SOCIAL ISSUES IN RESTORING STRESSED FOREST ECOSYSTEMS IN EASTERN OREGON AND WASHINGTON

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ABSTRACT

Human actions and natural processes in interior forest ecosystems of Washington and Oregon have resulted in ecosystem conditions that people perceive as stressed. Previous well-intended forest management is now seen as having caused or precipitated reduced ecosystem function and productivity. Discontinuity between the intents of management and its results is the source of social stress as well. Prominent among concerns is the capacity of existing political and economic institutions to revive and sustain rural communities. As people begin to think of themselves as an inextricable part of ecosystems, the role of rural communities in ecosystem processes becomes more obvious. Maintaining the role of rural communities in purveying desired ecosystem goods, services, and states to the wider public, and in restoring productive and biodiversity capacity of local ecosystems, is essential to both sustainable ecosystems and sustainable society.

People view ecosystems in various ways depending on their culture and from their analysis and perceptions of ecosystem information. The diversity of human values often confuses and retards the process of formulating and attaining goals for restoration. Society does not have a single definition for restoration. Important policy questions concerning the amount of labor and capital to invest for different types of forest ecosystem restoration will be the subject of stressful debate. Costs for restoration activities will have to be weighed against products and services foregone if restoration does not occur. The appropriate intensity and duration of a sustained program of restoration for interior forests is not at all clear. Costs of information about societal values and about ecosystem structure, pattern, and function may limit and redefine the kinds and amounts of information that people engaged in restoration activities will have to draw upon.

Assessment and integration of required restoration activities will become more complex as restoration is required to achieve desired goals at multiple biological and social hierarchical scales. Restoration activities are likely to become more holistic in nature such that entire ecosystems are considered rather than single components or processes. Restoring the dynamic nature of eastside forest ecosystems and the ability of rural communities to adapt to a dynamic resource base is a priority restoration activity.

Keywords: societal values, ecosystem stress, ecosystem restoration, economic considerations, societal participation, ecosystem management

INTRODUCTION: HUMAN-CAUSED STRESS IN MANAGED ECOSYSTEMS

Human actions affecting the structure and function of forests in eastern Washington and Oregon have resulted in stressed ecosystems. We confine our discussion in this paper to stresses directly or ultimately attributable to human activities. Natural stresses such as drought may cause loss of forest structure and function at one scale but represent, at other landscape scales, evolutionary adaptations for maintaining landscape pattern and species diversity. Stresses generated by human actions may induce disturbances to which an ecosystem is not adapted, when one or more environmental factors overwhelm the assimilative capacity of the ecosystem and disrupt ecosystem development (Handley 1986). Such stress may also combine synergistically with natural stress to intensify natural patterns of disturbance.

Ludwig et al. (1993) point out that the difficulties in managing natural resources often manifest themselves as biological problems such as pest population explosions. These biotic phenomena, however, mask the underlying cause of management as a function of human behavior and limitations. Recent outbreaks of western spruce budworm (*Choristoneura occidentalis* Freeman) and Douglas-fir tussock moth (*Orgyia pseudotsugata* McDunnough) in Eastside forests, for example, appear to be the result of a combination of human management activities including fire suppression and selective harvest (Gast 1991). Human predilection for short-term results and unfamiliarity with ecosystems are frequent causes for ecosystem stress or ecosystem disruption.

Societal stress has also resulted from people's awareness of biological stresses caused by human activities. Eastside forest ecosystems do not match society's expectations for ecosystem goods, services, and states. The variety and intensity of people's demands for forest-based resources have increased while ecosystem production for human use or benefit has declined. The congressional call for an Eastside Forest Ecosystem Health Assessment in 1992 has translated public concern about this disparity into political action.

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ECOSYSTEM RESTORATION AS AN ANTIDOTE FOR STRESSED ECOSYSTEMS

Policy-makers wish to restore the balance between societal demands for forest-based resources and the forests' capacity to supply these resources. Natural restoration is the biophysical capacity of an ecosystem to recover its original components, structures, processes, and interactions after a disturbance caused by a natural calamity, human management, or a combination of both. Resiliency in restoration is precluded, however, when stress or disturbance to the ecosystem is so profound as to render the ecosystem incapable of maintaining or recovering previous ecosystem features. Ecosystems may not recover in a timely manner for functional usefulness to society.

Ecosystem restoration initiated by people provides an alternative that promises to circumvent barriers to natural restoration and to recover ecosystem productivity when resiliency has been lost. In the Pacific Northwest, as elsewhere, the idea of a human role in restoring stressed ecosystems to former or greater production and productive capacity has captured the interest of scientists and managers. Ecosystem management principles and resource information contained in the Eastside Forest Ecosystem Health Assessment (Everett et al. 1994b), the Westside FEMAT report (Forest Ecosystem Management Assessment Team 1993), Professional Societies Report (Scientific Society Panel 1993), and the Assessment of Indian Forests and Forest Management in the United States (The Indian Forest Management Assessment Team for the Intertribal Timber Council 1993) have set the groundwork for planning a program of Eastside forest ecosystem restoration that includes watershed rehabilitation (Regional Ecosystem Office 1994), altering tree species composition (Daniels 1994) and creating a network of old-forest habitats (Everett et al. 1994c).

