Blue River Landscape Study: Testing an Alternative Approach

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October 13, 1999

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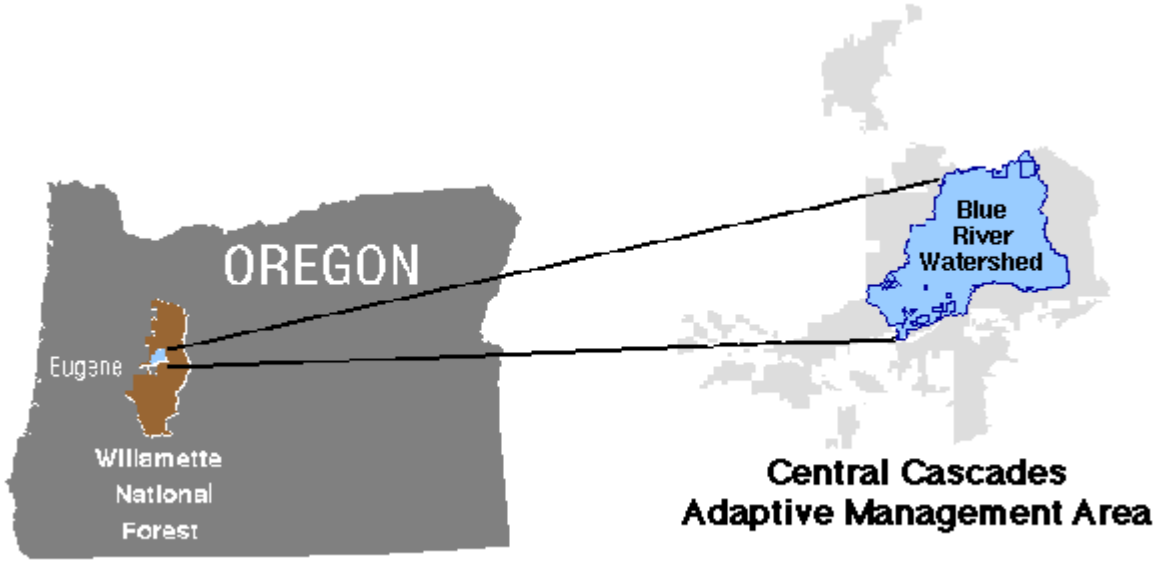
Introduction

A team of scientists and managers based on the H.J. Andrews Experimental Forest and the Blue River R
District of the Willamette National Forest have been working together for most of this decade to develop
test a landscape management approach based on natural disturbance regimes. The team has been motivat
a significant degree by concern over the loss and fragmentation of older forests, and the lack of a coherer
long-term strategy for conservation of older forests in managed landscapes. The underlying assumption o
approach is that by approximating key aspects of important disturbance regimes in management regimes
posed to native species and ecological processes are reduced as compared to other historical and
contemporary landscape management approaches (Swanson et al. 1994).

Concepts concerning use of information about natural disturbance regimes in management activities are emerging in many forest landscapes (Baker 1992, Hunter 1993, Mladenoff et al. 1993, Morgan et al. 199 Swanson et al. 1994, Bunnell 1995, Stuart-Smith and Hebert 1996, Cissel et al. 1998, Cissel et al. 1999, Landres et al. 1999). These approaches use information on historical and current landscape conditions, disturbance history, and social goals to set objectives for future landscape structures that provide desired habitat, watershed, timber supply, and other functions. The intent is not to mimic natural conditions, but rather to use them as a reference in developing and evaluating management alternatives to meet these go

Setting

The study includes the entire Blue River drainage (approximately 23,000 hectares), a tributary watershec the McKenzie River basin.



The landscape is steep, highly-dissected, volcanic terrain of the Cascade Range. Annual precipitation exc 2500 mm which falls mostly in October-April as rain at lower elevation and snow in higher areas. The landscape ranges from 317 m (1040 ft) to 1639 m (5349 ft) in elevation largely covered by conifer forest dominated by Douglas-fir (Pseudotsuga menziesii), western hemlock (Tsuga heterophylla), and Pacific s fir (Abies amabalis). The majority of these natural forests have developed after wildfire 60-150 yrs and 4 500 yrs before present. Cutting in the Andrews Forest in 1950-1970 and in the rest of Blue River mainly 1960-1990 has created scattered conifer plantations and other early-successional vegetation patches.

