A Citizen's Call for Ecological Forest Restoration: Forest Restoration Principles and Criteria

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Decision makers, scientists, and the interested public now recognize that there is an urgent need to restore forest ecosystems after decades of intensive logging, fire suppression, road building, livestock grazing, mining, and invasions by exotic species (see Noss and Cooperrider 1994, Ricketts and others 1999, Pimmentel and others 2000 for reviews). Such damaging activities have compacted soils, channelized streams, fragmented forests, suppressed natural fire, assisted the spread of some invasive species, and caused the loss of native species and their habitat (Noss and Cooperrider 1994, Heilman and others 2002).

Years of efforts by scientists, forest practitioners, environmentalists, restoration workers, and others have helped develop restoration methods and techniques. The result has been both good and bad restoration projects—models of what to do and what not to do when restoring forests. Today, job programs are being developed around the country to create a work force focused on restoring ecosystems rather than on resource extraction. Local governments and citizens are working together to restore watersheds that provide drinking water for their communities (for example, Ashland Watershed Alliance in southwest Oregon). Restoration programs and ideas continue to be developed to help us understand how to restore forests holistically.

At the same time, there are serious questions as to whether some proposed "restoration" activities are really beneficial to the landscape. Due to recent pressure from decision-makers to address forest fires in the West, federal agencies are developing plans to implement environmentally questionable "restoration" projects on a national scale (see DellaSala and Frost 2001 for limitations; also see White House Healthy Forest Legislative Initiative; www.nifc.gov). The National Fire Plan has funded fuel reduction projects (many of them commercial timber sales) in endangered species habitat, roadless areas, old-growth forests, and areas where there is no scientific evidence that forests are at risk from catastrophic fires (DellaSala and Frost 2001). An increase in use by the Forest Service of the commercial timber sale program to "restore" federal lands poses risks that logging will adversely affect fish and wildlife habitat and ecologically sensitive landscapes.

The Citizens' Call for Ecological Forest Restoration is proposed as a national

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policy framework to guide sound ecological restoration policy and projects. Through these restoration principles, we seek to articulate a collective vision of ecologically appropriate, scientifically supported forest restoration. Scientifically credible principles and criteria provide a yardstick with which to evaluate proposed forest restoration policies and projects that can be used both on the ground and in policy debates. While this paper was developed to respond to restoration policy and projects on federal lands, the principles and criteria are relevant to other land ownerships as well. By including social criteria, the restoration principles also help to bridge the gap between what is good for the forest and what is good for communities and workers. Moreover, by integrating science with community participation in restoration, the principles are consistent with the expanded approach to ecological restoration as defined by Eric Higgs (1997).

The forest restoration principles and criteria were developed by a diverse group of forest activists and forest ecologists from around the United States with input from representatives of forest practitioners and community-based forestry groups. These people first met in 2001 at a Forest Activist Restoration Summit in Boulder, Colorado and in a subsequent restoration workshop near Spokane, Washington in 2002. This diverse group came together because they recognized that to develop and implement a sound restoration agenda, the conservation community must learn from and work with both scientists and practitioners. At the Boulder meeting, forest ecologists established the scientific basis for the discussion that generated these principles. Forest practitioner, labor, and community-based forestry advocates then added their traditional, experiential and methodological knowledge, and provided focus on the socioeconomic and hands-on aspects of restoration that were further refined and presented in the subsequent workshop.

The restoration principles covered here are predicated on the assumption that successful ecosystem restoration must address ecological, economic, and social needs, including community development and the well-being of the restoration work force (that is, in the spirit of an expanded approach to ecological restoration; see Higgs 1997). While emphasizing that the primary goal of restoration is to enhance ecological integrity by restoring natural processes and resiliency, this approach proposes three core and interrelated principles to set the stage for what constitutes good ecological restoration: 1) ecological forest restoration; 2) ecological economics, and 3) communities and work force (Figure 1).

In order to implement ecologically sound restoration, all three core principles must be working together. Restoration principles and criteria provide a transparent and verifiable (on the ground) approach to guide and evaluate the efficacy of restoration projects, programs, and policies with respect to the core principles. The restoration principles can be used to guide the process of restoring ecological integrity through the use of restoration assessments that are conducted at multiple spatial scales. The principles outline specific restoration methodologies and criteria for adaptive management through monitoring and evaluation of restoration projects.

