

Chapter 4: Environmental Consequences

This chapter describes the impacts of the various alternatives on the environment. Because the primary intent of the Wildlife Mitigation Program is to increase long-term wildlife habitat values within the Columbia River Basin, any of the alternatives would provide a net benefit to wildlife, and should generally provide a net benefit to the associated resources of soils, water quality, vegetation, and fish. Other resources, such as land and shoreline use, cultural and historic resources, economics, recreation, and air quality, might benefit, be adversely affected, or remain essentially unchanged, depending on the particular circumstances surrounding each mitigation action.

The following sections outline possible environmental consequences associated with the alternatives and the impacts of the various management techniques that may be employed under some or all of the alternatives. Impacts are discussed in this chapter by resource topic (e.g., **Soils** or **Recreation**.) Four major headings are discussed under each resource topic:

- *Context*: Identifies applicable laws, standards, and policies to provide the legal and political framework for managing the specific resource; it also lists potential impacts to be avoided as project managers work to establish a desired future condition.
- *Impacts of Alternatives*: Discloses and compares the anticipated impacts of each alternative on the specific resources.
- *Impacts of Techniques*: Discloses the anticipated impact of the site-specific techniques that may be used under any of the alternatives (see **Chapter 2** and **Appendix A**).
- *Potential Program-Wide Mitigation Measures*: Identifies ways to avoid, reduce, or rectify the potential environmental impacts of wildlife mitigation techniques.



4.1 SOILS

4.1.1 Context

- **Legal.** Most states and counties have regulations to protect soils. Soil regulations may be tied to water resource protection (see **section 4.2, Water Resources and Quality**). Under state regulations, mitigation plans may be needed to develop specific erosion and sediment control plans that specify best management practices to reduce soil loss.
- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: disturbing soils on unstable slopes; disturbing the upper soil horizons or accelerating erosion well beyond that occurring under natural processes; compacting of soil such that plant growth is prevented or severely restricted; or allowing sufficient deposition of salts or other materials into soils that vegetation growth is inhibited.

4.1.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Soils

Under No Action, wildlife mitigation projects would continue to be developed on a case-by-case basis. Experience with recently completed projects indicates that minor soil disturbances would occur during project implementation, followed by increased soil stability over time.

Alternative 2: Base Response - Potential Effects on Soils (Common to All Alternatives)

In general, soil conditions would improve at wildlife mitigation sites because large areas are protected from ground disturbance. Soil would be temporarily eroded, compacted, or displaced whenever ground-disturbing activities take place as part of active habitat improvement activities.

Alternative 3: Biological Objectives - Potential Effects on Soils

Under Alternative 3, relatively high amounts of short-term soil erosion and compaction would be expected during the initial phases of each new project, as a wide range of management techniques was implemented. Over the long term, soil conditions on mitigation sites would greatly improve as vegetation became established, roads were decommissioned or closed, and timber harvest, crop production, and grazing were reduced or stopped.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Soils

Short-term impacts on soils would be minor under Alternative 4 because it relies primarily on natural regeneration (rather than active restoration) to achieve biological objectives. No significant long-term adverse impacts on soils would be expected, although ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the likelihood of localized soil erosion or compaction. Soil conditions would be slow to improve over the long term.

Alternative 5: General Environmental Protection - Potential Effects on Soils

Because Alternative 5 would include an emphasis on providing side benefits to fish, soil protection measures would be a high priority. Impacts on soils, therefore, would be minor. Application of program-wide mitigation measures, as appropriate, would further minimize impacts on soils (see **Section 4.1.4**, below).

In general, Project Management Plans would include little use of chemical fertilizers and/or herbicides. Major soil-disturbing activities would also be minimized under this alternative, with infrequent use of wetland creation or water development and/or distribution techniques (e.g., diversions, drainage ditches).

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, soil erosion associated with these activities might occur (see **Section 4.1.3, Effects of Techniques**).

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Soils

Under BPA's preferred alternative, a moderate level of short-term soil erosion would occur as new projects were begun. Program-wide measures would be applied, as appropriate, to minimize erosion.

Because project managers would rely primarily on natural regeneration to achieve biological objectives, little soil would be disturbed at new mitigation sites. In addition, project managers would favor wildlife management activities with side benefits for fish, including activities that protect soils. Therefore, Alternative 6 would generally benefit soil productivity and stability.

4.1.3 Impacts of Techniques: Potential Effects on Soil

Land Acquisition Techniques

Land acquisition has little direct effect on soils. Should lands be taken out of crop production and designated as wildlife habitat, erosion problems that might have occurred under farming might be reduced.

Plant Propagation Techniques

Erosion potential can be eventually reduced by the implementation of any of the plant propagation techniques, because all can be used to stabilize banks and other areas vulnerable to erosion.

