

National Park Service
U.S. Department of the Interior
Bandelier National Monument
New Mexico



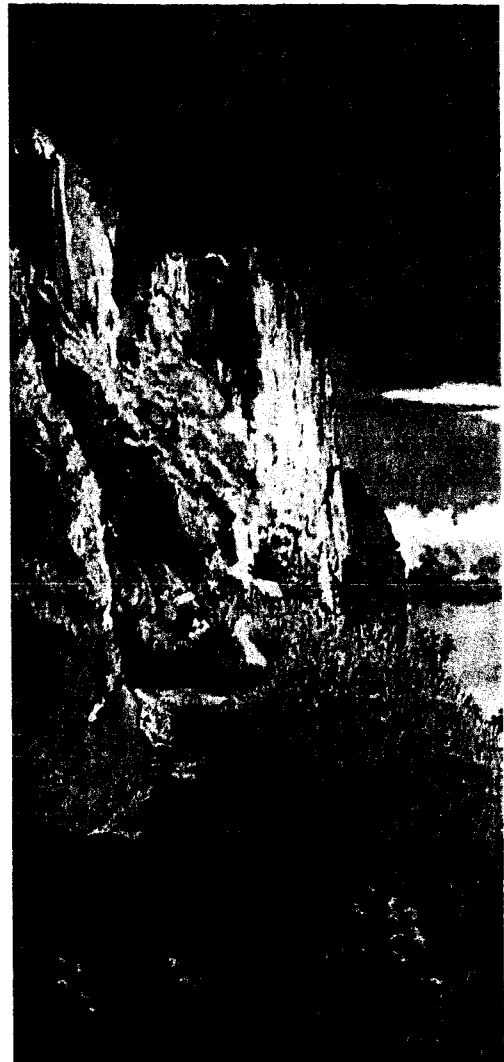
Ecosystem Restoration Plan

Record of Decision

Approved:

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Michael D. Snyder
Intermountain Regional Director
National Park Service



**UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

RECORD OF DECISION

**BANDELIER ECOLOGICAL RESTORATION PLAN
FINAL ENVIRONMENTAL IMPACT STATEMENT**

**Bandelier National Monument
Los Alamos, New Mexico**

The Department of the Interior, National Park Service (NPS), has prepared this Record of Decision (ROD) on the *Ecological Restoration Plan/Final Environmental Impact Statement (FEIS)* for Bandelier National Monument, New Mexico. This ROD includes a statement of the decision made, synopses of other alternatives considered, the basis for the decision, a description of the environmentally preferable alternative, a discussion of impairment of park resources or values, a listing of measures to minimize environmental harm, and an overview of public involvement in the decision-making process.

PROJECT PURPOSE

The purpose of the *Ecological Restoration Plan* is to re-establish healthy, sustainable vegetative conditions within the piñon-juniper woodland and to mitigate accelerated soil erosion that threatens the cultural resources. Protection of these cultural resources is identified in Bandelier National Monument's enabling legislation.

Prior to creation of the monument, historic land use, particularly grazing, resulted in changes in ecosystem processes that continue to adversely affect both natural and cultural resources inside Bandelier. The most detrimental of these changes is the accelerated rate of soil erosion and associated loss of archeological resources occurring now in the piñon-juniper woodland.

Continued rapid soil loss in already degraded piñon-juniper communities threatens the integrity of thousands of prehistoric cultural sites, which the monument was specifically set

aside to preserve. Over 75% of the known prehistoric sites at Bandelier occur within piñon-juniper communities, and nearly 90% of these have experienced adverse effects related to erosion. Without management intervention to actively restore the herbaceous understory and stabilize soils in degraded woodland communities, an estimated 1,900 archeological sites are considered at risk of damage or loss from erosion.

DECISION (SELECTED ACTION)

The National Park Service will implement the modified preferred alternative (modified Alternative B) as described in the *Final Environmental Impact Statement* issued in August 2007. By implementing this alternative, the National Park Service will fully accomplish the stated purpose of taking action, which is to re-establish healthy, sustainable vegetative conditions within Bandelier's currently degraded piñon-juniper woodland to mitigate accelerated soil erosion that threatens the cultural resources of the monument. The method used to restore these conditions is a proven treatment technique of cutting and scattering branches from nearby trees. Treatment would be applied over a five year period to approximately 4,000 acres of woodland, all of which lies in the Bandelier Wilderness.