Efforts to undertake region-wide ecosystem restoration in eastern Washington and Oregon greatly exceed the scope of previous restoration projects on federal lands. Focusing attention on a large area from the onset underscores the need to integrate knowledge about ecosystems. Processes of political and societal decision-making also become more complicated as boundaries of jurisdiction, ownership, and value systems are crossed. The hope is that complex, integrated solutions become the robust, enduring ones that restore an ecosystem to resiliency and greater self-regulation (Cairns 1993).

In the remaining sections of this paper, we examine the major social and policy issues for human-aided restoration of human-stressed ecosystems, with special reference to the unique circumstances of the Eastside forests of Oregon and Washington.

THE ROLE OF INTEGRATION

The extensive literature on reclamation of mined lands (see Fox 1984) presents an overview of readily available technical methods for particular biophysical settings. Compilations of existing resource tools and analyses of field conditions for ecosystem restoration in the Eastside region already exist (Everett 1994a; Gaffney 1994). Although this technical knowledge is necessary for excellent restoration work, it alone is not sufficient. A project to accelerate ecosystem restoration is initiated by the will and participation of people whose demands for forest resources are met by human-aided ecosystem restoration (Cowell 1993). Societal processes for group decisions define restoration programs and enable the ecosystem restoration to proceed. By the same token, the social sciences furnish society with greater knowledge about itself, and particularly about its role in shaping ecosystems. This knowledge is crucial to society and government for making decisions, based on the public interest, about restoration on public lands. A blend of social and technical expertise can effect a program for restoration that is at once scientifically defensible and socially acceptable.

The practice of restoration ecology has not escaped social critique. Much of the criticism has either implicitly or explicitly faulted the lack of vision and of scope on the part of practitioners of ecosystem restoration. Allen and Hoekstra (1992, p. 265) dismiss conventional ecosystem restoration as "a sort of gardening with wild species," at best concerned with "bottom-line testing of ecological theory." Relevance to social and technical realities of public land management is limited because of an "artificial focus of restoration on a one-scale/one-criterion agenda" (Allen and Hoekstra 1992, p. 267). This emphasis runs counter to current needs in public land management for restoration at multiple scales (including large regional scales) for multiple uses destined for multiple groups of beneficiaries. Developing restoration action based on expectations and desired conditions at large scales, in addition, provides an opportunity to accumulate positive effects in both the biological and social systems.

Past emphasis on restoring only specific components of ecosystems, particularly restoration of certain species, rather than on restoring whole ecosystems and across multiple spatial scales has led to catastrophic results and even economic upheaval. Results of past restoration efforts for salmon in the Pacific Northwest are indicative. Social investments were made in the artificial propagation and restocking of the individual anadromous fish species to restore populations. If the investments had been to restore or mitigate degraded salmonid habitats, then once ecosystem restorations were complete, the ecosystem would sustain propagation at no social cost, barring future degradation. Because the system of artificial propagation requires continual infusion of labor and capital, it represents an annual drain on restoration funds that could be applied elsewhere (Meefe 1992) on a one-time basis.

THE MORAL FUNCTION OF ECOSYSTEM RESTORATION

The idea that people are an inseparable, integral part of ecosystems is gaining wider currency (Zonneveld 1988; Bormann et al. 1994). People, however, have a unique role in that they simultaneously participate as part of ecosystems and consciously decide how to craft the structure and function of ecosystems to their benefit. Through ecosystem restoration, many people see an opportunity to make positive intrusions to correct past management errors in managerial craft and to assuage what Baldwin et al. (1994) call people's "debilitating sense of species guilt." Human interventions for ecosystem restoration are predicated on beliefs that people can successfully re-establish viable species

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populations and their habitat, increase sustainability of desired ecosystems, and once again sustainably extract ecosystem goods, services, and states for societal needs. Restoration also provides an opportunity to focus attention on increasing the types and abundance of resources rather than to concentrate on divisive debates about the distribution of increasingly scarce resources (Krueger 1992). Restoration is then a kind of investment in ecosystem "infrastructure" (Schmidt et al. 1993) that permits improved ecosystem development and ecosystem protection for the future.

Yet, optimism about a "silver bullet" cure for ecosystem ills through restoration may prove misleading. Panaceas have an unfortunate way of turning into snake oil. The history of past forest management reveals numerous false expectations and assumptions. A caveat is in order for careful application of restoration projects. Adoption of any single philosophy, strategy or practice to accomplish multiple management goals in complex natural systems is likely to fail because one solution will not fit all settings or all time frames.

