Using the Past to Plan the Future in the Pacific Northwest

By J.H. Cissel, F.J. Swanson, W.A. McKee, and A.L. Burditt

A goal of ecosystem management in the Pacific Northwest and elsewhere is maintaining native species, ecosystem processes and structures, and long-term emsystem productivity while simultaneously producing wood fiber. Successful ecosystem management should address both biological and social issues at appropriate scales (Grumbine 1994). Each scale involves distinctive spatial and temporal issues, ecological principles and concepts, and essential components of management designs *(table 1)*. Yet analysis and decisions at one scale influence those at other scales.

Two broad schools of thought exist reregarding landscape planning. In one, future landscape patterns are described in terms of specific desired products (e.g., wood fiber, habitat) and known ecosystem processes. The theme can be summarized as "we know what we want and we know how to get it."

In the other approach, future patterns are based on historical patterns to the degree feasible. This point of view reflects the fact that we cannot even name all of the species in the landscape, much less rationally plan for their habitat needs and ecosystem functions. A premise of this approach is that native species have adapted to the disturbance events and resulting range of habitat patterns of the past thousands of years. The probability of their survival is reduced if their environment deviates substantially from the range of historic conditions (Swanson et al. 1993). We believe that elements of both approaches can be combined for successful ecosystem management.

The Augusta Project

We adopted this viewpoint in the Augusta Project, an example of an ecosystem management design at the landscape/watershed scale that is set within a regional context and that also provides direction for stand management. This form of ecosystem management pertains to federal forest lands; the same principles may have different expression in private lands where different management objectives, legal context, and regulations apply. The 19,000-acre analysis area includes two unroaded reserves. Most of the remainder falls within a mix of land use designauons that prescribe various levels of timber cutting (USDA Forest Service 1990, USDA Forest Service and USDI Bureau of Land Management 1994).

The regional context is set by the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994). This plan designates the South Fork McKenzie River watershed, which contains the Augusta area, as a key watershed to provide primary habitat for bull trout and spring chinook salmon. A network of late successional reserves in the Northwest Forest Plan provides primary late-successional habitat for northern spotted owls and other old-growth-favored species, while the Augusta area provides dispersal habitat for some of these species. Timber harvest is expected to occur within parts of the South Fork watershed, subject to findings from a watershed analysis indicating that harvest is compatible with objectives of the Aquatic Conservation Strategy of the Northwest Forest Plan.

A variety of objectives underlie the Augusta landscape analysis process and results.

1. Sustain dynamic landscape patterns based on the range of historic conditions, which we assume has a high probability of maintaining native species and ecosystem functions. We use landscape pattern (i.e., amounts and arrangements of upland and riparian stand structures) as a basis for describing and monitoring desired ecosystem conditions and guiding management.

2. Produce wood fiber in appropriate areas.

3. Integrate understanding of historic and current conditions, disturbance regimes for both aquatic and terrestrial ecosystems, and linkages among ecosystem components, such as forest-stream and upstream-downstream interactions (Gregory and Ashkenas 1990, Gregory et al. 1991).

4. Define the silvicultural practices used to reset, accelerate, or sustain development of desired stand conditions. For example, we assume that a fire suppression policy will continue into the near future and that silvicultural practices and prescribed fire will be used to control forest structure and composition.

Based on these objectives, the actual analysis consists of six phases leading to a listing of potential management actions for the near term. In Phase 1, historic and current disturbance regimes and conditions were assessed for both terrestrial and aquatic systems. Historically, fire played the major role in shaping landscape patterns in this area. Consequently, we conducted a fire history study (Connelly and Kertis, unpubl. data) to map individual fire events back to 1500, and to describe historic fire regimes in areas with distinct fire frequency, severity, and spatial pattem. Disturbance processes that extend from hillslopes to screams (e.g., landslides and debris flows) were also analyzed.

In Phase 2, information from Phase 1 was integrated and used to define a desired landscape condition and associated management approach. Desired conditions are described for subareas within the overall project area. These subareas have similar disturbance regimes, potential vegetation, and human-use patterns. For example, an area comprised of steep-walled, north-draining valleys at the head of Augusta Creek appears to have experienced stand-replacement fires infrequently. Desired conditions call for a high proportion of mature forest and large stand sizes. A riparian reserve network linked to the desired landscape pattem was developed concurrently.