Key elements of the selected alternative include the following:

- The selected alternative includes the use of chain saws in the woodland to cut trees and

branches required for scattering. A wilderness minimum requirement analysis indicated that treatment of such a large area would be infeasible without the use of motorized equipment, and that impacts to monument resources would be substantially reduced through the use of this equipment.

- In areas where minimum requirements analyses indicate motorized tools should be used, small diameter piñon and juniper trees would be flush cut at their base using chainsaws. Limbs would be lopped and scattered over bare soil. In some localized areas chainsaws may be replaced with hand tools to prevent resource impact.
- Primary emphasis for treatment would be placed on more productive sites with deeper soils and remnant herbaceous cover or dominated by smaller diameter or younger trees. Shallow, rocky, or otherwise low productivity sites within the watershed unit or those dominated by larger diameter or older trees would generally receive little to no thinning.
- Up to two crews of six to ten personnel would simultaneously implement treatment during each season. Each crew would work approximately eight to ten hours per day and eight to ten days per work session, treating an average estimated 2.5 acres per day or 50 acres per month. The work season would begin in September and end in May to avoid the time when the park is most visited, soils are wet, and the nesting season of state (peregrine falcon) and federal listed bird species (bald eagle and Mexican spotted owl) has begun.
- Management actions would be focused in mesa top settings between 6,000 and 7,000 feet elevation.
- About one-fifth of the 4,000 acres (e.g. 800 acres) would be treated each year. The basis for selecting a general area or "basin" for treatment each year would include a combination of logistics, geography, staff and funding availability, weather conditions and chance of treatment success. Soil factors and vegetation attributes including density

would be used to refine and delineate actual treatment boundaries in individual "sub-basins" within the larger basin area that would be treated each year. These treatment boundaries would be documented in an Annual Implementation Plan.

- Monument staff will monitor response to treatment and use the information gathered from the sites to modify future actions, site selection, or other factors, if warranted.
- A total of up to eight backcountry camps would be needed during the five-year work period. Camps would be about one acre in size. Camps within a three-hour walking distance from Bandelier headquarters would be supplied by mule pack trains. Those in more remote locations would require helicopter support.
- Prescribed fire may be used to maintain mechanical thinning treatments and promote long-term recovery of the herbaceous component. Fire would only be intentionally introduced when native, perennial grass cover constitutes at least 10% basal cover, and no sooner than ten years following treatment. Until this occurs, the current practice of suppressing fires in piñon-juniper woodland would remain in effect in treated areas.

OTHER ALTERNATIVES CONSIDERED

Two other alternatives were analyzed in the EIS:

No Action Alternative (Alternative A)

The No Action alternative would result in no changes from current management of piñon juniper woodland at Bandelier. Under this alternative, monument actions on most resources in the piñon-juniper woodland at Bandelier would be limited, with no active management of soils, vegetation, or wildlife beyond current research and monitoring activities. On-going research on soils and vegetation, as well as that for wildlife and special status species would continue. Current cultural resources research (e.g., current condition assessments/monitoring, recording of insufficiently documented sites, inventory of unsurveyed areas, resource stabilization, limited data recovery) would

continue as funding permitted. Wilderness would continue to be managed and maintained to provide a primitive and natural experience. Front and backcountry patrols would continue to emphasize visitor and employee safety, resource protection, fire prevention, and minor maintenance of trails.

Alternative C

This alternative focused on treating sub-basins containing the highest priority cultural resource sites within piñon-juniper woodland. High priority sites included those with the greatest cultural significance and the greatest threat of loss without treatment. For analysis purposes, Alternative C was assumed to use one crew of six to ten people for treatment. Because high priority sub-basins may not be contiguous, additional time to treat the 4,000 acres, logistic coordination, and number of camps established and used or re-used would increase. With a single crew treating approximately 200-300 acres/year, treatment of the 4,000 acre woodland is estimated to take up to 20 years.

Alternatives Considered But Dismissed

Other alternatives considered but dismissed from further analysis include:

Using hand tools exclusively. This alternative was dismissed because treatment would take twenty times or longer to complete, resulting in loss of soils, vegetation, and cultural resources the project is intended to preserve.

Widespread reseedling. Research at the monument indicates this is not an effective restoration treatment.

Allow drought and bark beetles to kill off trees and restore the understory. Although this does increase understory vegetation (in response to greater soil moisture following piñon mortality), the level and pattern of increase is insufficient in most areas to significantly reduce rates of soil erosion.