The principles also address the importance of an economic and institutional framework that accounts for non-market ecological services (Rasker 1994, Power 1996a, 1996b), such as clean air and water, and that encourages the long-term viability of communities by operating within the capacity and resiliency of forest ecosystems, fostering a culture of environmental sustainability, and meeting human needs. This includes the development of a highly skilled and well-paid work force to perform high-quality restoration work that proactively engages people through socially just and economically viable training and employment systems.

Core Forest Restoration Principles

Sound forest restoration requires an integrated, multi-disciplinary approach rooted in conservation biology and ecosystem restoration that includes preserving and protecting intact landscapes (particularly those that serve as reference or baseline conditions); allowing the land to heal itself; and, where necessary, helping it to do so through active restoration. Through thoughtful strategies employed over time, we can reestablish sustainable human connections to the land, creating high-quality restoration jobs and encouraging conservation-based economies.

The restoration principles approach to restoring ecological integrity is the basis for three core principles, several working principles, and numerous criteria that are provided in a checklist format for

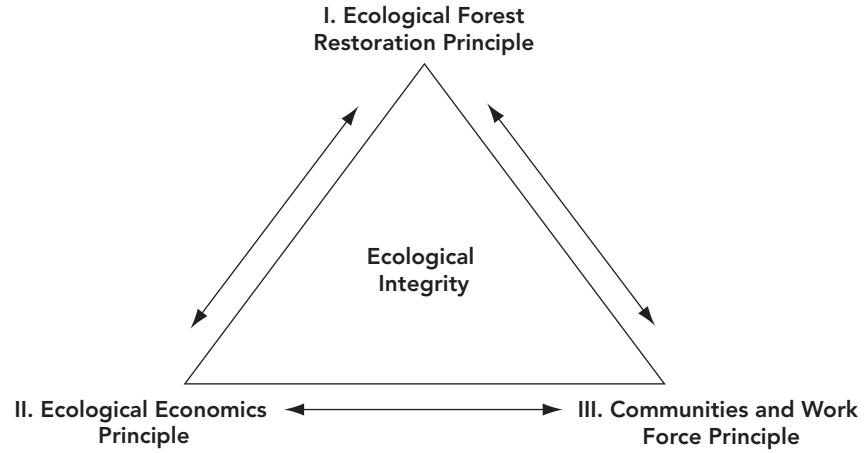

Figure 1. General relationship between core restoration principles and ecosystem integrity. *Courtesy of the authors*

Charlotte Fox, formerly with the Government Accountability Project in Washington, D.C., stands between two large diameter trees marked for removal in the Umpqua National Forest near Roseburg in southwestern Oregon. The trees are marked as part of proposed commercial timber sale that local National Forest and Bureau of Land Management staff claim will reduce hazardous fuels and tree overcrowding due to fire suppression. In reality, such trees are marked for cutting to pay the costs of fuel-reduction activities. *Photo by F. Eatherington, Umpqua Watersheds*

use by practitioners (Appendix 1). The checklist can be taken into the field to evaluate the efficacy of restoration projects in meeting the goal of restoring ecological integrity. It is also useful for helping to inform policymakers regarding what constitutes ecologically and socially appropriate restoration.

Ecological Forest Restoration Core Principle

Enhance ecological integrity by restoring natural processes and resiliency

Effective forest restoration should have as its primary objective the reestablishment of fully functioning ecosystems. Ecological integrity can be thought of as the "ability of an ecosystem to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, and functional organiztion comparable to that of natural habitats within a region" (Karr and Dudley 1981, Karr 2000). A restoration approach based on ecological integrity incorporates the advantages of historical models while recognizing that ecosystems are dynamic and change over time. This is fundamental to the development of restoration approaches and is the core principle central to all related principles and criteria.

Ecological Economics Core Principle

Develop and employ the use of economic incentives that protect or restore ecological integrity

Intact forest ecosystems provide the natural capital, including clean air and water, upon which all life and all human economies ultimately depend. Restoration of healthy ecosystems is an investment in regaining the natural capital that has been diminished by decades of forest degradation. An economic and institutional framework that fully accounts for these non-market ecological services should be created in order to recognize the value of intact ecological systems and to guide restoration efforts. As such, sound restoration must balance achieving restoration goals with the cost of restoration, while giving priority to ecological effectiveness (Higgs 1997). However, because ecologically sound forest restoration is a long-term natural process that will not always provide short-term benefits and may not pay for itself, a time frame for economic analysis must be used that recognizes the long-term benefits of restoration (for example, clean water, restored fire regimes) often must take precedent over concerns regarding efficiency (Higgs 1997). Therefore, economic incentives that drive the degradation of forests must be replaced with restoration incentives that protect and restore ecological integrity.