As a counterpoint, the most intractable criticism of ecosystem restoration comes from people concerned with preserving existing ecosystems, preferably under conditions of minimal interference from people (Cowell 1993). Many skeptics believe that people are inherently despoilers whenever they come into contact with ecosystems. This pessimistic view of human behavior (Ludwig et al. 1993), bounded by greed, incompetence, or ignorance, precludes the possibility of constructive intervention (Aldo Leopold's "intelligent tinkering") by people and of their ability to learn and change as the result of their interactions with ecosystems. Part of the intelligent tinkering then may be incentives and policies directed at people to discourage human economic and social behavior that compromises long-term sustainability of ecosystems and societal well-being linked to ecosystems.

THE EDUCATIONAL FUNCTION OF ECOSYSTEM RESTORATION

Some of the best-documented ongoing restoration efforts have been consciously conceived as virtual museums (Wingate 1990 in Bermuda) and as educational centers (Janzen 1988 in Costa Rica) for rare or vanished ecosystems. Restorations as museum pieces on a small scale of several hectares are invaluable as instructional devices for ecological sciences and visible proof of possible transformations that could capture the imagination of people as a means to gain social or political acceptance for work to be carried out at larger scales. Restoration at the scale proposed for Eastside ecosystems, like that proposed for Guanacaste in Costa Rica, differs from "museum piece" restorations because it requires considerable expenditure of public funds for startup. Large-scale restoration efforts should include educational programs about their accomplishments for diverse and thoughtful production of ecosystem goods, services, and states that society desires. Lastly, employment and internships as part of restoration projects provide people with intimate working knowledge of ecosystems and experience for technical transfer of knowledge elsewhere.

ECOSYSTEM RESTORATION AS PART OF ECOSYSTEM MANAGEMENT

Historically, Native Americans in eastern Oregon and Washington practiced a synthesis of their ecosystem science, technology, and culture to shape Eastside forests into ecosystems that met their needs (Robbins and Wolf 1994). They used fire as a primary management tool to create the sustainable open forest ecosystem that Euro-American settlers encountered on their arrival in the 19th century. Present-day society, more numerous and even more diverse, is in the throws of refashioning a synthesis of culture, technology, and science in the landscape to create both socially desirable and sustainable ecosystem conditions. Ecosystem restoration is an element of the modern-day societal reorientation to the Eastside landscape.

The state of flux that characterizes American society's managerial relationship with its ecosystems indicates that many people are now demanding less extraction and more protection and restoration for ecosystems (Grumbine 1994). Restoration efforts are coupled with activities to protect ecosystems and to derive various human benefits, as part of the still-evolving framework for the theory and practice of ecosystem management of USDA Forest Service lands (Overbay 1992). Restoration programs require two types of decisions: technical and policy. Socially-acceptable coordination of the two is crucial to the enduring success of restoration efforts. In the dynamic and uncertain environment of current ecosystem management, a lack of concreteness about ecosystem restoration can create potential social pitfalls. Clark et al. (1991) have identified three major obstacles: lack of shared problem definition, lack of unifying policy and goals, and lack of administrative coordination.

Managerial failures in problem definition, goal setting, and coordination in ecosystem restoration projects can be remedied within the Forest Service's framework of ecosystem management. Ecosystem management incorporates adaptive strategies for simultaneous learning about society and ecosystems. It also strives for open communication as part of its program (Walters 1986; Lee 1993; Bormann et al. 1994; Everett et al. 1994d) as a means of continually increasing the knowledge base and as a safeguard against human error in management. Restoration programs conducted as responsible experiments within ecosystem management serve as vehicles for learning.

Careful conceptualization, planning, coordinating, and monitoring of restoration projects can provide a compendium of reliable knowledge about applications of ecosystem restoration for managers, scientists, policy makers, and the general public. Ideally, a culture that is learning will not make the same managerial mistake twice; society will learn not to repeat actions that led to previous ecosystem deterioration. Eventually, adoption of ecosystem management should usher in an era when the need for restoration is largely phased out. People will have learned to manage forest ecosystems more circumspectly and avoid types of crises that require intensive restoration.

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SOCIETAL PARTICIPATION IN ECOSYSTEM RESTORATION

Both technical and policy decisions require, in advance, determination of which participants are charged with making decisions for restoration. The work force in land management agencies (USDI Bureau of Land Management and the USDA Forest Service) and regulatory agencies (Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Marine Fisheries) has developed and will continue to refine the decision-making systems for the technical decisions in restoration. Province Teams established by the President's Plan (FEMAT) provide for administrative coordination in restoration efforts among government agencies.