Use only prescribed fire instead of motorized and hand tools. Although prescribed fire is allowed in the woodland, it cannot burn without the herbaceous understory to carry it.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Records of decision are required under the Council on Environmental Quality regulations to identify the environmentally preferred alternative. The environmentally preferred alternative is defined as the alternative that best meets the criteria laid out in §101(b) of the National Environmental Policy Act these criteria, as well as the alternative that:

... causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources (CEQ 40 Most Commonly Asked Questions).

Section 101(b) states that "it is the continuing responsibility of the Federal Government to:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Based on an analysis of each alternative and its ability to meet relevant portions of these criteria, as well as the option that "causes the least damage to the biological and physical environment" and best "protects, preserves, and

enhances historic, cultural, and natural resources,” the modified Alternative B is the environmentally preferred alternative. Compared to the other two alternatives, this alternative better protects important park resources, particularly vegetation, soils, water resources, and cultural resources, without degradation. Because of its faster timeframe, the risk of ongoing degradation and loss of soil, vegetation, and cultural resources would be lower than in Alternative C. Fewer sites would be so degraded as to be untreatable during the five-year treatment period in the modified Alternative B than in Alternative C, and therefore more acres of piñon-juniper woodland would be treated and the resources in the woodland would be saved and restored. The ability to protect and preserve additional natural and cultural resources is pertinent to both CEQ’s interpretation of the §101(b) criteria, as well as criterion four (“Preserve important historic, cultural, and natural aspects of our national heritage...”) itself. In a similar vein, the modified Alternative B also fares best on criterion one, because it will preserve more of the woodland for succeeding generations to appreciate.

The modified Alternative B offers the best balance of protection of resources in the short- and long-term with fewer permanent adverse impacts, particularly to natural and cultural resources. Because the adverse effects take place over a shorter period of time, it causes the “least damage” of the two action alternatives to most elements of the biological and physical environment. In the case of air quality and health and safety, taking no action would result in the “least damage.” However, for all other resources and values, any short-term impact from treatment under the modified Alternative B is far outweighed by its long-term beneficial effects.

Again because it accomplishes the same or greater restoration than Alternative C in a shorter period of time, the modified Alternative B would also best assure safe, healthful, productive, and esthetically and culturally pleasing surroundings, as resources would be restored to a more natural or stabilized state and the impacts of treatment would be minimized by completing work quickly.

While both action alternatives would promote the quality of renewable resources (in this case, natural resources), the modified Alternative B would accomplish this in a significantly shorter time period and so it is environmentally preferred under this criterion (number six) as well.

Both the modified Alternative B and Alternative C were found to equally meet the criteria for achieving a balance between population and resource use and promoting health and safety.

BASIS FOR DECISION

In reaching its decision to select the preferred alternative, the National Park Service considered the Organic Act, the enabling legislation for Bandelier National Monument, the Wilderness Act, and *NPS Management Policies*, as well as environmental, economic, and technical advantages an alternative might offer. The NPS also carefully considered public comments received during scoping and review of the Plan/EIS.

As part of the planning process, monument staff identified the *purpose* of action and *objectives* it believed must be met by taking action. The public also reviewed this set of guiding principles during the public open houses in 2003. When deciding between alternatives, the degree to which each alternative meets the purpose and objectives was used in addition to differences in environmental impact to help in deciding between alternatives evaluated in the EIS. As noted above, the modified Alternative B was environmentally the best of the three alternatives analyzed. Below is a summary of how the degree to which the purpose and objectives of action were met in the modified Alternative B.

The purpose of the *Ecological Restoration Plan* is to re-establish healthy, sustainable vegetative conditions within the piñon-juniper woodland and to mitigate accelerated soil erosion that threatens the cultural resources for which Bandelier National Monument was established.

Objectives are more specific statements of the purpose of the plan, and are detailed below for the Ecological Restoration Plan:

The No Action alternative was not selected because, in addition to have major adverse

environmental impacts it would not meet the purpose or objectives 1-3. Although both action alternatives largely meet the purpose and all four objectives of the plan, the National Park Service believes the modified Alternative B meets them to a larger degree than Alternative C.