Communities and Work Force Core Principle

Make use of or train a highly skilled, well-compensated work force to conduct restoration

Ecological restoration also must become an important component of an ecologically sound, socially just forest economy. This approach has the potential to support the long-term viability of communities within the capacity and resiliency of forest ecosystems, while fostering a culture of environmental sustainability.

A highly skilled, well-compensated work force is essential for restoration to meet high ecological standards. Building the restoration economy requires a commitment to regional training capacity (multi-jurisdictional and interdisciplinary), skill certification, consistent funding over decades, and assuring workers' rights to organize and bargain collectively. The process of advancing ecological restoration must be open, inclusive and transparent, and should contribute to breaking down class, culture, gender, language, and religious barriers.

Ecological Forest Restoration Principles and Criteria

Restoration Project Planning Principle

Document all restoration projects in the context of a restoration assessment and appropriate restoration approaches that restore ecological integrity

All restoration projects must be planned and implemented in the context of a restoration assessment (see Forest Restoration Assessment Principle) and use appropriate restoration approaches (see Forest Restoration Approaches Principle) to restore and enhance ecological integrity. Because ecological systems are inherently complex and dynamic, it is impossible to accurately predict all the consequences of our actions, even well-intentioned restoration actions. The more controversial or experimental the project is, the smaller the scale should be. If there is high risk and weak scientific support, the burden of proof falls upon the project's proponents.

Restoration planning incorporates numerous criteria, including making use of the best available science, monitoring and evaluation, regulatory compliance, prioritization of integrity goals, endangered species recovery, and securing adequate funding (Appendix 1, I.1).

Forest Restoration Assessment Principle

Conduct a restoration assessment prior to restoration activities

A restoration assessment must be done prior to implementing a restoration project or beginning restoration activities. The assessment is conducted to determine if any restoration activities are required, and is used to 1) identify the root causes of ecosystem degradation at multiple spatio-temporal scales, including eco-regional, intermediate, and site-specific (see related criteria below); 2) determine appropriate methods for restoring degraded systems; and 3) create a spatially explicit prioritization of restoration needs across spatial scales (Appendix 1, I.2). The assessment and corresponding actions are then followed by sufficient monitoring that measures progress towards restoring a degraded system so that it is more resilient to disturbance and can persist in the absence of further human intervention.

The restoration assessment should first be conducted within the context of a broader ecoregional assessment designed to determine the status and condition of ecological integrity across the ecoregion and the appropriate spatial layout of core reserves, landscape connectivity, and restoration areas needed to maintain or enhance integrity (also see DellaSala and others 1996). Examples of ecoregional assessment criteria can be found in Scott and others (1993), Noss and Cooperrider (1994), and Ricketts and others (1999) or obtained from published regional assessments available for most ecoregions. The inclusion of additional scales of analysis provides a foundation for assessing cumulative impacts of proposed projects from the site to the ecoregional level (Appendix 1, I.2).

Ecological Restoration Approaches Principle

Determine the appropriate use of protection, and passive and active restoration based on restoration assessments

Restoration projects are designed to move forest ecosystems toward a higher level of ecological integrity. The restoration plan chosen for a particular place should be based on the most effective techniques recognized through the restoration assessment while favoring the least intrusive or intensive methods that will effectively move the area toward ecological integrity. This approach will usually produce the best results for the least amount of time and effort, promoting efficient use of restoration resources. It is important to note that there will be projects where short-term treatment impacts should be accepted because the project will result in long-term positive gains in ecological integrity (for example, removal of roads, barriers to fish passage, removal of exotic species).

In some cases, effective restoration may require taking action in areas of relatively high ecological integrity. In other cases, the best approach will be to focus restoration efforts on more degraded landscapes. Factors such as broad-based support among restoration stakeholders and the potential for restoration of landscape linkages between ecologically intact areas may lead to restoration efforts that are more time consuming and costly, but are necessary to achieve restoration objectives. Restoration assessments can be valuable in resolving such issues.