Initially, planting disturbs the soil. Hand-transplanting of vegetation affects relatively small areas. Mechanical transplanting and seeding, as well as seedbed preparation (e.g., tilling), can temporarily destabilize soils and increase susceptibility to erosion (Chutter 1969).

Irrigation can lead to sheet, rill, and gully erosion, although soil condition (including vegetative cover, slope, and drainage pattern) is usually the underlying cause of erosion associated with irrigation (Brady 1984). Irrigation can concentrate salts by leaching them from the top layers of soils or by depositing those salts contained in the irrigation water itself. Excess salts are often removed through flushing, which involves temporary heavy irrigation to wash away salts.

The addition of nitrogen fertilizers can change the natural nitrogen cycle, reducing free ammonia (a necessary component of the cycle) and increasing soil acidity. Consequently, heavy nitrate fertilization can even increase losses of nitrogen from the soil (Brady 1984). Fertilizers also build up as salt layers in soil.

Habitat Creation and Conversion

Creating wetlands can have both beneficial and adverse effects on soils. Such wetlands can reduce stormwater runoff and associated erosion problems. Manipulations of wetlands can stabilize stream banks and elevate existing erosion problems. Adverse effects include potential temporary erosion during construction or during diversion of water flows to increase wetland depth or size. Created wetlands can also create anaerobic and saturated soil conditions, with potential permanent changes in soil structure.

Creating habitat islands within wetlands or lakes can cause temporary erosion, either in acquiring source material or in placing the material in water.

Artificial nest structures generally have little effect on soils, other than the small amount of soil disturbed during establishment of some nest types requiring foundation.

Water Development and Management Techniques

Developing wells, diversions, springs, impoundments, and guzzlers can lead to soil erosion. Direct erosion can occur as these features are developed, given the typical combination and close proximity of moving water and disturbed soils. Spillways constructed as part of check dams can concentrate downstream flows during flooding, potentially adding to bank and gully erosion.

Indirect erosion may occur as water obtained from wells, diversions, springs, and impoundments is delivered to other areas, as described below, under **Water Distribution Techniques**. Because water may be acquired for irrigation, see also the discussion, above, under **Plant Propagation**

Techniques. Guzzlers, springs, ponds, and other water developments might draw wildlife that trample and compact vegetation and soils.

Water Distribution Techniques

Pipelines, culverts, and drainage ditches/conveyance channels also pose a risk to soil erosion during installation because disturbed soil may be exposed to moving water. Drainage ditches/conveyance channels can similarly be long-term sources of erosion.

Development of culverts with elevated outfalls (greater than 1 m or 3 ft.) can cause erosion downstream and potentially block fish passage. Culverts can be installed to divert water to vegetated areas in order to decrease sedimentation and reduce water flows.

At road and trail crossings, and other areas where a stream could be subject to heavy sediment inputs or to excessive down-cutting, culverts can function to protect water quality. Properly designed and maintained, these culverts work to reduce erosion, sedimentation, turbidity, and pollutants associated with increased sediment load. Culverts commonly protect streams at road and trail crossings and in areas of excessive stream velocity, such as downstream from stream segments that have been straightened or have otherwise lost their natural meanders.

Fire Management Techniques

Natural fire management would increase the risk of high-intensity wildfires, with extreme combustion temperatures that tend to damage soils severely. Severe fire intensity can change the water-holding properties of soils, so that they repel water rather than hold it. Such changes can increase erosion potential, increase water runoff, and decrease productivity during site restoration and regeneration. Where fires are allowed to burn, the risk of high-intensity fires would eventually decline over the long-term as unplanned fires reduce fuels; however, where unnaturally high fuels have accumulated, the effects of an initial burn could be long-term.

Prescribed burns carry the same risks as high-intensity wildfires, but generally have much lower intensity and associated effects. They also augment soils with ash and associated nutrients and protect soils from the potentially adverse effects of unmanaged wildfire. Over the long run, the need for and use of prescribed fire at some mitigation areas would decrease as fuel loads become lighter and as fire begins to function in its natural ecological role.

Vegetation Management: Enhancement and Control

Herbicides generally decompose in the soil (USEPA 1980). How long herbicides remain in the environment is highly variable. Weather and site-specific properties (e.g., soil type) greatly influence the rate of decomposition. The USFS (USFS 1988), in evaluating 16 of the most commonly used herbicides, found that 4 had a half-life of less than 1 month, 5 a half-life of 1 - 6 months, and 6 a half-life greater than 6 months.

Mechanical removal of vegetation can disturb soils and make them vulnerable to erosion. Biological control (e.g., using insects) and hand-pulling has little direct effect on soils. Prescribed burns conducted for vegetation control carry the same risks and benefits as those conducted for fuel reduction (see previous section). Prescribed fire can be used instead of grazing as a vegetative management strategy (e.g., controlling shrubs), avoiding some of the more serious adverse erosion problems associated with grazing (e.g., erosion along riparian areas and nutrient loading from animal waste).