Traditional lack of representation of varied interests among advocates and decision-makers for restoration ecology projects points to poorly developed awareness of the social function of restoration (Grizzle 1994). Societal goals in concert with available technical methods will increasingly need to reflect emergent societal consensus about the role of people in restoring ecosystems. Restoration must address people's needs for goods and services broadly enough that restoration projects gain the support of the general public and the participation of their political representatives who fund restoration projects. Without a broad base of appeal resulting in a secure and adequate funding base, potential restoration programs will remain relegated to small-scale grassroots efforts with limited ameliorative effect for society.

Defining the scope of restoration problems and their solutions from multiple perspectives and with diverse people is time-consuming but is more likely to achieve societal support in the long run. In response to the need for policies for implementing restoration, the current Eastside Strategy project is inventing a process to incorporate the widest possible spectrum of public input about restoration programs on public lands. The degree to which diverse members of the public are legally allowed to participate jointly in public land management agency decisions about ecosystem restoration is not at all clear, as evidenced by the new and tentative roles of public participants in recent Eastside FEMAT meetings. The final public involvement process has yet to be formulated.

SETTING SOCIETAL GOALS FOR ECOSYSTEM RESTORATION

People are accustomed to defining ecosystem production and productive capacity either in biophysical or in social terms. Biophysical productivity consists of quantitative results of the accumulation and cycling of elements, energy, and biomass. On the other hand, societal norms for measuring ecosystem productivity are quantitative in part but are also selective and subjective. Human value judgments and appraisals focus on certain aspects of biophysical production. For much of the recent history of the Pacific Northwest, timber productivity has been synonymous with forest productivity. Forest management decisions on public lands were essentially timber management decisions because policy makers believed that society valued timber more than other components of the ecosystem.

Societal values about ecosystem productivity and functional capacity are becoming more complex, however. A directly utilitarian approach to biomass production is being supplanted by a more holistic approach that recognizes that people value production of economic, aesthetic (non-consumptive), and functional resources of ecosystems. Restoration projects, in effect, must respond on several levels at once to provide the expected range of desirable social values. To various degrees, projects may restore production of goods and services, intangibles such as recreational experiences, and ecosystem robustness to provide expanded options for people confronting an uncertain future.

Ecosystem managers and the American public are confronted with the tasks of identifying ecosystem dysfunctions with social impacts, clarifying societal objectives for restoration solutions, recognizing political and economic constraints, and evaluating inherent societal and ecological risks. Society will have to formulate realistic expectations and commit adequate resources and consistent effort to achieve those expectations (Everett et al. 1994b).

The diversity and malleability of human behavior ensure that the sum of human demands for ecosystem development are also complex, mutable, and often contradictory. People advocate goals and methods of restoration projects variously, depending on their culture and their analysis of ecosystem information. Expectations for ecosystems differ among hierarchically organized public interest groups at the local, regional, and national scales. Historically, local residents have tended to promote commodity resources, and remote public groups have viewed local ecosystems as necessary components to achieve regional or national non-commodity objectives such as recreation and biological diversity. Spatial discounting of the importance of economic values (Daily 1993) transforms the concerns that various interest groups express for a specific ecosystem and sets the stage for partisan confrontation.

Diversity of human values can confuse and retard the processes of formulating and accomplishing goals for a specific restoration project. At the same time, diversity of values and views also provide a safeguard against blindspots when people approach thorny, complex issues. The challenge is knowing how to translate these multiple points of view and diverse preferences into coherent policy for ecosystem restoration. Decision-making processes for ecosystem restoration may be painstaking, but vigilance in assuring that diverse views are represented and held up to fair scrutiny can prevent mistakes and crises in the future. Success of restoration projects will require consensus among hierarchical segments of the public about goals and expectations, and sufficient incentives for local groups to carry out the expectations of the interested groups. By their conduct, public land agencies can foster a predisposition to tolerance and empathy among participants which can bridge different cultural values and address diverse interests equitably with creative solutions.

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ECONOMIC CONSIDERATIONS FOR DECISIONS ABOUT RESTORATION

Decisions to undertake restoration are based as much on economic constraints and other societal objectives as on mastery of technical analysis of natural landscapes and expertise for transforming them (Smith 1986, p. 22). Kirby (1994) criticizes restoration ecologists for their general neglect of human political and economic concerns. In Kirby's view, class and cultural bias for ecosystem restoration—as thus far enunciated in North America—represents primarily the aesthetic interests of the well-educated, upper middle-class. Often lost in the enthusiasm for restoration of public lands is the idea that it may function as a tool for economic and community development. Ecosystem restoration projects can employ rural workers negatively affected by economic changes as management of Eastside forested ecosystems shift (FEMAT 1993; Oliver et al. 1994). Restoration employment may ease the transition to more sustainable and diversified jobs in rural economies, and may help ensure that a trained work force remains locally available to accomplish future management objectives for ecosystem protection and development.