The following are three approaches and related criteria that define the range of forest restoration methods used to restore ecological integrity (Appendix 1, I.3).

Protection of Areas of High Ecological Integrity

Identify and secure areas of high ecological integrity

Relatively intact natural areas and core refugia that have high ecological integrity and little need for restoration should be protected and maintained. Protection of areas of high ecological integrity will provide critical sources of biodiversity, and/or reference landscapes needed as a source of baseline information (Noss and Cooperrider 1994).

Areas of high ecological integrity that may serve as core refugia include: rare community types (for example, as identified in the Natural Heritage database), intact old-growth forests, native forest ecosystems operating within the bounds of historic disturbance regimes, intact watersheds and large roadless areas, designated wilderness areas, and unimpaired streams and other aquatic habitats of high conservation value (Noss and Cooperrider 1994, DellaSala and others 1996).

Passive Restoration

Cease activities that have been determined by a restoration assessment to impede natural recovery processes

Halting activities that cause degradation or prevent ecosystem or species recovery should be considered the first and most critical step in restoration (Kauffman and others 1997). This form of restoration, which should be based on thoughtful analysis and planning, must be distinguished from passive management, which has been criticized as mere neglect (Agee 2002). Passive restoration should take

A fuel-reduction project in a fire-adapted, Jeffrey pine (*Pinus jeffreyi*) savanna on Rough and Ready Creek in southwestern Oregon. The project, which was organized by the Lomakatsi Restoration Project of Ashland, Oregon, includes small-tree thinning, lower-branch pruning, and brush pile burning. The project makes use of National Fire Plan funds for small tree and brush removal. *Photo by O. Catranides*

precedence where it is vital to eliminate or reduce the root causes of ecosystem degradation, including stopping destructive logging, road building, livestock grazing, mining, building of dams and water diversions, off-road vehicle use, and alteration of fire regimes (Appendix 1). Passive restoration can be applied alone or in combination with active restoration techniques provided that the primary goal is to stop the degradation and restore ecological integrity.

Active Restoration

Reintroduce natural processes or species through direct intervention

Direct human intervention is needed in cases where it is necessary to reintroduce (or secure) natural processes, at-risk species, or regionally extirpated species, and in cases where ecosystem composition, structure, and function are degraded or hindered by factors such as compacted soils, channelized streams, invasive species, or fire suppression. Active restoration methods include, but are not limited to, planting, prescribed burning, road obliteration, removal of barriers to fish passage and water diversions, invasive species control, fuel treatment, and riparian restoration. Such approaches should target areas of greatest risk to ecological integrity and be implemented in situations where the risks of no action outweigh those of active restoration. However, given the infancy of forest restoration science, active restoration should take a precautionary approach and make use of monitoring and adaptive management techniques.

Community Protection Zone Principle

Distinguish between fuel-reduction treatments that restore ecological integrity and those that serve primarily to protect property and human life

A clear distinction must be made between fuel-reduction treatments that restore ecological integrity and treatments that protect property and lives by reducing fuels in the "community protection zone" (CPZ: a limited area between rural communities and undeveloped forestlands, also known as the wildlands-urban interface). Treatments protecting property and lives in the CPZ may address the human safety issue, but should not be considered forest restoration in themselves since they may only involve very limited aspects of ecological integrity. Mechanical fuel treatments, such as thinning small-diameter trees, can be a step forward toward forest restoration if planned and implemented in the context of a restoration assessment. However, it must be recognized that fuel-reduction treatments alone do not address the wider range of ecological issues included in a comprehensive restoration plan and may result in degraded soils, native vegetation, and wildlife habitat (Brown 2000, DellaSala and Frost 2001). Specific criteria related to the CPZ, defensible space (Cohen 2000), and treatment types for use in this zone (Center for Biological Diversity 2002) are covered in Appendix 1, I.4.