Water level manipulation to control vegetation can add to soil erosion and transport. During drawdowns, exposed fine sediments can be vulnerable to wind or water erosion. During flooding, rising waters may destabilize banks, causing erosion, and deposit loosely consolidated soils that may be further eroded.

Species Management Techniques

While the introduction of peregrine falcons or similar small species generally has little effect on soils, the introduction of large, herding animals, such as elk, can cause soil compaction and erosion.

Introduction of non-native or non-endemic species can have serious effects on vegetation and soils. For instance, mountain goats have caused serious erosion and other problems for the alpine environment at Olympic National Park (Robinson and Bolen 1989).

Control of nuisance animals can protect vegetation or vegetation enhancement projects, which in turn can protect soils. For example, voles and mice can often kill significant amounts of planted vegetation by eating through the bark, and Canada geese can remove planted tubers and bulbs.

Multiple Use Techniques

Crop production practices related to harvest and planting can cause significant levels of soil erosion. For example, crop tilling can destabilize soil, making it susceptible to erosion.

Provision of educational and recreational opportunities on mitigation lands can add to soil erosion and compaction problems. However, most public uses consistent with wildlife mitigation are generally low-intensity activities such as group tours, photography, and hiking, with little impact on soils.

Recreational vehicles can add to soil problems. In the absence of managed trails, regular use of off-road vehicles poses the greatest level of risk because large networks of braided trails are typically established (Jones & Stokes Associates 1995).

High levels of grazing can cause direct soil erosion and compaction through physical disturbance (the direct action of breaking and compacting soils through repeated walking, trampling, laying, and wallowing), and indirect erosion through removal of vegetation by feeding or trampling, especially in riparian areas.

On mitigation lands, timber management is used primarily as a tool to benefit wildlife habitat; commercial harvest is a secondary consideration. In such cases, existing disturbances that might have been occurring under intensive forestry management would be greatly reduced. Timber harvest and associated road construction have a high potential to compact, displace, and/or erode soil. Where tractor yarding is used, repeated travel over the soil with a tractor or rubber-tired skidder can compact and displace soils.

Transportation/Access Techniques

Restricting access by fences and gates can prevent potential erosion caused by recreational activities and other public uses. Construction of fences and gates can cause short-term disturbance to soils: fence post holes are dug, vegetation is trampled, and soils are compacted by vehicles and equipment and at material staging areas.

Road construction can increase soil erosion. Unimproved roads (i.e., dirt and gravel roads) may themselves erode by diverting runoff along tire ruts or by rills created by moving water cutting into the road. Roadside ditches can accelerate runoff velocity and erode road beds. Drainage structures installed in conjunction with roads to allow surface water flows disturb soils and can lead to erosion if soil is allowed to be exposed to moving water.

4.1.4 Potential Program-Wide Mitigation Measures — Soils

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Monitor newly disturbed soils for evidence of erosion; implement active controls, such as plowing and seeding of new gullies (or temporary stabilization for later seeding during dry season).
- Where soil-disturbing activities are being considered, survey soil conditions to find and map potentially fragile soil types (such as shallow "scablands") and allow only those activities that would not disturb soils in these areas.
- *For projects involving land acquisition*, develop and implement a sediment and erosion control plan where soils might be disturbed.
- Develop and implement an erosion control plan that applies best management practices for each activity that involves disturbing soils (e.g., preparation of seedbeds or creation of wetlands).
- Use conservation tillage practices for planting and maintaining vegetation (e.g., no-till methods). These methods (including reduced-tillage or no-tillage methods) are less harmful to soils.
- *For projects involving water development*, establish guzzlers, springs, ponds, and other wildlife water developments in areas where soils can tolerate increased wildlife trampling.

- *For projects involving installation of guzzlers*, design guzzlers in accordance with NRCS specifications.
- *For projects involving installation of culverts*, avoid elevated outfalls. Where such outfalls are unavoidable, install energy diverters to absorb and deflect flow.
- Plant vegetation, or place riprap or similar material along created ditches and channels to minimize bank erosion.
- *For projects involving prescribed burns*, implement the recommended goals and actions outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA 1995). (The report recommends that agencies develop a plan-by-plan strategy to introduce landscape-scale prescribed burns across agency boundaries. The report also directs agencies to seek opportunities to enter into partnerships with Tribal, state, and private land managers to achieve this objective.)
- *For projects involving prescribed burns*, conduct a pre-burn inventory to identify areas to avoid, including areas that may be vulnerable to increased erosion. Develop an approach to avoid these areas.
- *For projects involving prescribed burns*, check burned areas at regular intervals (e.g., once every 3 months during the first 2 years) to identify potential problem areas requiring additional treatments, such as transplanting, seeding, soil stabilization, or fertilization.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, develop a specific population control strategy for introduction programs involving large mammals.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, introduce large mammals only where feasibility studies indicate that soils and vegetation can tolerate increased foraging or physical damage.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, introduce only species that have been historically present, and ensure that factors resulting in previous extirpation are no longer present.
- Control nuisance animals where they are hindering establishment of vegetation.
- Use conservation tillage practices for crop production on mitigation lands.
- *For projects involving property acquisition*, inventory and map sensitive soil areas, and restrict human access to these areas.
- Manage livestock levels and timing to minimize damage to soils.
- Allow livestock grazing only as a vegetation management tool (possibly conflicts with Economic considerations).
- *Where off-road vehicle travel is planned*, develop a trail network to contain travel routes.
- *For projects involving road construction*, build roads with water bars, culverts, and other erosion control features, such as placement of gravel or pavement where soil, slope, and other site conditions may encourage erosion.

