state of our knowledge, in preparation for Forest Plan revision. An assessment provides a way of analyzing the current state of the of FMU systems and facilitating understanding of the place of the National Forest in the larger context and in identifying the need for change.

Analyzing the Existing Management Situation and Collaboratively Identifying the Need for Change
A collaborative approach to sustainability monitoring provides an opportunity for more participatory development of the analysis of the management situation and identification of the need for change. Although a C&I-based sustainability-monitoring program will not eliminate conflicting perspectives, it will facilitate a richer dialogue in understanding those different perspectives because of the use of a common language of C&I used to discuss the topics.

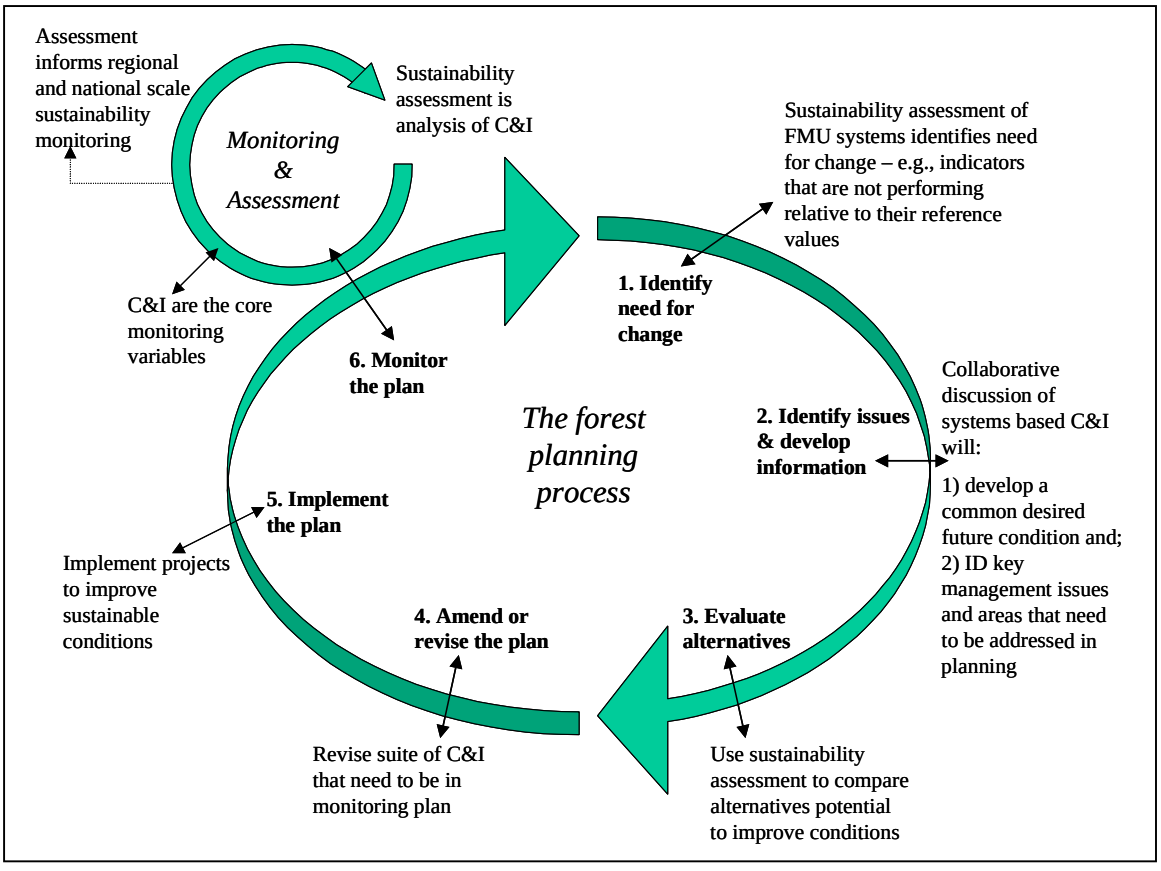
Highlights of Contributions to Forest Planning

- To form the core of the monitoring activities for Forest Plan monitoring;
- To perform an analysis of existing FMU system conditions (traditionally referred to as the Analysis of the Management Situation, or AMS) as preparation for Forest Plan revision;
- As a common set of criteria and indicators to compare alternative options on equal footing and with a common language;
- For periodic assessment of the state of systems;
- To facilitate dialogue and engage collaborators in a discussion of a relative assessment of sustainability;
- To provide a trigger or early warning of the need for change in the Forest Plan or for more detailed analysis;
- To provide higher consistency in monitoring activities from Forest to Forest to facilitate understanding among the public; and
- To organize and contribute to our understanding of sustainability at other spatial scales (e.g., subregional, national, and international reporting initiatives).