Adaptive Management Principle

Monitoring and evaluation must be assured before restoration proceeds and should be incorporated into the cost of the project

Ecological forest restoration of any type at any scale is a process of adaptive management. Due to high levels of complexity, uncertainty and risk, restoration requires an approach that is careful, flexible and able to respond to change and new information. Acceptable restoration projects must include a transparent public process that provides for assessment, implementation, monitoring, evaluation, and adaptive criteria (Appendix 1, I.5). Given that many restoration projects do not pay for themselves, monitoring and evaluation are often underbudgeted and, therefore, not included in restoration. The lack of sufficient monitoring and evaluation hampers the ability of ecological restoration to contribute to our understanding of restoration ecology. Therefore, monitoring and evaluation must be included as criteria in the assessment of restoration projects.

Ecological Economics Principle and Criteria

Economic Framework Principle

Develop and employ positive incentives to encourage ecologically sound restoration

Positive incentives are needed to encourage ecologically based restoration and eliminate incentives that encourage activities that are ecologically degrading. Such incentives should protect and restore ecological integrity within an ecological and institutional framework that accounts for the benefits and costs associated with restoring natural capital. As such, incentives that encourage activities that degrade the ecological health of the landscape are inconsistent with improving ecological integrity or otherwise may cause ecological damage and, therefore, must be eliminated. Investments in ecosystem restoration should be applied across land ownerships, fostering co-management agreements between the federal government and the private sector (Appendix 1). For this to work at the policy level, specific reforms are needed to fund restoration projects not tied to traditional commercial timber operations. We propose several criteria to encourage the development of positive restoration incentives (Appendix 1, II.6).

Road recontouring (middle of photo) along Grass Valley Creek in Redwood National Park, northern California, one year after project completion. The removal of roads and recontouring of slopes helps restore hydrological processes and aquatic health while reducing the effects of forest fragmentation. *Photo by John McCullah, Salix Applied Earthcare*

Communities and Work Force Principle and Criteria

Community/Work Force Sustainability Principle

Effective restoration depends on strong, healthy and diverse communities and a skilled, committed work force

Restoration must foster a sustainable human relationship to the land that promotes ecological integrity, social and economic justice for workers and communities, and a culture of preservation and restoration. In turn, effective restoration depends on strong, healthy and diverse communities and a skilled, committed work force. While the restoration principles provide the "ecological horse" for steering such an approach, the "economic cart" generated by restoration activities can provide numerous opportunities for making use of a highly skilled work force. As such, restoration must be linked to economic development in a way that prioritizes the long-term interests of communities over short-term and non-local economic interests (Appendix 1, II.6). Given the extensive degradation of forests throughout the nation, there are numerous opportunities for fostering cooperation between restoration scientists and a community work force interested in restoring forests and creating high-quality jobs and sustainable communities through related criteria (Appendix 1, III.7).

Participatory Principle

Encourage involvement of a diversity of communities, interest groups, agencies, and other stakeholders at all levels

Meaningful involvement of a diversity of communities, interest groups, agencies and other stakeholders (at local, regional, and national levels) should be achieved through open, inclusive, and transparent decision-making processes with recognition of and respect for differences. This is the foundation for an expanded approach to restoration (Higgs 1997) that takes advantage of opportunities to blend scientific understanding of restoration with local and traditional knowledge of forest ecosystems (Appendix 1, III.8; also see Kimmerer 2002). Local communities can be more involved in restoration through "all-party" monitoring, provided that such actions are part of the larger public participation in public lands restoration and related criteria for inclusion.

Conclusion

The Citizens Call for Ecological Forest Restoration establishes a vision for restoring natural processes and native species in forested ecosystems through an adaptive and inclusive process. Ecologically sound forest restoration provides us with the opportunity to heal the land and to restore a viable community connection that in practice achieves an integrated vision of bio-cultural restoration. To ensure that this vision becomes reality, we must continue efforts to bring community

forestry and conservation groups together. We must commit to thoughtful, science-based restoration to ensure that future generations can experience and enjoy intact, diverse forested landscapes having the highest ecological integrity. While these principles do not address regional ecological differences, they do provide a national vision and guidance for the establishment of a sound restoration agenda, as well as the tools and a checklist to implement responsible forest restoration on the ground. The principles were forged in hopes that they will encourage the sharing of information and development of alliances among organizations and citizens that are necessary for successful forest restoration through an expanded approach. We have decades of restoration work ahead. It is vital that we begin to make the long-term investment in the protection and restoration of our forests that is necessary to secure their lasting value for future generations.