- Allow road construction only where necessary for maintenance and operation of mitigation lands. Decommission unnecessary roads.
- *On large tracts of wildlife mitigation land*, provide good, general vehicle access with relatively few roads by maintaining one or more through roads.
- *For projects involving road construction*, build roads at least 15 m (50 ft.) from perennial streams; construct within 46 m (150 ft.) only when necessary.
- Allow timber harvest only as a vegetation management tool (possibly conflicts with Economic considerations).
- *For projects involving commercial timber harvest*, use practices that avoid disturbing the soils, such as buffer strips along streams, use of designated skid trails, specific criteria for stream crossings, directional falling of trees, and full-suspension yarding on areas susceptible to soil erosion, such as steep slopes.



4.2 FISH AND WATER RESOURCES

4.2.1 Context

- **Legal: Water.** The U.S. Department of Energy requires an assessment of impacts on floodplains and wetlands (10 CFR 1022.12). The NRCS regulates wetlands on agricultural lands. The Corps regulates discharge of dredge and fill material in waters of the United States, including wetlands under Section 404 of the Clean Water Act. In addition, state and county regulations may be more restrictive and may preempt certain activities that would otherwise be authorized under a Federal permit.

Several state agencies and Tribes also have regulatory authority over protection, use, and management of water resources. Projects would need to comply with state-specific regulations, as well as with any county, district, or other local regulations. The state agencies that may be involved in regulating water use and management on mitigation lands include:

1. **Washington State Department of Ecology:** regulates pollutant discharge to waters of the United States, which include lakes, rivers, streams, wetlands, natural ponds, and tributaries.
2. **Oregon Water Resources Department:** responsible for overseeing state regulations to protect water resources, permit and license procedures for water rights, well construction, and stream channel alterations.
3. **Oregon Department of Environmental Quality:** regulates all pollution control programs in the state. Has jurisdiction over water quality.
4. **Oregon Department of Agriculture:** State administrative agency for non-point source water quality programs dealing with agricultural lands. Also manages the state's field-burning weather monitoring program, and the native plant species conservation program.
5. **Idaho Department of Water Resources:** responsible for permit and license procedures for water rights, well construction, and stream channel alterations.
6. **Montana Department of Natural Resources and Conservation:** plans, regulates, and coordinates the development use of other water, land, and energy resources; water-right adjudication; floodplain management.
7. **Nevada Department of Conservation and Natural Resources, Division of Water Resources:** responsible for permit and license procedures for water rights, well construction, and stream channel alterations.
8. **Utah State Department of Natural Resources, Division of Water Rights and Division of Water Resources:** responsible for permit and license procedures for water rights, well construction, and stream channel alterations.

9. **Wyoming Environmental Quality Department:** regulates water quality and use.

10. **Indian Tribes:** Some Tribes regulate water quality and use.

- **Legal: Fish.** As described under **Section 4.4.1**, Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered species. Officially designated critical habitat for listed species cannot be adversely modified.

The USFS and BLM have developed guidelines for management activities that may affect fish on Federal lands. These guidelines are identified in the Decision Notice/Decision Record for Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho and Portions of California (PACFISH), and the Decision Notice for the Inland Native Fish Strategy (INFISH) (USDA 1995). The Inland Native Fish Strategy applies only to USFS lands. In general, these guidelines identify riparian management objectives, standards and guidelines, and monitoring requirements for USFS and BLM activities. These guidelines may apply to mitigation actions taking place on Federal lands.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following water resources impacts: violating water quality standards; placing dredge or fill materials into wetlands under the jurisdiction of the Corps and not covered under a nationwide permit, as defined under Section 404 of the Clear Water Act; reducing instream flows to the extent that riparian vegetation is likely to be permanently reduced or eliminated; or infringing upon existing, priority water rights. They will further seek to establish that condition without the following impacts on fish: adversely affecting a fish species listed or proposed for ESA listing; adversely modifying designated critical habitat for listed fish species; adversely affecting fish species listed by state fish and wildlife or Tribal agencies as species of special concern (such as endangered, threatened, sensitive, etc.); removing habitat that has been identified by state or Tribal agencies as unique, rare, or important to fish distribution; directly killing fish or fish eggs; permanently removing or degrading spawning habitat; temporarily reducing habitat that in turn may result in increased fish mortality or lowered reproductive success; or avoidance by fish of biologically important habitat for substantial periods (e.g., blockages of upstream passage), possibly resulting in increased mortality or lower reproductive success.