In Phase 3, the resulting management approach is projected into the future with simple modeling in a geographic information system. In this simplified depiction of

Table 1. Examples of components of ecosystem management at regional, watershed/landscape, and stand scales.

Regional level (10^7 acre)	
Biological issue	Sustain species with range over the region.
Ecological principles/concepts	Species are dependent on the mix of habitat needed for critical components of life history, e.g., forage, rearing, dispersal habitat.
Social issues	Regional economy; federal government involvement in transition related to change in wood supply.
Example of management design	Regional conservation strategy embodying reserve systems, prescriptions for matrix lands between reserves, etc.; e.g., USDA Forest Service and USDI Bureau of Land Management (1994).
Watershed/landscape level ($10^4 - 10^6$ acre)	
Biological issues	Sustain species (achieved through preservation/management of uplands riparian vegetation patterns and aquatic habitat).
Ecological principles/concepts	Disturbance regimes (frequency, severity, topographic pattern of disturbance processes) strongly regulate structure and function of ecosystems at landscape/watershed scale.
Social issues	Stability of local communities.
Example of management design	Landscape/watershed management plan based on natural variability and disturbance regime such as the Augusta project.
Stand level ($10^0 - 10^2$ acre)	
Biological issues	Sustain productivity and habitat for species with limited range.
Ecological principles/concepts	Certain processes are dependent on specific species and environmental conditions (e.g., N-fixation by *Ceanothus velutinus* germinated by fire or by canopy lichens favored by old-growth microclimate). Certain species are dependent on specific habitat elements, such as standing and down coarse woody debris.
Social issues	Use of specific sites; public involvement in project planning.
Example of management design	Retention of levels of coarse woody debris and live trees at levels necessary to meet habitat and ecological process objectives.

the future, considering only the uplands and assuming no wildfire or other disturbance, some parts of the area simply undergo natural succession — such as the wilderness and roadless areas along ridges bounding the planning area. The center of the planning area is cut with a frequency and intensity that approximate the historic fire regime. The result is, in the long term, a spatial distribution of seral classes of vegetation and wildlife habitat within the range of historic conditions.

The projected management pattern also provides a broad range of landscape structures from small gaps to large patches distributed across the landscape in proportions that approximate historical patterns. This produces a very different landscape structure than that produced by the traditional approach of dispersed, 40-acre clearcuts.

The landscape pattern projection developed in Phase 3 must be analyzed (Phase 4) to determine whether adjustments will be needed to meet established objectives. For example, conditions today differ from the past because of forest cutting, road construction, fire suppression, and other factors. We are evaluating the need to adjust the desired landscape conditions and near-term course of management to account for current conditions that lie outside the range of desired conditions (e.g., clearcuts that occupy about 20 percent of riparian zones). This alteration would ensure that sufficient habitat is available for species affected by timber cutting, and minimize hazards associated with future timber cumng, such as landslides. Potential adjustments (Phase 5) may include altering the frequency, intensity, or location of future cutting; altering the amount or configuration of upslope or riparian reserves; or prescribing ecosystem restoration practices.

Once analysis is complete, existing conditions can be compared to the planned trajectory of conditions to identify management actions that encourage desired conditions (Phase 6). For example, a 150-acre area intended to be managed as a unit over time might be projected to be in a mature forest condition for the next 50 years and then be reset through timber cutting and reforestation to a two-storied stand with 40 percent overstory retention. Portions of this area may benefit from commercial thinning in the short term. Contiguous land areas with common silvicultural prescriptions may be much larger than a single cutting unit.

Further steps are necessary and in progress in development of the Augusta ecosystem management plan. These include comparing the management scenario outlined here with alternative scenarios in terms of ecological and social objectives; increasing public participation in ecosystem management planning; conducting more rigorous analysis of the context of the Augusta planning area such as its setting within the South Fork McKenzie Key Watershed; and conducting landscape experiments and modeling to improve our understanding of ecosystems at larger scales. These steps will help determine the extent to which this plan can sustain bull trout, spring chinook, and other native species; long-term site productivity; and other elements of the ecosystem.