The Blue River watershed is a part of the Central Cascades Adaptive Management Area, an allocation in Northwest Forest Plan that encourages development and evaluation of new approaches. The H.J. Andrew Experimental Forest (approximately 6,300 hectares), established in 1948, is located entirely within the B River watershed.

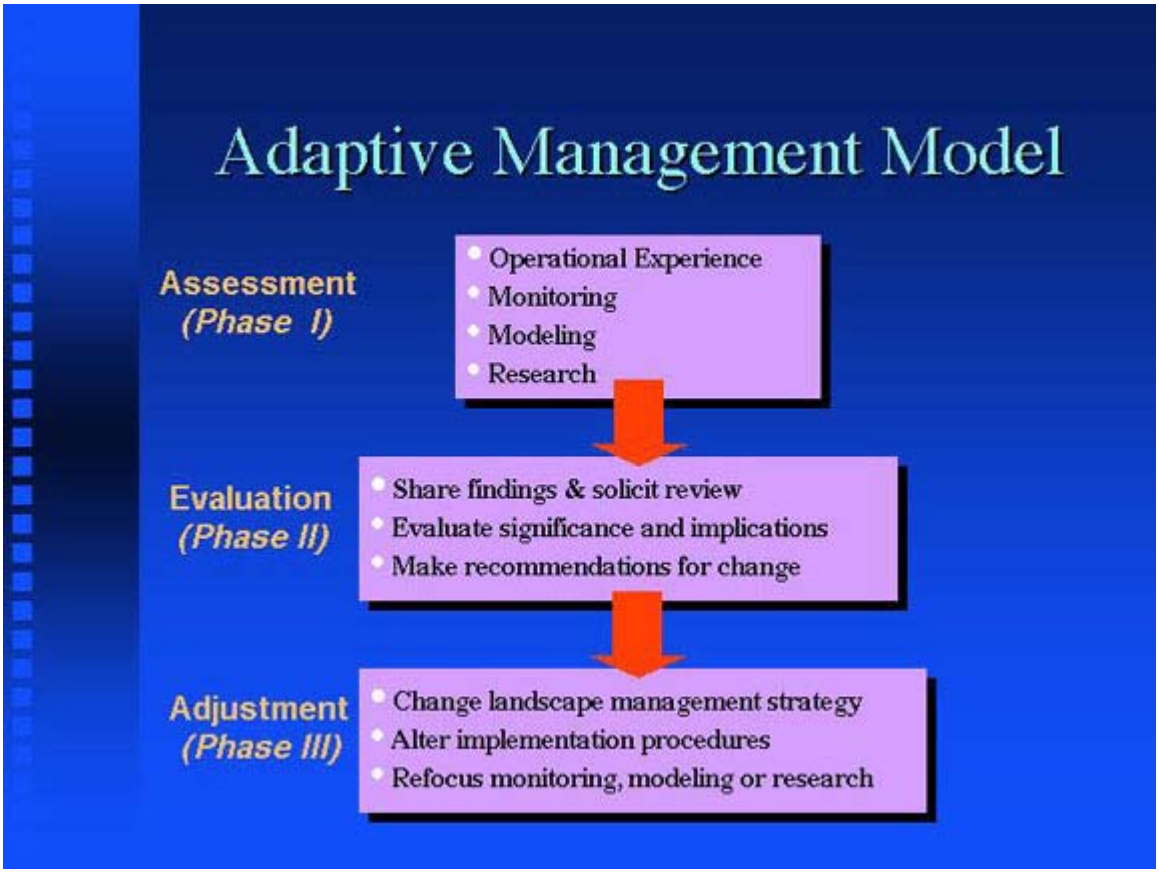
Objectives

The overriding objectives given to the Central Cascades Adaptive Management Area in the Northwest F

Plan are to conduct "intensive research on ecosystem and landscape processes and its application to fores management in experiments and demonstrations at the stand and watershed level", and to develop "approaches for integrating forest and stream management objectives and on implications of natural disturbance regimes" (USDA and USDI 1994). The Blue River Landscape Study is specifically designed develop, test and modify a landscape management approach based on natural disturbance regimes using adaptive management model. Integration of forest and stream management objectives is also a strong and complementary theme of the study. The landscape management approach used in the study is intended to meet the same general objectives underlying the Northwest Forest Plan: provide habitat to sustain specie associated with late-successional forests, maintain and restore aquatic ecosystems, and provide a sustaina supply of timber.