4.2.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Fish and Water Resources

Under No Action, individual projects would continue without a standardized program; impacts on fish and water resources could vary widely. Overall, fish and water resources/quality would benefit (after some initial impacts) from riparian and other habitat improvements that would continue with or without a standardized program to implement projects.

Alternative 2: Base Response - Potential Effects on Fish and Water Resources (Common to All Alternatives)

Ground-disturbing activities, such as riparian habitat restoration or creation of wetlands, would potentially disturb water quality and fish habitat in the short term. However, state water regulations would be followed under all alternatives, so no significant impacts are expected.

All alternatives would follow state and Federal regulations for all activities in or near wetlands and floodplains, whether for maintenance or enhancement. Many wildlife projects might involve activities within floodplains because the floodplains and their related surface waters have high wildlife values. Any development (such as fencing) within these floodplains would be to protect or enhance wildlife values, and would be designed to minimize or avoid any restriction in floodwater flow.

Over the long term, wildlife mitigation projects would benefit fish and water quality as vegetation cover increases (either by active restoration or by natural revegetation). Control of non-native species (especially carp) would improve water quality (carp muddy water by foraging along the bottom).

Alternative 3: Biological Objectives - Potential Effects on Fish and Water Resources

In the short term, water quality and associated fish habitat would potentially decrease at each site as a wide range of management techniques were implemented. Over the long term, water quality and fish habitat would generally improve as riparian habitat and other vegetation communities became established, as roads were closed, and as crop, timber, and grazing activities were reduced or stopped. Fertilizers and herbicides may be used to better meet biological objectives, thus increasing the potential for chemicals reaching surface waters and affecting fish.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Fish and Water Resources

Short-term impacts on fish and/or water resources/quality would be minor under Alternative 4 because it relies primarily on natural regeneration (rather than active restoration) to achieve biological objectives. No significant long-term adverse impacts on water resources/quality or fish habitat would be expected, although ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the likelihood of localized transfer of sediments and chemicals to streams and rivers. Long-term improvement of water resources/quality and fish habitat would occur, but at a relatively slow rate, as riparian habitat increased through natural succession.

Alternative 5: General Environmental Protection - Potential Effects on Fish and Water Resources

Alternative 5 would require Project Management Plans to provide side benefits to fish; therefore, fish habitat and water quality would increase across mitigation lands. Fertilizer and herbicides would be used only when necessary to meet mitigation objectives. Application of program-wide mitigation measures, as appropriate, would minimize impacts on fish and water resources/quality.

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, sediment transfer associated with these activities might occur over time, reducing the improvement potential for fish habitat and water quality.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Fish and Water Resources

Under BPA's preferred alternative, project managers would have a wide range of techniques available that could potentially affect fish and/or water resources/quality. However, program-wide measures would be applied, as appropriate, to minimize or avoid such impacts. BPA would also support actions under Alternative 6 that provide side benefits to fish, so that fish and associated water quality would be generally protected program-wide. In addition, because Alternative 6 would emphasize natural revegetation rather than the more intensive techniques of seeding and transplantation, the short-term effects of ground disturbance would be low. Fish habitat and water quality at new mitigation sites would increase over the long term as riparian habitat were allowed to develop and as intensive timber, farming, and grazing activities were reduced.

4.2.3 Impacts of Techniques

Land Acquisition Techniques

Converting lands under active crop, range, or timber management into wildlife mitigation areas would generally benefit fish and water quality as land-disturbing practices (e.g., intensive logging, grazing, and farming) are reduced. The act of acquiring lands and designating them for wildlife mitigation would provide long-term benefits for fish and water quality throughout the Columbia River Basin.

Plant Propagation Techniques

Restoration of riparian communities would increase fish habitat and stream stability and decrease sediment that is contributed to bank erosion. Plants along streams can reduce stream stormflow velocities and associated erosion potential. Root systems of riparian vegetation help to hold soil together, thus preventing soils from being dislodged and entering the stream system (Salo and Cundy 1987). Short-term increases in stream sediments may occur during initial phases of planting or seedbed preparation; however, the long-term effect would be positive.

Fertilizers can be transported through soil, by rain or irrigation water, to surface and ground water. Excess amounts in wetlands, ponds, and streams can cause algae blooms, reduced oxygen levels in the bottom layers, and the development of organic material that eventually builds up on the bottom (*eutrophication*).