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Appendix 1. Ecological Forest Restoration Principles and Criteria Checklist

Core Principle

I. Ecological Forest Restoration—Enhance ecological integrity by restoring natural processes and resiliency

Subprinciple and Criteria

1. Restoration Project Planning Principle—Document all restoration projects in the context of a restoration assessment and appropriate restoration approaches that restore ecological integrity

Restoration Planning Criteria

- Take a thoughtful, careful, and conservative approach.
- Use the best available science and incorporate experiential and indigenous knowledge where applicable.
- Make use of an adaptive and public process that regularly incorporates revisions from monitoring and evaluation.
- Prescriptions for active restoration must be clearly applied to those factors that are currently limiting ecosystem recovery and integrity. Priorities identified during the assessment should not be abandoned in order to meet other objectives not directly aimed at ecosystem integrity and resilience.
- Restoration treatments must use the least intrusive techniques that will be effective in order to avoid negative cumulative effects to watersheds and wildlife, except under special circumstances where a high level of intrusiveness is needed to restore ecological integrity (for example, road obliteration, see section IV, 2).
- Comply with and uphold all applicable local, state and federal laws and regulations.
- Incorporate and/or improve recovery plans for threatened and endangered species.
- Budgets must include realistic and dedicated funding for and an institutional commitment to assessment, monitoring and evaluation, with systems designed and in place before activities commence.
- Assess the work force and community capacity for carrying out restoration work, and recommend actions to meet Quality Jobs Criteria below.

2. Forest Restoration Assessment Principle—Conduct a restoration assessment prior to restoration activities

Ecoregional Level Assessment Criteria (Broad Scale Assessment)

- Use published ecoregional classifications to identify the ecoregion within which the site occurs.
- Determine the status and condition of ecological integrity attributes across the ecoregion (for example, what are the major forest types or species in decline and what are the root causes of such declines?).
- Identify core refugia, landscape connectivity, and restoration areas needed to maintain or restore integrity across the ecoregion.

Intermediate Spatial Scale Assessment Criteria

- Identify the specific unit used in an intermediate spatial assessment—the unit of analysis should be defined based on the integrity needs addressed (examples include landscape, watershed, subbasin, river basin, mountain range).
- Focus on extending high-integrity areas and connecting them at the intermediate scale, wherever connectivity was characteristic of the natural landscape as recognized by the ecoregional assessment.
- Determine the need and efficacy for performing restoration objectives at intermediate spatial scales (for example, Are treatments needed at the scale of the landscape or is it best to start at some other unit?)
- Evaluate cumulative impacts and address how a site-specific project will affect ecological integrity at intermediate scales.

Site-Specific Assessment Criteria

- Determine the importance of the site within the larger landscape context.
- Identify the specific ecological processes, species, or functions at risk.
- Document the types of restoration treatments needed to maintain or restore ecological integrity.
- Establish clear links to the spatial and temporal issues identified in the ecoregional and intermediate assessments.
- Link site-specific information to the role the site plays in determining resiliency and integrity at the watershed, landscape and global scales.
- Determine the role that individual target sites play within the watershed or landscape based on conservation biology principles (for example, is an area an important corridor for wildlife, the only old-growth forest in the region, critical habitat for an area-limited species?).
- Evaluate cumulative impacts and address how a site-specific project will affect ecological integrity at broader scales.
- Evaluate the appropriate restoration methods (protection, passive, or active restoration) based on ecological need, importance of the site in the watershed or landscape, and the timing and resources needed to restore ecological integrity.
- Focus on projects with a high likelihood of successful ecological results and low risks or where risks of inaction jeopardize important ecological values of the site.
- Give consideration to areas of greatest need/areas where threats are the greatest.
- Give extra consideration to the presence of populations of at-risk species.
- Assessments must include data that indicate:
  1. Baseline (current) conditions.
  2. Associated ecological reference conditions (reference sites or ecological conditions that support[ed] native biodiversity and ecological processes) that account for resilient and dynamic systems (for example, flood- or wind-prone areas, areas experiencing population cycling and periodic fire events). Ecological reference conditions must inform restoration and are selected to define, achieve, and maintain ecological integrity.
  3. Control sites based on reference conditions or landscapes.

3. Ecological Restoration Approaches Principle—Determine the appropriate use of protection, passive and active restoration based on restoration assessments

Protection of Areas of High Ecological Integrity Criteria—Protect areas of high ecological integrity

- Identifying and protecting areas that currently exhibit high ecological integrity must be the first priority of restoration plans.