Restoration efforts are particularly crucial where ecosystem restoration of obvious economic benefit to society is likely to be slow or impossible otherwise. In some instances, the best interests of society may be served when ecosystem managers permit natural restoration to proceed without additions of labor and capital because either the costs are too high or the perceived benefits are too meager (Weigand 1994). Monitoring to determine how, when, to what ends, and to what degree Americans will best use their land, labor, and capital for restoration must be an explicit and ongoing function of restoration management.

Because funding for restoration is finite, programs for ecosystem restoration will have to compete with other beneficial social projects for increasingly scarce public funds. Settling priorities in restoration activities becomes essential. Managers will have to make use of a sort of triage (Dyer 1992) to apply funds to ecosystems where restoration efforts optimize human benefit and to withhold funds from ecosystems where the allocation would be needless or ineffective to accomplish socially desirable ends. Usually, societal criteria for judging the merit and the success of restoration projects are not explicit. Indicators for policy analysis on the adequacy of a restoration project to accomplish explicit goals are needed to answer the policy questions: Which proposed restoration project is most beneficial and how much restoration is enough (Hayden 1991)? Comparing potential returns and tradeoffs between restoration projects and other projects of merit completely and objectively is difficult because the type of ecosystem products, their schedule of production, and the quantity of returns on investment to society may be highly uncertain or ill-defined.

Although the industry of restoration is still in its infancy, the need for economic analysis and appropriate methodologies to assess the economic efficiency for social benefits of restoration projects is acute. Economic analysis has largely concentrated on the negative economic outcomes of deleterious changes to ecosystems occasioned by people (Johansson 1993). Little attention has been paid to calculating costs and benefits of restoration projects to society. Ascertaining the success of restoration projects for society will be difficult because precedents for projects may not exist to provide meaningful comparison, and methods for economic analysis are not well-developed. Traditional economic indices such as cost/benefit ratios, net present value, and economic efficiency, when used singly, do not suffice for a judgment based on complex societal values. Also, less conventional indicators such as the value of potential productivity forgone by not acting to restore, existence values, and option values need to be considered (Hayden 1991) .

Government has tended to choose the lowest-cost option rather than the option with the best performance or highest chance of achieving the policy objective of sustainable restoration (King 1991). This behavior itself should be evaluated as a risk to societal well-being. Parsimony without attention to quality in initial investment in the infrastructure incurs a lasting opportunity cost to society, in terms of forgone ecosystem production, as compared to a policy that allocates a larger initial investment.

HOLISTIC RESTORATION

Multifaceted societal concerns and demands for restoration projects in eastern Oregon and Washington emphasize holistic restoration—holistic across interacting landscape scales (Jensen and Bourgeron 1994), ecosystems, and human artifacts of ownership and jurisdiction in the landscape. In addition, policy makers must link restoration of the biophysical capacity for ecosystem production closely to restoration of economic development and to the vitality and diversification of rural communities and the nation. This link is the logical extension of the credo that people are inherent parts of ecosystems.

Decisions for restoration projects must not create victims or disenfranchise people. Doing so creates alienation and contentiousness that distract from the work of restoration. Individual property rights and protection of public resources can be equitably safeguarded while people work toward common goals. Adaptive strategies for ecosystem management can fit and respond to the special social patterns and needs of ownership and jurisdictional boundaries.

Restoration is not the exclusive domain of any one segment of the public or single area of technical expertise; it is a community effort, with community broadly defined. Restoration projects on the Eastside provide a forum for civic discourse about community cooperation and community development. Multiple interest groups meet to jointly envision and plan restoration work for reinvesting in productive capacity of self-regulating ecosystems (FEMAT 1993). Individual interest groups are likely to concentrate on a variety of particular goals and outcomes for restoration, but a common issue typically emerges: use of restoration as a tool for reducing hazard and risk to human well-being, whatever the site-specific means or outcome. The means to achieve risk reduction are, of course, open to societal and scientific debate.

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SOCIETAL CONSTRAINTS AND LIMITS TO RESTORATION

Many people share a profound longing to recreate ecosystems according to remembrances of things past. But practical restoration will rarely, if ever, accomplish an exact copy of the past. Forest conditions experienced during any one person's lifetime are only a small snapshot of potential forest conditions. In Eastside forests, these remembered forests may be a product of past fire suppression and selective harvesting. These ecosystems may not be sustainable ecologically or socially in the long-term. From a policy perspective, a short-term view of historical forests can make an unattainable solution. Too many ambiguities exist about definitions and preferences for past ecosystem states to know which is the "best" ecosystem.