Adaptive Management Model

The adaptive management model followed in this study consists of three phases:



The first phase, the assessment phase, employs multiple modes of learning to discover the potential effec managing under this concept. These findings are evaluated in the second phase to determine their signifi and implications. Adjustments to the landscape management strategy are made in the third phase based o information produced from the preceding phases, and other sources of new concepts or information.

Four primary methods are used to assess the effects of the landscape management plan. The plan is being implemented on the ground through normal Forest Service programs. Novel aspects of the plan challeng ranger district employees to think differently and try new approaches. Hence operational experience is a mode of learning and a true testing ground. Field-based monitoring efforts are a second major mode of learning. Permanent plots are in place to measure the effects of plan implementation on a variety of spec

and ecological processes. However, it may take decades before many effects are observable and their significance known. Meanwhile a series of modeling assessments are being conducted to provide prelim results. A fourth method of learning derives from the H.J. Andrews Experimental Forest research progra Applicable research projects conducted in the watershed are designed to help understand patterns and processes directly relevant to the landscape management approach in the study.

Findings are evaluated through information exchange with interested parties, and through workshops anc reports focused on evaluation. Results from phase one are shared with a wide variety of audiences throug field tours, informal and formal reports, web sites, presentations and open houses. Feedback obtained dir from managers, policy-makers and interest groups through personal interaction is an important means of evaluation. Results from phase one are also evaluated through analysis and written reports (e.g., Weisber 1999, on file at the Blue River Ranger District), and through adaptive management workshops and field The principle result from these efforts are recommendations for potential changes to the landscape plan c the assessment projects.

The landscape management plan will be periodically revised when these results indicate a potential bene doing so. We have not yet been through this phase, but envision that recommendations will also be share widely with involved individuals to gain further perspective on the desirability of making changes to the study. Forest Service managers and scientists responsible for conduct of the landscape study will make tl final decisions concerning changes to the study.

Landscape Management Plan

Analysis

Two primary sources of information support much of the landscape management strategy. Earlier work i Augusta Creek landscape planning area (Cissel et al. 1998), where many of these concepts were pioneere demonstrated the importance of understanding natural disturbance regimes. Fire has played a central role shaping historical landscapes in this part of the Cascade Range. Fire history information from previous s in the area (Teensma 1987, Morrison and Swanson 1990) and from new data were complied in "Blue Riv Fire Regime Analysis and Description" (Weisberg 1996, on file at the Blue River Ranger District office) Data and supporting maps from this report provided descriptions of general fire regimes in the Blue Rive watershed. A watershed analysis was conducted following procedures in the Federal Guide to Watershec Analysis (USDA Forest Service 1996, on file at the Blue River Ranger District office) to describe and document hillslope-to-stream disturbance processes across the watershed. Other important information sources included "Herpetofauna in the Blue River Watershed, Western Cascades, Oregon" (Hunter 1996 file at the Blue River Ranger District office), and data on spotted owl productivity within the watershed f the spotted owl demography study (data on file at Blue River Ranger District).

Reserves

Two types of reserves were established. First, "Special Area Reserves" allocated in the Willamette Natio Forest Plan (USDA 1990), as amended by the Northwest Forest Plan, were delineated. These include Sp Interest Areas, Late-Successional Reserves, and the H.J. Andrews Experimental Forest. In addition, "Aq Reserves" were established to help meet the aquatic ecosystem objectives in the Northwest Forest Plan w be met. These reserves are of two types: small-watershed reserves and corridor reserves. Small-watershe reserves are strategically located throughout the watershed to encompass areas of particular importance t aquatic ecosystems and spotted owls. In addition, corridor reserves are established on all fish-bearing str Objectives for these reserves are to generally allow natural succession to occur, except where experimen being conducted in the Andrews Experimental Forest, or late-successional habitat can be enhanced throu

management activities in young stands.

Landscape areas

The remainder of the watershed is subdivided into three areas, termed "Landscape Areas", based on the natural fire regime interpreted for each area. Historically, fire frequency, severity, and spatial pattern var across the watershed. Wetter, cooler sites experienced infrequent severe fires and warmer, drier sites experienced more frequent lower severity fires. For each landscape area, timber harvest and fire prescrip were based on the underlying fire regime, as interpreted from tree-ring records. Timber harvest frequenc rotation age (100 - 260 years) were based upon historical fire frequency, timber harvest intensity (15% - overstory retention) was based upon historical fire severity, and the spatial patterns of timber harvest we based upon the spatial patterns of historical fires. The apparent pattern of historical fire in the watershed quite variable (Weisberg 1996). Landscape areas were intended to reflect that variability across the wate rather than represent a precise fit at an individual site. Fire prescriptions are integrated with the timber ha prescriptions. Implementation guidelines are intended to reflect natural disturbance patterns to the extent feasible while protecting ecological values. **Figure 3** depicts a plan view of both the landscape managem plan ("Landscape Plan") and a literal implementation of the Northwest Forest Plan as if it were applied t Blue River watershed ("Interim Plan"). Future timber harvest and forest successional patterns were proje across the watershed for the next 200 years for both plans (**Figure 4**).