Irrigation runoff can transport soil, agricultural chemicals, salts, and naturally occurring inorganics leached from soils. Many of these chemicals can be toxic to aquatic organisms (Ohlendorf et al. 1988, Ingersoll et al. 1992, Dwyer et al. 1992). On areas previously used as croplands, existing soils may contain pesticides, industrial chemicals, and various persistent compounds found in irrigation drainwater (e.g., heavy metals).

Habitat Creation and Conversion

Creating wetlands can have both beneficial and adverse effects on fish and water quality, or may have no effects at all. Such created wetlands can support resident and anadromous fish and can improve downstream fish habitat and water quality by providing stormwater storage, sediment catchment, and biofiltration. Wetland water levels could be raised or lowered to reduce excessive concentrations of aquatic plants, which can be detrimental to resident fish populations.

Sediment may temporarily be transported during wetland construction or expansion. Adverse effects of wetland creation include temporary sediment transport or diversion of water flows to increase wetland depth or size.

Creation of habitat islands within wetlands or lakes can cause temporary turbidity and sedimentation.

Water near the bottom of deeper impoundments can be low in oxygen, and release of this water can decrease downstream oxygen contents, which is harmful to fish, especially salmon and trout.

Water Development and Management Techniques

Water rights acquisition can affect fish and water quality. Adverse effects may include impacts associated with irrigation (see **Plant Propagation Techniques**, above).

Beneficial effects may occur where poor water practices by the existing water-rights holder are curtailed through acquisition of the rights. Overall effects of acquiring water rights may be neutral because, in many cases, no significant change in water use or management practice would occur.

Development of diversions and check dams or impoundments can reduce instream flows in source waters, which in turn reduces habitat for fish and other aquatic organisms. Diversions and dams can also block upstream or downstream fish passage or can directly kill fish that pass through spillways or into diverted water flows.

Development of springs and guzzlers typically occur away from major surface waters. Little degradation in fish habitat or water quality would occur from these types of developments.

Water rights could potentially be compromised unintentionally where new wells are developed, possibly decreasing aquifer reserves in circumstances where a shallow and limited aquifer is tapped. Likewise, major water diversions, flood irrigation, or development of new well sources could cause unintentional flow changes in shallow aquifers. Both potential conditions can be predicted through hydro-geologic testing and avoided through design of particular water developments. More generally, existing water rights would be protected through consultation with state water resource agencies and notice to potentially affected water-rights holders.

Water Distribution Techniques

Pipelines, culverts, and drainage ditches/conveyance channels also pose a risk to fish habitat and water quality during installation because disturbed soil might be exposed to moving water. Drainage ditches/conveyance channels can be long-term sources of water-borne sediments where bare soils are exposed to water.

Development of culverts with elevated outfalls (greater than 1 m, or 3 ft.) can add to downstream sediment loads and block fish passage.

Water distribution systems can also distribute undesirable elements as well. For example, livestock waste products or weed seeds can be carried to streams, rivers, wetlands, and other waters. Likewise, carp, an exotic species that disturbs aquatic vegetation and makes waters turbid (cloudy), can be introduced to areas through water distribution systems.

Fire Management Techniques

Intense fires can eliminate all vegetation, root systems, and organics; this elimination can result in increased stormflows, surface runoff, and sedimentation, with potential effects up to 3 years or more after a fire (Ursic 1970). Fires also contribute polycyclic aromatic hydrocarbons (in the form of ashes) to aquatic systems; most of these are ultimately deposited in sediments (Eisler 1987), which can adversely affect fish and other aquatic organisms by covering the bottoms of shallow lakes and wetlands.

Prescribed burns are conducted under controlled conditions and generally do not result in significant impacts on water quality. Over the long term, prescribed burns can reduce fuel loading and the risk of high-intensity wildfires and associated impacts on fish and water quality. Because of the typical high fuel-loads of forests within the Columbia River Basin, reliance on natural fire management without active fuel management would increase the risk of high-intensity wildfires, which tend to damage soil, vegetation, fish habitat, and water quality severely.

Vegetation Management: Enhancement and Control

Overall, removal of undesirable species improves fish habitat and water quality over the long term. For example, control of reed canary grass in wetlands would maintain natural wetland conditions

and would increase both plant diversity and structure, and associated water cleansing and storage benefits in wetlands and floodplains.

However, the methods used to remove undesirable species can have temporary adverse effects on the environment. Herbicides can pollute water and lead to decreased productivity in aquatic systems. Each of the wide variety of herbicides carries its own risks, benefits, and drawbacks. Standard buffer requirements of 6 m (20 ft.) from surface waters provide some protection, but cannot ensure complete protection. An analysis of each type of herbicide is beyond the scope of this assessment. Refer to the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).

Mechanical removal of vegetation can lead to soil erosion and increased stream sediments. Biological control and hand-pulling has little direct effect on fish or water quality.