Ecosystems are constantly changing; thus, the "natural" state of an ecosystem is open to subjective interpretation. Human values may color perceptions of the past. Insistence on restoration to purported natural states will engender societal conflict. Different interest groups have different concepts of which past ecosystem they wish to restore. Ecosystems have the capacity to arise from different paths at the same site, and society will partition itself as partisans advocate for one or another previously known "end condition" or some other, yet conceived. The true goal is to decide on a wide spectrum of goals appropriate to diverse social and ecological conditions under management (Diamond 1987). The cost of complete control—if that were possible—over ecosystem development would be prohibitive. The most cost-effective strategy is to aim for a variety of societal goals within the capacity of ecosystems. The resulting diverse mosaic becomes the product of a "mosaic of goals" (Patten 1991). Restoration then ensures that society and ecosystems support each other.

Present societal values and ecological options may also directly conflict with past values and options such that historical landscapes are neither possible nor desirable. For example, severe disturbances and long recovery periods tolerated at low human populations in the past are no longer acceptable. Only a fraction of the ponderosa pine forests that Euro-American settlers first encountered (Robbins and Wolf 1994) can be restored because societal health standards will limit controlled burning to prevent ill-effects of smoke on local communities (Arno and Ottmar 1994).

Societal acceptability and norms for ecosystem restoration are limited. Contemporary restoration reaches a real impasse when discussion turns to restoring grizzly bear and wolf populations for Eastside ecosystems. Conflict becomes manifest if the ethical ideals of wildlife biologists are not reconciled with concerns for personal safety and property (e.g., livestock) on the part of Eastside residents. When ecosystem restoration does not promote societal security, people will not support restoration.

CONCLUSION: MAKING RESTORATION LAST

Social processes to support ecosystem restoration will themselves generate stress among different interest groups and within land management agencies. The amount of information and communication resources needed to do restoration simultaneously across multiple landscape scales for multiple interest groups will stress existing information networks. They will require improved information distribution and collaborative learning to formulate restoration plans. Restoration managers will likely continue to be stressed by incomplete information and increased societal demands as they attempt to organize restoration projects without precedents to guide them.

The convergence of new knowledge about ecosystem management and the increasing availability of integrated biological and socioeconomic assessments of ecosystems provide expanded opportunities for holistic ecosystem restoration. Landscape ecology and conservation biology principles will provide new tools for conserving diversity of landscapes, biological diversity, and sensitive species. New methods of integrating hierarchically organized public expectations into planning for hierarchical ecosystem conditions at all scales have biological and socioeconomic benefits. Success in restoration projects depends on planning for flexibility with multiple possible outcomes and restoring ecosystem potential rather than re-creating historical conditions.

We touched previously on the difficulty of replying to the assertion that people are capable only of selfish and unsustainable behavior; the history of the Eastside forests since the advent of Euro-American settlers 150 years ago does not contradict it. Rapid resource exploitation by people unaccustomed to the patterns and processes of Eastside ecosystems created, albeit unwittingly, social and biophysical instability that the present generation now wants to remedy. The sense of seemingly unlimited natural resources has given way to a sobering understanding that streams, forests, and soils do not have an unlimited capacity to produce what people want (Robbins and Wolf 1994).

Human-aided restoration is not likely to re-create past ecosystem conditions exactly. The most may be unacceptably high because conditions that initiated desirable past ecosystems may no longer exist (Cairns 1993; Luh and Pimm 1993). Demands of people now are different from those in the past and the sheer number of people making demands on ecosystems has grown tremendously in the last 150 years.

This paper has focused on the role of people in restoring the productive capacity of Eastside ecosystems. But another critical factor is restoring a healthy, nonstressful relationship between nature and human culture (Jordan 1994). Society may have to change itself to complete the restoration of Eastside ecosystems. People need to ask about balancing human expectations with the needs of the whole ecosystem. Should ecosystems bear an increasing burden of human demands for goods, services, and ecosystem conditions? Or is some modification or reduction of human demand appropriate? A challenge to people participating

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in ecosystem management is to discover alternative human behavior that leads to well-being and happiness while avoiding ecosystem stress and the subsequent need for restoration.

LITERATURE CITED

Allen, T. F. H and T. W. Hoekstra. 1992. Toward a unified ecology. (Complexity in ecological systems series.) New York: Columbia Univ. Press. 384 pp.

Arno, S. F and R. D. Ottmar. 1994. Reintroduction of fire into forests of eastern Oregon and Washington. *In*: Everett, R.L., comp. Volume IV: Restoration of stressed sites, and processes. Gen. Tech. Rep. PNW-GTR-330. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Baldwin, A. D. Jr., J. de Luce, and C. Pletsch. 1994. Introduction: ecological preservation versus restoration and invention. *In*: Baldwin, A. D. Jr., J. de Luce, and C. Pletsch, eds. Beyond preservation: restoring and inventing landscapes. Minneapolis: Univ. Minneapolis Press. pp. 3-16.