Objective 1: Increase cover of native, perennial, herbaceous plants within degraded portions of the piñon-juniper woodland in order to reduce soil, runoff, and loss of cultural resource integrity

Both the modified Alternative B and Alternative C would increase the cover of native, perennial, herbaceous plants within degraded portions of the piñon-juniper woodland, resulting in slowed erosion and slowed loss of cultural resource integrity. However, Alternative B meets this objective to a greater degree than Alternative C because of its shorter time period for treatment. Soil erosion and resulting loss of cultural resources would continue in untreated areas during the time period treatment is applied in either alternative. This means soil erosion, loss of cultural resources, and unnatural conditions for vegetation and wildlife in untreated areas would be ongoing for up to 5 years in Alternative B, but up to 20 years in Alternative C.

Soils in the woodland are generally quite shallow and new soil forms slowly. In addition, much of the organic material, as well as nutrients or seed stock, is contained in the upper soil layers. With exposed (unvegetated) soil surfaces in the woodland currently exceeding 80% over much of the monument, rainstorms erode soil quickly, at a rate of 3.5 to 4 centimeters per century. This means that, during the 15-year difference between treatment times in Alternatives B and C, at least some sites in the woodland will lose enough soil or surface nutrients and organics that they will not be able to recover, even with treatment. Upland mesas at lower elevations and at the southern end of the monument are most susceptible to becoming unrecoverable during this timeframe. While the extent of this impact is unknown and depends on climate, rainfall, intensity of storms, and other factors, it is certain that for every year

full treatment is postponed, the risk of additional unrecoverable acreage increases.

The difference in time frame is also important for preserving eroding cultural resources. Alternative B is expected to stabilize 98% of recorded cultural sites across the woodland landscape as a result of treatment. Although Alternative C would provide major benefits to cultural resources, it is expected to stabilize 94% of recorded sites across the monument woodland. Analysis indicates that the threat of jeopardizing a site's integrity particularly increases between years five and 10 when treatment is extended as it is in Alternative C. This slows after year 10 because fewer sites remain to be threatened. As a result, in addition to stabilizing fewer sites, Alternative C would also result in more sites with lower levels of cultural integrity. In other words, by the time the sites are stabilized, they would be in worse condition under Alternative C than Alternative B.

Objective 2: Create conditions within degraded portions of the piñon-juniper woodland that will support a surface fire regime within the natural range of variability (for example, sufficient to maintain restored grass-dominated communities)

Both Alternative B and C would fully meet this objective, because treatment would slow erosion and allow herbaceous vegetation to recover to the point it could carry surface fires within the natural range of frequency and intensity (e.g. the natural range of variability). At the same time, the potential for patchy, high severity fire and subsequent weed colonization would be minimized.

Although piñon and juniper are native to Bandelier, the ecology of the woodland and the distribution of these species have changed during the last century and have become overly abundant, increasing in both profusion and range. Evidence suggests the trees were common on hillsides and rocky slopes, but did not regularly occur in lower gradient, deeper soil settings such as the mesa tops in Bandelier. In addition, the extent of the understory of grasses, herbs, and forbs that characterized much of the landscape decades ago has been greatly reduced

or eliminated, primarily as a result of intensive historic livestock grazing.

The loss of understory, as well as deliberate fire suppression, has altered the important ecosystem processes of fire frequency and intensity. Frequent lower intensity surface fires at intervals of 15-30 years generally do not take place in the monument's piñon-juniper woodland. Relatively "cool" lightning fires traditionally had reinvigorated annual and perennial grasses and forbs, while killing back piñon and juniper seedlings and restricting them to more "fireproof" rocky outcrops or shallow soil sites. The closing of the canopy with piñon and juniper trees in areas that had traditionally been more open and savanna-like furthered the loss of herbaceous understory plants and contributed to accelerated soil erosion and runoff.

Treating degraded mesa-top piñon-juniper under either of the action alternatives is expected to result in major beneficial impacts to the herbaceous understory across this vegetative type. Although both action alternatives could potentially treat up to 4,000 acres, the actual number of acres treated under the modified Alternative B would likely be higher than for Alternative C. As noted above, successful treatment requires intact surface soils, which would continue to erode and be lost during the years treatment is ongoing for untreated sites. Additional sites which could have been successfully treated earlier would be degraded to such an extent during the 15-year difference between the two action alternatives as to be untreatable. Therefore, although both action alternatives would meet this objective, the modified Alternative B would do so to a greater extent.

Objective 3: Manage degraded portions of the piñon-juniper community using information gained through an active program of research and monitoring

Both Alternatives B and C would fully meet this objective. Monitoring of the condition of archeological resources, as well as soil and vegetation, would occur under either.