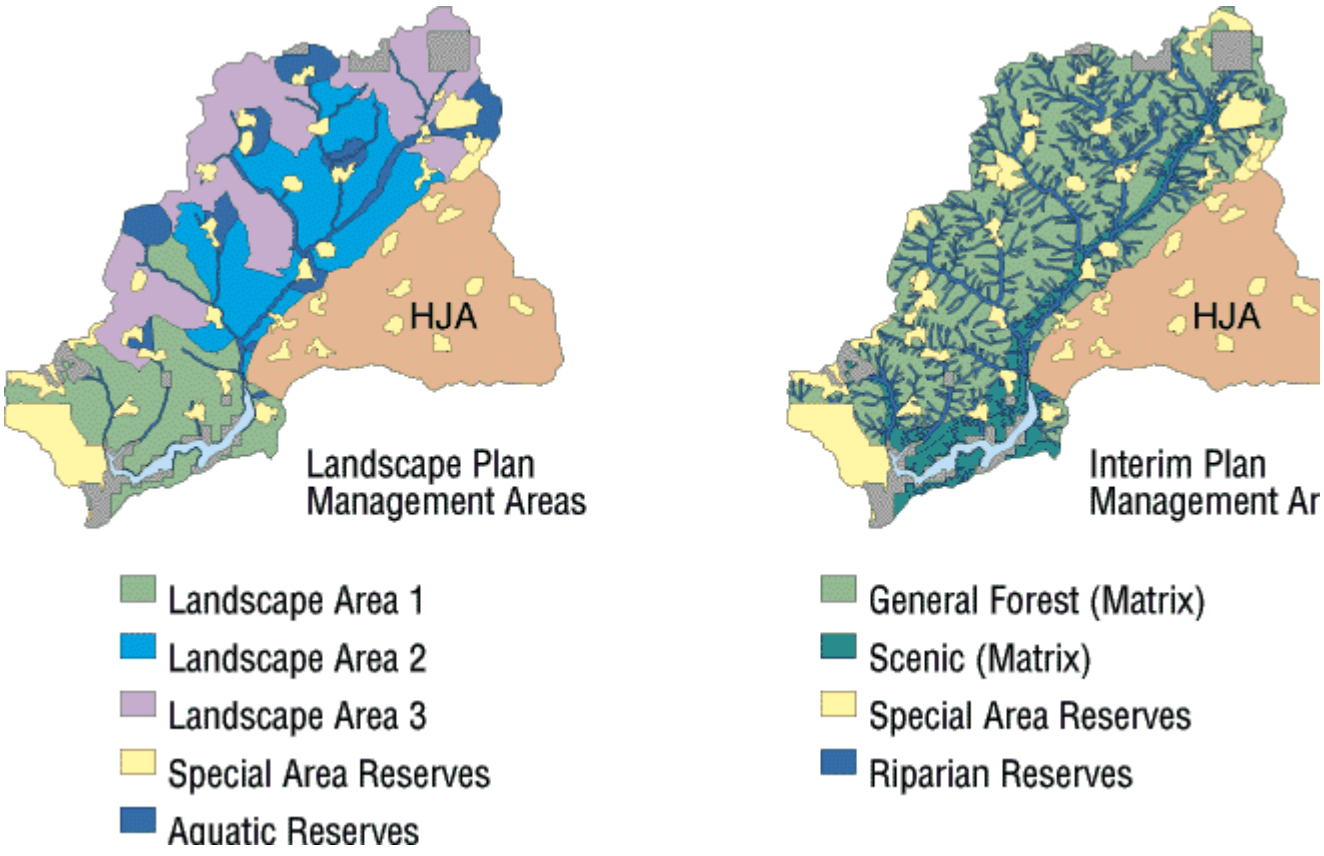


Figure 3. Management areas for the Blue River Watershed managed under matrix and riparia reserve designations in the Northwest Florest Plan (termed "Interim Plan"), and for the Blue Ri landscape management strategy (termed "Landscape Plan").