Water level manipulation can reduce water quality. During drawdowns, exposed fine sediments can be washed to receiving waters. During flooding, rising waters may destabilize banks and increase stream sediments. Water level manipulation may also affect water quality or quantity for adjacent landowners or downstream water users by changing surface water and sediment transport regimes. During drawdowns, young fish can be stranded and killed, and exposed fine sediments can be washed to receiving waters. During flooding, rising waters may destabilize banks, increasing stream sediment.

Prescribed burning generally does not significantly affect fish habitat, water yield, or water quality except where severe fires damage soils or riparian habitat or where previous soil damage has caused increased vulnerability to erosion. Should soil damage occur, then so would the potential for increased sediments in surface waters. As described under **Soils**, severe fire intensity can create hydrophobic soils, which can in turn increase stormwater runoff. Following fire, nutrient levels may rise in surface waters as nutrients leach from ashes.

If allowed to invade riparian areas, prescribed burning can remove streamside shade. Water temperatures consequently increase, thus harming aquatic organisms, including fish.

Prescribed fire in grasslands can be used in place of grazing and haying as a habitat management strategy, thereby avoiding some of the more serious adverse water quality impacts associated with these practices. Also, prescribed burning would reduce the threat of more ecologically destructive wildfire. On balance, increasing prescribed burning would have a slightly positive effect on water quality by eliminating these other potential effects.

Species Management Techniques

Introduction of large, herding animals, such as elk, can possibly remove vegetation, compact soil, and cause erosion, all of which can adversely affect fish habitat and water quality. However, introduction of small mammals or birds generally has little effect on water quality.

Control of nuisance animals can protect vegetation or vegetation enhancement projects, and thus protect fish habitat and water quality. For example, controlling carp by regulating water levels

would increase water quality. Carp stir up muddy bottoms of wetlands when feeding and can create very turbid water conditions. Temporary control of waterfowl in newly planted wetlands can encourage the successful development of wetland vegetation and associated benefits to water quality.

Multiple Use Techniques

Intensive agriculture can affect fish habitat and/or water quality as chemicals (fertilizers and herbicides) are introduced and sedimentation increases.

Reduction of grazing as a mitigation action would improve fish habitat and water quality by reducing animal wastes and by reducing physical damage to streams caused by grazing. Livestock grazing increases the amount and rate of transport of fine sediment to streams and rivers (Meehan and Platts 1978). In addition, grazing can affect streams by indirectly increasing water temperatures as riparian habitat is lost, as concentrations of ammonia and fecal coliform increase, and as concentrations of dissolved oxygen decrease (Meehan and Platts 1978, Platts 1979). Therefore, reducing or controlling grazing can reduce existing impacts on water quality before the site is converted to a mitigation site. Conversely, increasing or maintaining current levels of grazing would have negative or neutral effects on water quality.

In most instances, timber management would be reduced on wildlife mitigation lands; associated impacts of timber harvest would therefore be reduced or eliminated. Forest management, including conifer tree planting, selective tree harvesting, tree thinning, and timber sales, can affect fish and/or water quality as vegetation, soils, and hydrology are disturbed (see also **Soils**). The potential for impact is greatest on steep slopes (generally greater than 40%).

Transportation/Access Techniques

Fencing lands to prevent cattle from entering riparian areas would improve fish habitat and water quality by increasing stream stability and reducing stream sediments. Reducing human access and activities on some lands may reduce sedimentation caused by human disturbances (Cole and Landres 1995). Should access be increased or roads developed, then stream sedimentation near roads and alteration of stream courses might increase. Should access be increased or roads developed, then stream sedimentation near roads and alteration of stream courses might increase, thus increasing the risk of adverse impacts on fish survival, production, and passage.

Road development can add to sediment loads of streams and rivers by exposing disturbed soils to streams and stormwater runoff. The development of culverts and roadside ditches can also add to stream sediment loads. Roads also can promote human activities, including fishing, which can potentially affect fish populations. Closing roads and restoring natural stream courses could improve water quality by alleviating these potential problems.