For cultural resources, key variables of the site condition including cultural integrity, information potential, detectable threats, and other factors would be recorded on a 10% representative sample of treated archeological sites one year after treatment, then every three years afterward to detect any changes pre- and post-treatment. Collection of the full range of qualitative and quantitative data will provide the opportunity to identify unforeseen consequences (beneficial or detrimental) to treated archeological sites.

The effect of treatment on soil production would be monitored by calculating sediment production on small (e.g. 0.1 to 1.0 hectares) areas located wholly within representative treatment and control areas. Comparable contributing areas within representative treatment and control areas would be instrumented with fabric sediment dams and sediment removed and measured on a monthly basis. Supplemental information from repeat photography, erosion bridges, and vegetation cover may also be utilized to clarify system response.

The effect of treatment on vegetation would be monitored by collecting data from vegetation transects located wholly within representative treatment and control areas. Two permanently marked 100-meter vegetation line transects, running downslope (perpendicular to contours) from the watershed divide and spaced at least 25 meters apart, would be established within representative treatment and control areas.

Management responses to the effect of treatment on soil and vegetation would vary. If no difference between treated and control areas is detectable, additional thinning actions would take place in subsequently treated areas. If response is detectable but slight, the monument would consider additional thinning or assume that additional time is needed to achieve an acceptable system response. If marginal results occur on several areas, monument staff would evaluate site features to see which are limiting response, and possibly refine the range of woodland sites considered suitable for future treatment. Moderate or major beneficial effects are anticipated. However, if treatment produces even moderate adverse effects, restoration treatment would be suspended to evaluate if

current methods are still appropriate when applied correctly.

Objective 4: Build support for, and actively share information about, restoration actions and related research and monitoring efforts with government agencies, pueblos, and communities

All alternatives, including No Action, meet this objective, and no differences between Alternative B and C in the degree to which they meet this goal were detected. Educational and collaborative activities would include field tours, public presentations of post-treatment response, and articles in the park, local newspapers, and postings on the park and NPS websites. Visitors and the interested public would be regularly informed through annual reports on the woodland restoration efforts including monitoring results, and would be asked to provide feedback about project related effects (e.g., on the park environment or visitor experience) that might require additional mitigation or adjustments in how treatment is implemented. The park staff would provide regular project updates to interested neighbors including federal, state, and local entities, as well as wilderness or other special interest groups, private landowners, and affiliated Pueblo groups to inform and consult on planned restoration activities at Bandelier National Monument.

FINDINGS ON IMPAIRMENT OF PARK RESOURCES AND VALUES

The National Park Service may not allow the impairment of park resources and values unless directly and specifically provided for by legislation or proclamation establishing the park. Impairment that is prohibited by the NPS Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. In determining whether an impairment would occur, park managers examine the duration, severity and magnitude of the impact; the resources and values affected; and direct,

indirect, and cumulative effects of the action. According to NPS policy, "An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is: a) Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; b) Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or c) Identified as a goal in the park's general management plan or other relevant NPS planning documents."

This policy does not prohibit all impacts to park resources and values. The National Park Service has the discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impacts do not constitute an impairment. Moreover, an impact is less likely to constitute an impairment if it is an unavoidable result, which cannot be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values.

After analyzing the environmental impacts described in the EIS and public comments received, the National Park Service has determined that implementation of the selected alternative will not constitute an impairment to Bandelier National Monument's resources and values. The actions in the selected alternative are intended to restore healthy and more natural conditions in piñon-juniper woodlands, including the slowing of soil erosion which in turn would help stabilize cultural resources in the monument. Major beneficial impacts to vegetation, soil and water resources, hydrologic function, archeological resources, and wilderness character are expected as a result of implementing the selected alternative. Short-term adverse impacts from cutting trees with chain saws, camps and access by crews, and from leaving slash on the ground are possible for vegetation, soils, water quality, archeological resources, ethnographic resources, visitor experience, visual resources, wilderness recreation and values, wildlife, air quality, and park operations are possible. Short term impacts to listed animal species would be kept to negligible levels through mitigation. None of these short term adverse impacts would impair any park resource or value.

MEASURES TO MINIMIZE ENVIRONMENTAL HARM

In addition to selecting the alternative that provides the greatest environmental benefits, the National Park Service has also investigated all practical measures to avoid or minimize environmental impacts that could result from the selected alternative. These measures have been identified and incorporated into the selected alternative and are described in the Alternatives chapter (particularly in the *Actions Common to All Alternatives, Mitigation Measures* section) of the FEIS. They are summarized below, beginning with actions that would minimize environmental harm to several resources and then proceeding to those that are resource specific. Resource specific mitigation measures are listed in Table 1 of this Record of Decision.