Active restoration should not be applied in these areas unless it can be shown that there is a high degree of scientific and stakeholder support, and that there are no other means for restoring or maintaining ecological integrity.

Passive Restoration Criteria—Cease activities that have been determined by a restoration assessment to impede natural recovery processes

Passive restoration should be employed in areas where removal of degrading activities will allow natural recovery to occur.

Passive restoration can be employed alone, or prior to active restoration.

Active restoration that fails to incorporate appropriate passive techniques is unlikely to succeed.

Active Restoration Criteria—Reintroduce natural processes or species through direct intervention

Focus on areas of greatest risk to ecological integrity and processes.

Implement in situations where inaction might lead to the destruction or loss of natural processes or permanent decline of a species, stream function, or rare habitat type, or where it can be demonstrated that active restoration will greatly accelerate the return to a higher state of ecological integrity.

Apply active restoration judiciously in areas of high ecological integrity based on degree of degradation and ecological need.

Emphasize the least risky interventions that are likely to provide the greatest ecological benefit, while minimizing management-induced ecological risks and costs.

Provide benefits in areas that exhibit moderate loss of ecological integrity but still support key ecological elements and processes.

Incorporate appropriate passive techniques.

4. Community Protection Zone Principle—Distinguish between fuel-reduction treatments that restore ecological integrity and those that serve primarily to protect property and human life

CPZ Criteria

- Home-site treatments in the CPZ must be undertaken primarily within a 66-200 feet (20-60 meter) intensive treatment zone where fires most directly threaten structures and human life (Cohen 2000).
- Defensible community space that may include public and private lands should be created within an additional treatment zone up to 1667 feet (500 meters), which includes the 200-foot (60 meter) home-site treatment zone, for firefighter safety and protection of other flammable community values (Center for Biological Diversity 2002).
- Treatments to create defensible space may include thinning small-diameter trees, pruning, mowing, roof cleaning, as well as replacement of flammable landscape and building materials (Cohen 2000, Firewise 2001).
- Home-site treatment is sufficient for survival of a home during a forest fire. It is critical that these treatments be implemented for a CPZ protection plan to be successful. Priority should be given to home-site treatments when resources are limited. Federal cost-share grants for home-site treatment should be increased and maintained until a comprehensive program is completed.
- Long-term management of the community defensible space should be a cooperative partnership between the relevant agencies, communities, and homeowners beginning with the initial CPZ risk assessment and following through to future maintenance and should account for appropriate access to structures for fire fighting, fire-resistant landscaping, and consideration of construction standards and proper zoning laws for all land ownerships.

5. Adaptive Management Principle—Monitoring and evaluation must be assured before restoration proceeds, and be incorporated into the cost of the project

Monitoring and Evaluation Criteria

Have clearly stated objectives, as well as specific indicators and measures for determining effectiveness.

Be an integral component of the restoration project.

Be incorporated into the essential costs of the project.

Provide a process for all-party and scientific input.

Compile data, models, and analyses related to ecological restoration efforts in comparable formats and collect them in a central location.

Make data available to the public in a user-friendly format in both on-line and written display formats. Such information will indicate how data will be used in the restoration process.

Require that project implementation promptly respond to monitoring and evaluation results, as well as new information. This may include adapting or altering implementation plans and/or taking corrective actions.

Require that processes for carrying out assessments, planning, monitoring and evaluation of restoration efforts involve all local, regional, and national stakeholders.

II. Ecological Economics—Develop or make use of restoration incentives that protect or restore ecological integrity

6. Economic Framework Principle—Develop positive incentives to encourage ecologically sound restoration.

Economic Incentives Criteria

Investments in restoring ecosystems should be applied across land ownerships in cooperation with willing landowners and should be tiered to regional and local ecological needs.