Bormann, B. T., M. H. Brookes, E. D. Ford, A. R. Kiester, C. D. Oliver, and J. F. Weigand. 1994. Volume V: A framework for sustainable-ecosystem management. Gen. Tech. Rep. PNW-GTR-331. Portland, OR: USDA Forest Service, PNW Research Station. 61 pp. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Cairns, J. Jr. 1993. Ecological restoration: replenishing our national and global ecological capital. *In*: Saunders, D. A., R. J. Hobbs, and P. R. Ehrlich, eds. Reconstruction of fragmented ecosystems: global and regional perspectives. (Nature Conservation 3). Chipping Norton, NSW, Australia: Surrey Beatty & Sons Pty Limited. pp. 193-208.

Clark, T. W., E. D. Amato, D. G. Whittemore, and A. H. Harvey. 1991. Policy and programs for ecosystem management in the Greater Yellowstone Ecosystem: an analysis. Conserv. Biol.. 5(3): 412-422.

Cowell, C. M. 1993. Ecological restoration and environmental ethics. Environ. Ethics. 15(1): 19-32.

Daily, G. C. 1993. Social constraints on restoration ecology. *In*: Saunders, D. A., R. J. Hobbs, and P. R. Ehrlich, eds. Reconstruction of fragmented ecosystems: global and regional perspectives. (Nature Conservation 3). Chipping Norton, NSW, Australia: Surrey Beatty & Sons Pty Limited. pp. 9-16.

Daniels, J. D. 1994. Conserving biodiversity and long-term site productivity. *In*: Everett, R. L., comp. Volume IV: Restoration of stresses sites, and processes. Gen. Tech. Rep. PNW-GTR-330. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Diamond, J. 1987. Reflections of goals and on the relationship between theory and practice. *In*: Jordan, W. R. III, M. E. Gilpin, and J. D. Aber, eds. Cambridge, UK: Cambridge Univ. Press. pp. 328-336.

Dyer, M. I. 1992. Ecosystem redevelopment: prospects for the future. *In*: Wali, M. K., ed. Ecosystem rehabilitation. Vol. 1: Policy issues. The Hague, Netherlands: SPB Academic Publishing bv. pp. 215-220.

Everett, R. L. comp. 1994a. Volume IV: Restoration of stressed sites, and processes. Gen. Tech. Rep. PNW-GTR-330. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Everett, R. L., P. F. Hessburg, M. E. Jensen, B. T. Bormann. 1994b. Volume I: Executive summary. Gen. Tech. Rep. PNW-GTR-317. Portland, OR: USDA Forest Service, PNW Research Station. 61 p. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Everett, R. L., P. F. Hessburg, J. F. Lehmkuhl, M. E. Jensen, and P. S. Bourgeron. 1994c. Old forests in dynamic landscapes: dry-site forests of eastern Oregon and Washington. J. For. 92(1): 22-25.

Everett, R. L., C. D. Oliver, J. Saveland, P. F. Hessburg, N. Diaz, and L. L. Irwin. 1994d. Adaptive ecosystem management. *In*: Jensen, M. E. and P. S. Bourgeron, tech. eds. Volume II: Ecosystem management: principles and applications. Gen. Tech. Rep. PNW-GTR-318. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Forest Ecosystem Management Assessment Team. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. Portland, OR: USDA Forest Service, et al. Various pagination.

Fox, J. E. D. 1984. Rehabilitation of mined lands. Forestry Abstracts. 45(9): 565-600.

Gaffney, M. 1994. Eastside restoration: a literature review and recommendations. Manuscript prepared for the Concerned Friends of the Winema. 43 pp.

Gast, W. R. Jr., project leader. 1991. Blue Mountains forest health report: "new perspectives in forest health." Portland, OR: USDA Forest Service, PNW Region. Various pagination.

Grizzle, R. E. 1994. Environmentalism should include human ecological needs. Bioscience. 44 (4): 263-268.

Grumbine, R. E. 1994. What is ecosystem management? Conserv. Biol. 8(1): 27-38.

Handley, J. F. 1986. Landscape under stress. *In*: Bradshaw, A. D., D. A. Goode and E. H. P. Thorp, eds. Ecology and landscape design. The 24th symposium of the British Ecological Society, Manchester, UK, 1983. Oxford, UK: Blackwell Scientific Publications. pp. 361-383.

Hayden, F. G. 1991. Instrumental valuation indicators for natural resources and ecosystems. J. Econ. Issues. 25 (4): 917-935.

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The Indian Forest Management Assessment Team for the Intertribal Timber Council. 1993. An Assessment of Indian Forests and Forest Management in the United States. Portland, OR: Intertribal Timber Council. Various pagination.