Annual Implementation Plan

Each year the monument would evaluate several factors in a site-specific planning process. Actions would be consistent with this programmatic *Ecological Restoration Plan*, with this annual process would be designed to flesh out the details of treatment within particular sub-basins. Factors the monument staff would consider would be those geared to maximize the chances of success, minimize logistical problems, avoid site specific impacts to cultural and natural resources, and to determine whether intervention in wilderness is needed and if so, the minimum tool for conducting that intervention (e.g., the “minimum requirement process” described above).

Identification of individual treatment areas within each basin and sub-basin would be completed through analysis of soil suitability (i.e., soil type and depth), vegetation attributes, and status of cultural resource sites. The availability of woody biomass (i.e., tree density) would be used to further delineate treatment areas.

In subsequent treatment years, the results of prior year monitoring would be used to determine whether treatment is working as planned, or whether adjustments in implementation strategy are warranted.

Although monitoring results would generally not result in additional treatment such as seeding or erosion fabric, these measures may be beneficial and therefore used in small, select areas of high cultural value that would not otherwise respond to more typical treatments because of existing soil loss of other factors.

Monitoring

The monitoring of treatment areas will be designed to guide adaptive management actions throughout the life of the plan (see Appendix B of the FEIS). Soil erosion rates, cultural resource integrity and stability and the condition of vegetation following treatment would be compared to comparable control sites and the results evaluated each year. Adaptive management would allow for changes in site conditions, unexpected responses to treatment, and other pertinent information to be incorporated into planning and implementation of ongoing and proposed restoration activities. Adaptive management efforts will be designed to both maximize the response to treatment, and to minimize the short-term effects of treatment, particularly those to soil, water quality, vegetation, wildlife, and cultural resources.

In addition to monitoring to help improve site responses to treatment, the monument would also continue to monitor federal and state-listed bird species in order to evaluate any effects not evaluated or anticipated by the EIS. Pre-treatment surveys to determine whether the state-listed gray vireo is present may also be conducted.

Treatment Techniques

As noted above, a minimum requirements analysis conducted for this project indicated that the use of motorized equipment for treatment, including chainsaws and helicopters, was warranted and appropriate. This is because the use of hand tools would increase the amount of time needed for treatment by at least 20-fold, resulting in substantially greater loss of soils, cultural resources, and the continued degraded condition of vegetation in the piñon-juniper woodland. It would also result in longer term visitor disturbance and impacts to wilderness. Therefore, although chainsaws and helicopters may cause short term impacts to visitors, overall

this treatment technique is considered a measure that minimizes environmental harm.

Timing of Treatment

Annual ecological restoration work will be scheduled between September and May. Restricting work to this time period will aid in mitigating effects to wet soils and actively growing vegetation, limit exposure of work crews to adverse weather conditions, and minimize impacts to visitors during the summer months when the monument experiences its highest visitation rates. This will also avoid impact to breeding and nesting activities for some wildlife species.

Work camps

Potential locations of worker campsites would be evaluated based on a review of a series of criteria designed to avoid sensitive natural and cultural resources, main trails, and high visitor use areas. Workers would walk to camps and work sites along existing trails if possible to minimize disturbance to soils and vegetation.

Worker training

Before beginning treatment, monument staff would train crews by orienting them to a basic thinning/slash prescription, ensuring they are facile with the use of chainsaws and understand safety procedures, and can reasonably identify

cultural resources well enough to avoid them or stop work. The selected alternative initiates work in year one near monument headquarters in order to maximize the amount of time monument staff are able to be present on site to orient crews and monitor the progress of work.