Successful restoration on public lands requires reforming federal agency funding mechanisms and contracting procedures to remove incentives for ecologically and socially damaging activities. Such reforms should include the following:

1. Specific appropriations must commit consistent, adequate multi-year funding for all aspects of restoration—assessment, implementation, monitoring, evaluation, and adaptative management.
2. The current timber sale program continues to give priority to economic interests and is not appropriate for restoring forests. However, restoration byproducts derived from ecologically based restoration projects may have value secondarily. Contracting mechanisms, therefore, must be developed that are driven by ecological objectives.
3. Contracts for restoration work on public lands must be awarded on "best value" rather than "lowest bid" criteria. Best value should be based on desired ecological, community, and work force objectives, which ensure contractors possess the necessary skills and capacities to carry out

high-quality work, have successfully performed such work in the past, and provide social and economic benefits to communities.

4. Preference for "best value" contracts on public lands should not exclude any business or group of persons, but should be given to local crews and small businesses, underserved communities, and mobile workers, who can demonstrate direct knowledge and experience of the ecosystem in which the work will be done. Procurement mechanisms should encourage contractors to include a training and employment component that will increase the capacity of existing displaced timber workers and mobile workers to access and perform high-skill, long-duration work. The Mobile Workforce consists of economically disadvantaged, under-represented and culturally diverse crews of migrant and community-based forest workers who perform services such as tree planting, thinning, brush disposal, prescribed burning, trail construction, and so on.

For public lands, restoration funding should not include off-budget funds generated from commercial activities.

Restoration on private lands requires outreach to landowners with information about the ecological importance of their lands within the context of the larger landscape, and resources for technical and financial assistance to help landowners restore these lands.

1. Private forestland owners should be encouraged (including financial support for small landowners) to pursue Forest Stewardship Council certification to promote sound forestry on private lands.
2. Cooperative forestry programs should provide private forestland owners with access to education, training and incentives for participation in restorative forestry methods. Agencies must inform low-income and minority landowners of such opportunities.
3. A low-interest, revolving loan fund should be established to cover upfront costs to encourage landowners to shift to longer timber rotations.
4. Public funding sources and tax incentives for habitat restoration projects for threatened and endangered species and imperiled forest habitats should be established.
5. Federal land and water conservation funds should be appropriated for the acquisition, protection, and restoration of priority habitats.

III. Communities and Work Force—Make use of or train a highly skilled, well-compensated work force to conduct restoration

7. Community/Work Force Sustainability Principle—Effective restoration depends on strong, healthy, and diverse communities and a skilled, committed work force

Sustainability Criteria

Restoration and economic development must prioritize the long-term interests of communities over short-term and non-local economic interests.

Government, interest groups, and communities should cooperate to promote policies and programs that build community capacity for ecologically sound restoration, including work force and small business development that:

1. Are based on landscape-scale assessments of restoration needs, and are scaled appropriately within the carrying capacity of the land and regional economy.
2. Have the flexibility to adapt over time to new information.
3. Directly and proactively address barriers to equal access, such as differences based on class, culture, language, and religion.
4. Provide for intergenerational exchange and other proactive strategies to engage and empower youth and elders.
5. Are designed to add maximum value to restoration byproducts at the community level.

Quality Jobs Criteria

Restoration contracts should recognize and foster a multidisciplinary, high-skilled work force of trained, certified restoration technicians and applied ecologists, and provide stable, full-season employment.

Restoration workers should be compensated with a family living wage at levels commensurate with their knowledge and skills, set as a functional minimum.

Restoration must be supported by regional training and skill certification systems (for example, apprenticeship programs), with stable funding, that provide for multidisciplinary skill development to broaden career opportunities.

Employment and training systems must be equally accessible to the existing diverse work force. Restoration contracts and regional training systems must be linked by recognized skill standards and associated wage and benefit standards.

Contracting, employment, and training systems must promote the efficient and fair utilization of local, regional, and mobile workers in a way that most effectively meets ecological integrity as well as social goals.

Restoration workers at all wage and skill levels must be guaranteed the right to organize and bargain collectively.

8. Participatory Principle—Encourage involvement of a diversity of communities, interest groups, agencies, and other stakeholders at all levels

Participatory Criteria

Adaptive processes for carrying out assessments, planning, monitoring, and evaluation of restoration efforts on public lands should be "all-party" processes to the extent feasible; that is, open to and proactively inclusive of all stakeholders at local, regional, and national levels.

No one interest or community should be afforded control of or undue influence on public-land management decision making.

Adaptive all-party processes should strive to build consensus around ecological, social, and economic principles and practices by focusing on common values, mutual goals, and the resolution of conflicts based on class, culture, language, and religion.