Janzen, D. H. 1988. Guanacaste National Park: tropical ecological and biocultural restoration. *In*: Cairns, J. Jr., ed. Rehabilitation of endangered ecosystems, vol. II. Boca Raton, FL: CRC Press. pp. 143-192.

Jensen, M. E. and P. S. Bourgeron, tech. eds. 1994. Volume II: Ecosystem management: principles and applications. Gen. Tech. Rep. PNW-GTR-318. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Johansson, P. O. 1993. Cost-benefit analysis of environmental change. Cambridge, UK: Cambridge Univ. Press. 232 p.

Jordan, W. R. III. 1994. "Sunflower Forest": ecological restoration as the basis for a new environmental paradigm. *In*: Baldwin, A D Jr., J. de Luce, and C. Pletsch, eds. Beyond preservation: restoring and inventing landscapes. Minneapolis: Univ. Minnesota Press. pp. 17-34.

King, D. M. 1991. Costing out restoration. Restoration and Management Notes. 9(1): 15-21.

Kirby, J. T. 1994. Gardening with J. Crew: the political economy of restoration ecology. *In*: Baldwin, A D Jr., J. de Luce, and C. Pletsch, eds. Beyond preservation: restoring and inventing landscapes. Minneapolis: Univ. Minnesota Press. pp. 234-240.

Krueger, W. C. 1992. Building consensus for rangeland uses. Rangelands. 14(1): 38-41. Lee, K. 1993. Compass and gyroscope: integrating science and politics for the environment. Washington, DC: Island Press. 243 pp.

Ludwig, D., R. Hilborn, and C. Walters. 1993. Uncertainty, resource exploitation, and conservation: lessons from history. Science. 260: 17, 36.

Luh, H. K. and S. L. Pimm. 1993. The assembly of ecological communities: a minimalist approach. J. Animal Ecol. 62: 749-765.

Meefe, G. K. 1992. Techno-arrogance and halfway technologies: salmon hatcheries on the Pacific Coast of North America. Conserv. Biol. 6(3): 350-354.

Oliver, C. D., W. H. Knapp, and R. L. Everett. 1994. A system for implementing ecosystem management. *In*: Jensen, M. E. and P. S. Bourgeron, tech. eds. Volume II: Ecosystem management: principles and applications. Gen. Tech. Rep. PNW-GTR-318. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Overbay, J. C. 1992. Ecosystem management. *In*: Avers, P. E., ed. Proceedings of the national workshop: taking an ecological approach to management. 27-30 April 1992, Salt Lake City, UT. Document no. WO-WSA-3. Washington, DC: USDA Forest Service, Watershed and Air Management. pp. 3-15.

Patten, D. T. 1991. Human impacts in the Greater Yellowstone Ecosystem: evaluating sustainability goals and eco-redevelopment. Conserv. Biol. 5(3): 405-411.

Regional Ecosystem Office. 1994. A federal agency guide for pilot watershed analysis. Portland, OR: USDA, USDI, EPA, NOAA. Various pagination.

Robbins, W. G. and D. W. Wolf. 1994. Landscape and the intermontane northwest: an environmental history. Gen. Tech. Rep. PNW-GTR-319. Portland, OR: USDA Forest Service, PNW Research Station. 32 pp. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment; Hessburg, P. F., science team leader and tech. ed., Volume III: assessment.)

Schmidt, T., M. Boche, J. Blackwood, and B. Richmond. 1993. Blue Mountains ecosystem restoration strategy: a report to the Regional Forester. Portland, OR: USDA Forest Service, Pacific Northwest Region. 12 pp.

Scientific Society Panel. 1993. Interim protection for late-successional forests, fisheries, and watersheds. Executive summary. Washington, DC. 16 pp.

Smith, D. M. 1986. The practice of silviculture. 8th edition. New York: John Wiley and Sons. 527 pp.

Walters, C. 1986. Adaptive management of renewable resources. New York: Macmillan Publishing Co. 374 pp.

Weigand, J. F. 1994. Economic issues in ecosystem restoration. *In*: Everett, R. L., comp. Volume IV: restoration of stressed sites, and processes. PNW-GTR-330. Portland, OR: USDA Forest Service, PNW Research Station. (Everett, R. L., assessment team leader; Eastside forest ecosystem health assessment.)

Wingate, D. B. 1990. The restoration of Nonesuch Island as a living museum of Bermuda's pre-colonial terrestrial biome. *In*: Woodwell, G. M., ed. The earth in transition: patterns and processes of biotic impoverishment. Cambridge, UK: Cambridge Univ. Press. pp. 133-150.

Zonneveld, I. S. 1988. Basic principles of land evaluation using vegetation and other land attributes. *In*: Kuchler, A. W.; and Zonneveld, I. S., eds. Vegetation mapping. Dordrecht, the Netherlands: Kluwer Academic Publishing. pp. 499-517.

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