Education and Consultation

Educational and collaborative activities including field tours, public presentations of post-treatment response, and articles in the park, local newspapers, and postings on the park and NPS websites would be available to all visitors or other interested parties. Visitors would be regularly informed through annual reports on the woodland restoration efforts including monitoring results, and would be asked to provide feedback about project related effects (e.g., on the park environment or visitor experience) that might require additional mitigation or adjustments in how treatment is implemented. The park staff would provide regular project updates to interested neighbors including federal, state, and local entities, as well as wilderness or other special interest groups, private landowners, and affiliated Pueblo groups to inform and consult on planned restoration activities at Bandelier National Monument. Each of these would help in minimizing the impact to visitors and neighbors during treatment

Table 1: Mitigation Measures Adopted As Part of the Selected Alternative

Resource Protected	Mitigation Measure
Archeological resources	<ul style="list-style-type: none"> • Camp areas, helicopter drop zones, and pack train/human access trails will be located away from archeological sites. • Prior to the start of work, the archeologist will instruct crews in identification of cultural materials and review federal and state laws protecting archeological sites and artifacts. • Work crews (treatment and monitoring) will minimize walking over architectural and other features. • All cultural sites within the treatment area will be identified and located by an archeologist. • As part of the annual treatment plan, the monument will evaluate the significance of historic properties in the area and will work with the State Historic Preservation Office to resolve any potential adverse effects. If adverse effects cannot be avoided or resolved, the monument may alter its treatment

Resource Protected	Mitigation Measure
	<p>plan to avoid impact.</p> <ul style="list-style-type: none"> • One archeological technician per work crew will be present on site during treatments to identify site components and supervise directional tree felling and placement of slash. • All dead trees, regardless of species, will be removed from structural elements of sites. Non-structural elements of sites should be treated using the same prescription as the surrounding landscape. • All 3-inch diameter and smaller trees will be removed. Cactus and other non-tree vegetation will be retained. • Larger (>3-inch) diameter trees growing in structures will be retained unless deemed by an archeologist to be detrimental to the stability or integrity of the structure. • Larger (>5-inch) diameter ponderosa pines growing in structures that are deemed unstable will be removed. • Heavy fuels (and woody material greater than 3-inch diameter) will be hand carried off structural elements. Lighter slash can remain if deemed necessary by the on-site archeological technician. • Before treatment is initiated, NPS staff at the monument will consult with affiliated Pueblo tribes to determine the location and importance of sacred sites and how best to protect their integrity during treatment. This could include avoidance of an area if necessary, or the use of hand tools to treat woodland vegetation.
Ethnographic Resources	<ul style="list-style-type: none"> • Continued consultation with the six affiliated Pueblos to identify treatment plans, site specific treatment maps, detailed archeological site maps, the need for tribal monitoring of treatment activities, proposed camp locations sites, and proposed mitigations for known ethnographic or culturally sensitive areas. • The Pueblos would be invited to identify potential Traditional Cultural Properties and express their concerns about any sensitive cultural or ethnographic resources or make their needs for access and use of traditional resources in the treatment area known. • The monument intends to make the results of cultural resource field inventories available to the Pueblos, and will document consultation efforts and identify any proposed measures to avoid adverse effects to historic properties.
Water Quality	<ul style="list-style-type: none"> • To mitigate potential effects to water quality, crew campsites will be located along mesa tops and away from streams; proper camp waste collection/disposal methods would be utilized
Visitor Experience	<ul style="list-style-type: none"> • To mitigate effects to the visitor experience, park staff will provide daily project status information to visitors, particularly related to the location of worker crew camps, helicopter traffic, and areas where chainsaws would be in use. By so doing, those visitors who may be particularly annoyed by noise or activity could choose to visit areas of the monument where restoration activities are not underway. • Helicopter take-off/landing sites will be limited to two designated areas (TA-49 heliport outside Bandelier and the monument's helispot along the entrance