Evaluation of Alternatives
The benefits from this common language of C&I can extend to the comparison of alternative management outcomes. The common set of C&I can be used to compare scenarios or alternatives; and the potential outcomes and interactions between social, economic, and ecological aspects of these alternative scenarios could be discussed. Alternatives can be compared against a set of common reference values; or alternatively a comparative analysis can be completed based on differing perspectives on outcomes (e.g., emphasis on short-term versus long-term outcomes or reference values prepared from different perspectives).

Monitoring the Plan from a Sustainability Perspective
From a Forest Plan monitoring perspective, sustainability monitoring switches the focus from short-term, implementation monitoring to monitoring the FMU conditions. The system approach that frames the monitoring system can have broader application throughout Forest planning and management as a framework for understanding complex living systems. Implementation monitoring and other monitoring requirements will still be necessary, but they can be organized within this comprehensive monitoring framework to facilitate bridging short-term actions to long-term outcomes.

Figure 2. The Relationship Between FMU Scale Sustainability Monitoring and Forest Planning



Coordinating Monitoring Efforts

A common monitoring framework that focuses on understanding the broader systems is also useful as a way to help rationalize and coordinate monitoring efforts. Often, each functional group (e.g., soils, aquatics) will propose monitoring items that are clearly related if not identical. Developing a systems-based monitoring program that frames and coordinates disciplinary measures can help identify those overlaps and reduce redundancies. In their experience in reorganizing the Forest Monitoring plan for the Southwest Idaho Ecogroup Forests (SWI EcoGroup), Forest planners found that it was relatively simple to fit each individual or functional units' monitoring need within a common framework (see Figure 3). They also noted that when forced to coordinate, in most cases groups could agree on measures or data that met a broad range of purposes. The ultimate result was that the overall suite of currently collected monitoring items was reduced (Morelan 2001).

Analysis and Synthesis of Results in an Adaptive Management Context

Systems-based sustainability monitoring supports the analysis and synthesis of information in a way more useful for program management decision-making. The comparison of indicators to reference values over time and the synthesis of these individual comparisons into an assessment of the overall system can help identify whether management actions and priorities should be revisited.

In an active management context the process of developing reference values requires analysis of the question: What variation from the reference conditions would initiate further evaluation and/or change in management direction? If progress is being made, management actions continue; and if not, the plan may be revisited or adjusted.

Flagging areas of concern can also lead to a more careful analysis of the appropriateness of the indicator or measure, the quality of the data, and the appropriateness of the reference value. An area flagged through monitoring might require a more detailed assessment or analysis. Using the systems framework as a guide, users may be able to hypothesize the possible effects of a problem in one area on interrelated issues in order to anticipate future problems.

Figure 3. Systems-Based Forest Sustainability Monitoring and the Southwest Idaho Ecogroup

The Southwest Idaho Group, consisting of the Boise, Sawtooth, and Payette National Forests, is a grouping of National Forests with similar ecology. The three Forests are working together to revise their Forest Plans and have incorporated much of the preliminary thinking from the LUCID Project into the design of the monitoring section of the draft Forest Plans. The initial draft set of LUCID C&I were used as a means of organizing the Forest Plan monitoring section. Lacking the more developed set of C&I that included measures and the associated database, the SWI Ecogroup went through a matrix of questions emulating many of the stages of the LUCID process. Indicators were examined for relevance in the context of the Forest Plan by identifying associated activities, practices, or effects to be measured. Each was evaluated through a set of six questions:

1) What was the question to be answered?
2) What technique should be used?
3) How reliable were the data?
4) How frequently should measures be taken and using what methods?
5) What was the reporting period? And
6) What variation would initiate further evaluation and or change in the management direction?

When revised and finalized, the resulting matrix in consort with other required monitoring elements forms the core of Forest Plan monitoring.

P.2 Principle: Maintain ecosystem integrity							
C.2.1 Criteria: Landscape function							
Indicator	**Activity, Practice Or Effect To Be Measured**	**Question To Be Answered**	**Monitoring Technique**	**Data Reliability**	**Measuring frequency and recommend method**	**Reporting Period**	**Variation That Would Initiate Further Evaluation And/Or Change In Management Direction**
2.1.1 Disturbance processes	Changes in landscape character	How are disturbance processes affecting ecological and watershed conditions?	Tracking acres burned by wildfires; acres affected by major wind events; number and size of landslide and flood events; and insect frequencies	Moderate	Annually via detection surveys, incident and fire reports, within selected 5th HUCs or groups of 6th HUCs	Five Years	20% change from average for selected 5 HUCs or groups of 6th HUCs.
2.1.2 Hydrologic condition	Riparian Condition	Are Forest management activities designed to maintain or improve riparian condition effectively meeting Forest Plan goals and objectives?	Proper Functioning Condition; Riparian Levels II and III evaluations (R4 Riparian Guide); National Resource Information System (which should include IIT data elements).	High	Three years via review of selected projects and surveys within 5th HUCs	Three to five years	Failure to achieve improving trend in vegetation composition and vigor, or other Watershed Condition Indices (WCIs) within selected 5th HUCs

(Source: Morelan 2002, Boise National Forest 2002)