Conclusions

The approach to ecosystem management described here assumes that forest landscapes can be managed to maintain native species and retain ecosystem function while providing some level of timber production. This assumption is neither proven nor universally held. Ecosystem management approaches that purport to maintain both native species and timber harvesting need to be tested by ecosystem and social experimentation and through monitoring. The focus on adaptive management in the Northwest Forest Plan, particularly within the recently adopted Adaptive Management Areas, may provide this opportunity.

There is a critical need for ecologists,

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(Cisel et al., continued from page 31)
biologists, foresters, and others to reach some common understanding concerning future forest ecosystem management. In particular, broad, habitat-based management designs need to be reconciled with individual species needs. The approach followed in the Augusta project uses initial landscape patterns keyed to historic conditions to set a broad habitat template that may maintain habitat for native species. This initial pattern provides enough detail that evaluations can be made for species that we have knowledge of, and adjustments made to meet their needs. We believe that this dual approach is feasible and provides a useful point of departure for future deliberation. JOF

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Neglecting Private Forest Owners

Remembering first their many good features, the *Journal of Forestry* and the Society of American Foresters have nevertheless created a large and critical vacuum. In. politics it is important to know the right persons; in forestry it is important to know the meaningful forest owners. Private forest owners — large and small — have very noticeably been neglected in this dubious environmental era. Recognized beyond their worth are outsiders (of forest ownership) who can only claim as US citizens a partial ownership of our national forests. Millions of Americans can also make this claim, but they are in no way represented in academic environmental circles.

The April issue of the *JOURNAL* is a fair example of why privately employed foresters have abandoned SAF. What we truly have in something like FEMAT is new forestry hokum and little more. Some of us still believe in private enterprise and private ownership. We covered important scientific bases in our stays at the university, and during our lifetime we have come to know how to effectively tend trees and forests for a maximized environment. A serious course correction at JOF and SAF is in order — the lighthouse and rocky shore are in sight.

Noel Olson
Fort Bragg, California

I would like to refer Mr. Olson and others to the May issue of the Journal of Forestry, *which war devoted to managing private forests. Subsequent issues will continue to feature forestry research and policy as it pertains to both public and private lands and owners.---Ed.*

A Wake Up Call

As a 40-year member and Fellow of SAF, I am angry. *Task Force Report on Sustaining Long-Term Forest Health and Productivity* fueled my feelings. I recall working in the back country of the Upper Umpqua River and the care we used in applying silviculture to harvest old-growth and also protect the environment.

The April 1994 issue of the *JOURNAL* with the FEMAT discussion made me angrier. I am tired of listening to pseudoscientists preach "politically correct" doctrines with little science involved. By far the weakest portion of the discussion was the economic assessment. The discussion of economic issues did not show the severe disruption to the economy of Oregon, nor did it examine the impacts on softwood lumber supply and prices in this country. The Canadian suppliers of softwood lumber are laughing their way to the banks. What other country would arbitrarily remove a huge portion of their lumber supply from the market and not anticipate the results in this country and other countries? When will the *JOURNAL* devote an issue to the other side of the story?

For foresters and others who should be concerned about the economic wellbeing of this country, we are far too complacent. If you want to be awakened, read Vice-President Al Gore's book, *Earth in the Balance.* Remember that the Clinton administration appointed the first political chief of the USDA Forest Service. If you remain complacent, then so be it. There will be spotted owls appearing in other forest areas of this country. The "owls" may be in the form of biological diversity or below-cost timber sales.

As a retired forester, I am obviously disturbed by what I see. I can only hope that our Society of American Foresters will remain a scientific organization and not become a "politically correct" group with little science.

David D. Olson
Big Bay, Michigan

Three Cheers

Three cheers for Malcolm Dick Jr. (May PERSPECTIVE)! Finally, a forester in a leadership position not afraid to set the record straight and tell it like it really is. We need not apologize nor prostitute our beliefs for the sake of political correctness. Thanks again, Malcolm!

Lawrence K. Miller
Cloquet, Minnesota

CORRECTION

We would like to clarify that "N/A" in Table 3 of Hendee and Pitstick's article, "Growth and Change in US Forest-Related Environmental Groups" (June JOURNAL), should have been defined as "information not available." In the same table, SAF dues should have been listed as $50 for new members (p. 30). We apologize for these errors.