Resource Protected	Mitigation Measure
	road). All helicopter deliveries to and pick-ups from the backcountry would be made by sling-load and would involve no landings/take-offs. Restricting the landing and take-off sites to two would minimize impacts to visitor experience by limiting areas where concentrated helicopter-related noise/activity would occur.
Wildlife	<ul style="list-style-type: none"> Vegetation treatment activities will occur during the months of September to May. This measure will significantly reduce effects to breeding and nesting activities as most wildlife species are not breeding during this time period.
Listed bird species	<ul style="list-style-type: none"> When treating piñon-juniper woodland near or in habitat that could be or is occupied by special status or federally listed species, hand tools might be the preferred method of treatment A biological monitor would be present during treatment to ensure no listed plant or animal species are disturbed, and to avoid or minimize impacts to other sensitive or unique species.
Mexican Spotted Owl	<ul style="list-style-type: none"> At the start of the Mexican spotted owl (MSO) breeding season (March 1), in order to mitigate any potential impacts to any nesting owls, occupancy surveys will be conducted to determine whether Mexican spotted owls are present in the monument and if so, their nesting status. If nesting MSOs are detected, the use of chainsaws and aircraft will not be allowed within 600 meters of an occupied suitable nesting area unless intervening topography attenuates the sound. Regardless of survey results, motorized activities on mesa tops will be prohibited within 100 meters of canyon rims within the shaded treatment basins shown in Figure 5 of the Final EIS (p. 37) between March 1 and May 15. In general, helicopter flights will be avoided over the shaded treatment basins shown in Figure 5 of the FEIS between March 1 and May 15.
Bald Eagle	<ul style="list-style-type: none"> No chainsaws will be utilized within 425 meters (0.26 miles) from fishing habitats and no helicopters will be flown within 1000 meters (0.62 miles) of fishing habitat along the Rio Grande from November 1 through February 28. Helicopter and chainsaw activities will avoid the shaded basins shown in Figure 5 of the FEIS after 4:30 p.m. MST and before 8:00 a.m. MST from November 1 through February 28.
Peregrine Falcon	<ul style="list-style-type: none"> In general, helicopter flights will be avoided over the basins indicated in Figure 6 of the FEIS (p. 40), which include peregrine falcon habitat management Zones A and B, from March 1 through May 15. Motorized activities in basins indicated in Figure 6 of the FEIS will be prohibited within 100 meters of canyon rims from March 1 through May 15.
Health and Safety	<ul style="list-style-type: none"> Where appropriate and in compliance with NIOSH guidelines, workers will use adequate ear protection while working in proximity to helicopters and chainsaws All crews will be briefed on emergency procedures and contact information to ensure they are prepared to act quickly and effectively should matters of their health and safety arise.

PUBLIC INVOLVEMENT

Governmental agencies and the public have been invited to help during several phases of this planning process, including during scoping where they were asked to provide input on the monument's stated purpose, need, alternatives, and environmental issues. The scoping process began with a notice of intent to prepare an environmental impact statement, which was published in the *Federal Register* on April 2, 2003. The monument then conducted four open houses to inform the public of the planning process and to invite comments on work to date. The open houses were held in June 2003 and November 2003. Each time, one open house was conducted in Los Alamos and a second in Santa Fe.

The first set of open houses in June 2003 presented the need for action, a summary of research results to date, and a summary of existing NPS and national monument policies regarding resource conservation, wilderness management, and other topics relevant to whether action should be undertaken. Comments from these sessions, as well as written comments received as a result of the *Federal Register* notice, were integrated into the scope of the planning effort to refine purpose, need, and objectives; to produce a range of reasonable alternatives; and to supplement the list of issues and impact topics. Written and oral comments were received at these open house sessions.

After the need for action, purpose, objectives and constraints were further refined based on the results of the first set of open houses, a second set was held in November 2003. These sessions presented specific objectives for each vegetative community, and a preliminary set of alternatives for review and comment. They also introduced the concept of adaptive management. Written and oral comments were received. Impact topics or issues and suggestions for new alternatives either resulted in additions or changes to the existing scope, or were considered and rejected for reasons summarized above in the *Other Alternatives Considered* section.

The *Draft Ecological Restoration Plan and EIS* was distributed January 19, 2007 for a 60-day public review. Hardcopy (23) and compact disc (21) copies were distributed to those named in the following distribution list. The draft EIS was also posted on the NPS Planning Environment and Public Comment (PEPC) website. Seven comment documents (one email and the remainder letters) were received. Substantive comments, which are those that question a fact, propose an alternative or a change to an alternative, or otherwise do not simply state an opinion, have been reviewed and responded to in the *Comments and Responses* section of the final EIS. Changes in the text of the draft document relevant to these responses have also been made.

The notice of availability for the FEIS was published in the *Federal Register* on August 17, 2007. The 30-day "no action" period concluded on September 17, 2007.

CONCLUSION

Among the alternatives considered, the selected alternative (modified Alternative B) best addresses the intended purpose of taking action, which is to re-establish healthy, sustainable vegetative conditions in the Bandelier piñon-juniper woodland and thereby mitigate accelerated soil erosion that threatens cultural resource integrity. The selected alternative is also environmentally preferable to other action alternatives analyzed because it completes treatment of the monument's woodland more quickly, reducing ongoing losses of soil and archeological resources while at the same time conferring major beneficial impacts on the park's natural and cultural resources. The selected alternative will not result in the impairment of park resources and values. The officials responsible for implementing the selected alternative are the Regional Director, Intermountain Region, and the Superintendent, Bandelier National Monument.