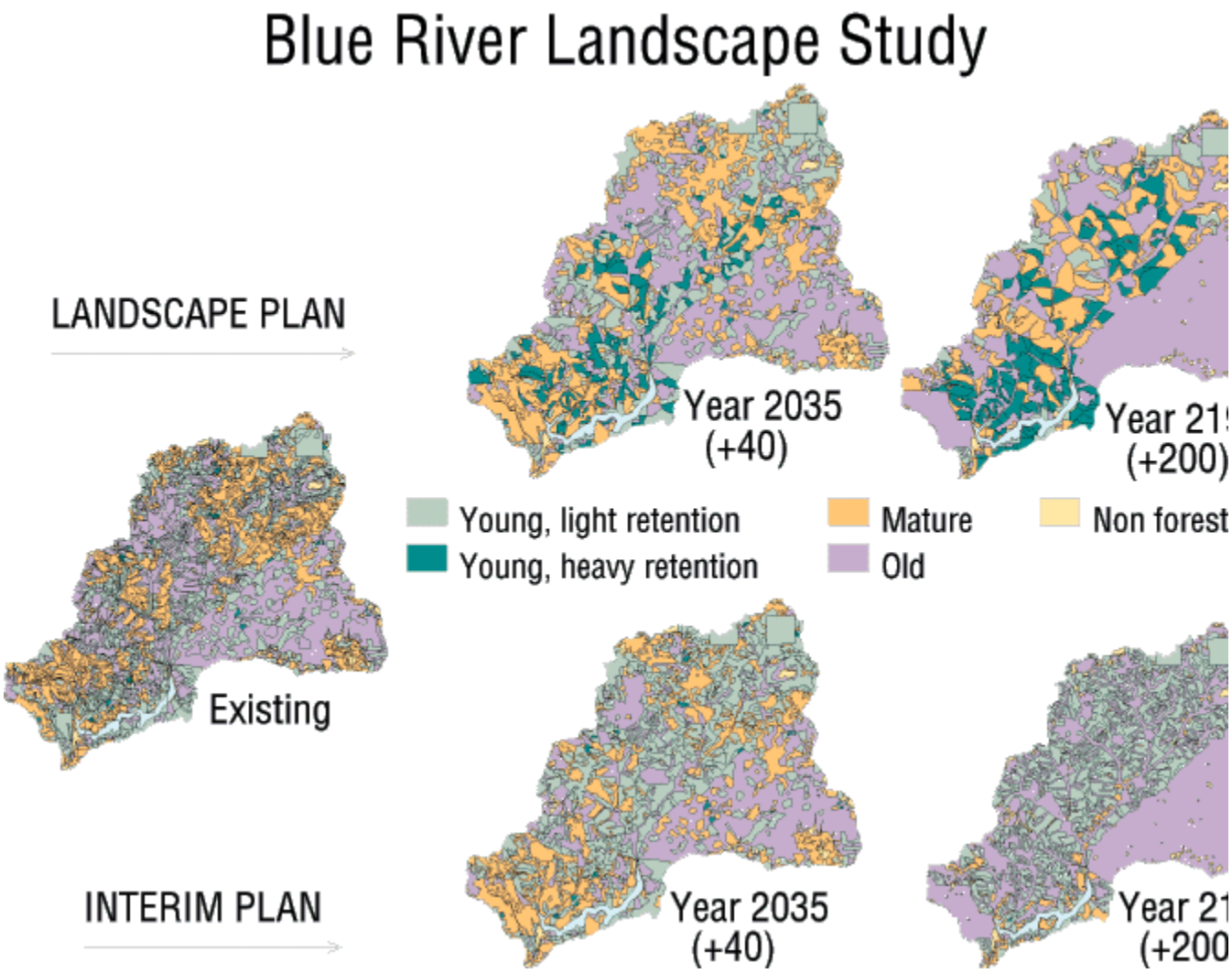


Figure 4. Projected future landscape structures for the Blue River landscape management strat (termed "Landscape Plan"), and for the Blue River watershed managed under matrix and ripar reserve designations in the Northwest Forest Plan (termed "Interim Plan").

Watershed restoration

Watershed restoration activities are intended to reestablish a resilient, interconnected aquatic network ca of maintaining aquatic habitats and processes while management activities are occurring in the watershe Development of a spatially- and temporally-specific schedule of future timber harvest activities allowed integrated planning and better attainment of restoration goals. For example, two sub-watersheds are plan as long-term restoration areas while timber sale regeneration harvests are planned elsewhere in the water Restoration activities underway or in the planning stage include addition of large wood to stream channe encouraging growth of large conifers near streams, improvement of road drainages, decommissioning ro while re-establishing stream channels, and removal of human-placed fish migration barriers. Noxious pla removal is targeted to specific areas where there is a reasonable likelihood of success.

Evaluation

Patterns of habitats across space and time have been assessed for both the landscape plan and the interim
Results show that the landscape plan will produce more late-successional habitat (71% of the watershed
versus 59%) in a less fragmented landscape as compared to the interim plan (Cissel et al. 1999). The
landscape plan is characterized by larger patches, more interior habitat, and less edge between old and yo
forests. In addition, the landscape plan contains more complex stand structures due to generally higher
overstory retention levels, and maintains a substantial component of mature forest. In contrast, the interi
plan nearly eliminates the mature forest component because almost all lands are either in a reserve, wher
lands grow old and large-scale disturbance is eliminated, or in matrix lands where a relatively short rotat
(approximately 80 years) prevents regrowth of mature forest i
interim plan poses substantial risk when mortality due to disturbance, climate change or senescence
eliminates older Douglas-firs in the reserves. Additional analyses are underway to evaluate lichen
communities, future stand structures, timber volume and economics.

Monitoring

A long-term, multi-scale monitoring plan is being implemented to evaluate the effectiveness of the lands
management plan. Some of the monitoring projects are continuing long-term monitoring associated with
Andrews Experimental Forest, others have been recently initiated. The monitoring framework is organiz
along a hierarchy of spatial scales.

Watershed scale

- Landscape pattern - satellite imagery is being used to analyze landscape pattern and vertebrate hab
over time across a large study area encompassing several land use categories.
- Northern spotted owls - the entire watershed lies within a larger, long-term northern spotted owl st
area where spotted owl demography and habitat use is being evaluated across land use categories,
including late-successional reserves and matrix lands.

Subwatershed scale

- Stand and landscape structure - the purpose of this component is to evaluate how well managemen
practices develop stand and landscape structures similar to those that developed historically.
- Stream discharge - a long-term program of hydrology monitoring in the Blue River watershed relie
the combined efforts of the Forest Service, Oregon State University, and USGS to develop and
maintain a network of eleven gauging stations, and to store and analyze the data from these station
Data from these watersheds are periodically reanalyzed to assess the effects of management activit
on stream flows.
- Social acceptability - this component is designed to gauge human reaction to and acceptance of the
landscape management plan.

Small-stream scale

- Stream-breeding amphibians - stream-breeding amphibians are being assessed in blocks where tim
harvest of various intensities is occurring by sampling in paired streams both before and after harv
- Stream temperature - pre- and post-timber harvest sampling of stream temperatures is occurring in
same sets of paired streams where amphibians are being analyzed to assess the effects of alternativ
riparian and lower slope management strategies.
- Riparian vegetation - plots are installed along the same pairs of streams to determine the nature of
changes to riparian vegetation as the result of riparian and lower slope management strategies.
- Stream channel morphology and down wood - transects are being established along the same pairs

streams to measure any changes in channel morphology and down wood as the result of riparian ar lower slope management strategies.

Site scale

- Erosion - long-term erosion studies in the watershed are periodically reanalyzed by conducting landslide inventories. Future inventories will be able to assess the influence of varying overstory retention levels and mitigation practices on mass erosion.
- Forest regeneration - tree establishment and growth are being monitored on a network of permaner plots being established across all three landscape areas, and on low productivity soils.
- Stand development - stand growth, mortality, and yield; dead wood components; and shrub and he composition and abundance are being monitored across a network of permanent plots in all three landscape areas.
- Nonvascular plants - permanent plots are being established across a range of riparian and upland habitats within each of the three landscape areas and reserves to monitor for changes in abundance epiphytic lichens.

Conclusions

Landscape structures resulting from both the landscape management plan in this study and from the inter plan are historically unprecedented. For that reason we feel it is critical that an adaptive management approach be followed for both approaches. We are pressing ahead with implementation, monitoring, modeling, and research to better define and evaluate a historically-rooted approach in the Blue River watershed based on the landscape dynamics inherent to the area. We hope these concepts can be tested in other provinces in the region, and that the matrix and riparian reserve approach of the interim plan can al similarly tested.

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