4.2.4 Potential Program-Wide Mitigation Measures — Fish and Water Resources

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Select, implement, and enforce Best Management Practices based on site-specific conditions, technical and economic feasibility, and the water quality standards for those waters potentially affected.
- Monitor water quality downstream from activities with potentially significant adverse affects on water quality, such as those land-disturbing activities occurring within 15 m (50 ft.) of the wetted perimeter of a stream or wetland. Implement corrective actions for conditions found to be approaching maximum allowable degradation under state regulation.
- *For projects involving creation of water conveyance features*, plant vegetation or place riprap or similar material along created ditches and channels to minimize bank erosion.
- *For projects involving the installation of culverts*, place structures at elevated outfalls to absorb and deflect flow.
- *For projects involving placements of culverts*, use culverts designed to allow fish passage (e.g., box culverts) in streams containing native fish or non-native food or game fish; position culverts even with the natural downstream flow.
- Minimize use of fertilizer and require monitoring of downstream wetlands and streams to identify possible adverse affects.
- Stop application of fertilizer if signs of eutrophication are detected.
- Use fertilizers with the lowest environmental cost that can still achieve acceptable results.
- Before establishing an irrigation system, sample soils and groundwater on previous cropland for possible accumulation of chemicals.
- Apply fertilizer away from streams. Do not apply fertilizer using aircraft in areas containing streams.
- Minimize irrigation runoff and monitor runoff for the presence of contaminants on newly irrigated lands.
- *For projects involving wetland and/or island creation*, construct wetlands and islands during the dry season.
- *For projects involving wetland creation*, ensure adequate strategy to control nutrients excreted by large concentrations of waterfowl.
- Monitor dissolved oxygen levels in water released from deep impoundments and take actions to eliminate low-oxygen discharges if found.
- *For lands involving property acquisition*, withdraw surface waters or groundwater only where such withdrawal is necessary for the use and management of the property and when

such withdrawal is demonstrated not to cause significant adverse effects on aquatic life, riparian communities, or adjacent land use.

- Coordinate with state water resource and/or rights agencies and with Tribes with parallel authorities to verify viability of new water sources and to design and implement features necessary to protect aquatic systems and other water users.
- Develop water impoundments or diversions in consultation with state water agencies and state and Tribal fish and wildlife agencies. Obtain Corps permits, where needed.
- *For each controlled burn operation*, develop a specific plan that outlines objectives as well as measures to minimize risk of escape and impacts on soils, air quality, and other resources.
- *For projects involving prescribed burns*, conduct a pre-burn inventory to identify areas to avoid, including areas that may be vulnerable to increased erosion. Develop an approach to avoid these areas.
- *For projects involving prescribed burns*, monitor burned areas at 1-day, 1-month, 6-month, and 1-year intervals to identify potential problem areas requiring additional treatments, such as transplanting, seeding, soil stabilization, or fertilization.
- *For projects involving prescribed burns*, maintain standard protection buffers near riparian areas; take protective measures, such as fire lines, to ensure that riparian vegetation is maintained.
- Coordinate with adjacent landowners and management agencies to discuss and resolve potential problems.
- *For projects involving use of herbicides*, prevent use of herbicides within 15 m (50 ft.) of water bodies, unless the herbicide has been approved by the EPA for use in or near water.
- Establish 15-m (50-ft) buffers for chemical spraying to control vegetation near perennial streams.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, develop a specific population control strategy for introduction programs involving large mammals (see related discussion under **Soils**).
- Prevent direct pollution by livestock under commercial grazing permits by eliminating streamside or lakeside corrals and pastures and associated watering sites on natural waters.
- *Where grazing will continue on mitigation lands*, fence riparian areas particularly susceptible to damage or areas that have already been damaged and are being restored.
- Develop roads only where necessary for efficient operation and maintenance. For recreational use, utilize existing roads.
- Prevent livestock from direct access to streams, lakes, or other natural surface waters.
- Allow timber harvest only as a vegetation management tool (possibly conflicts with Economic considerations).

- *For projects involving forest management*, use practices that avoid disturbing soils or streams, such as buffer strips along streams, use of designated skid trails, specific criteria for stream crossings, directional falling of trees, and full-suspension yarding on areas susceptible to soil erosion, such as steep slopes.



4.3 WILDLIFE

4.3.1 Context

- **Legal.** Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered species. Officially designated critical habitat for listed species cannot be adversely modified. The USFWS maintains considerable responsibility and regulatory authority over waterfowl and other migratory birds, as defined under the Migratory Bird Treaty Act. States maintain control over wildlife, especially over game species. States and Tribes generally have the authority to regulate hunting and hunting seasons.
- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adversely affecting a species listed or proposed for ESA listing; adversely modifying designated critical habitat for listed species; adversely affecting candidate species under the ESA, or species listed by state fish and wildlife or Tribal agencies as species of special concern (such as endangered, sensitive, monitor, etc.); or removing habitat that has been identified by state or Tribal agencies as unique, rare, or important to wildlife distribution (such as big game winter range, waterfowl nesting areas, late-successional forest, native shrub-steppe).

4.3.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Wildlife

Wildlife mitigation projects would continue to be implemented and, as with all alternatives, target wildlife habitats and species would increase. Wildlife disturbance would occur when projects first begin. BPA typically requires seasonal restrictions to avoid disturbance of sensitive wildlife habitats; however, no standardized program would be established to ensure program-wide mitigation.

Alternative 2: Base Response - Potential Effects on Wildlife (Common to All Action Alternatives)

All alternatives include, as a primary objective, protection and/or improvement of target wildlife habitats and species, and all alternatives would benefit these habitats and species as well as numerous other species. Control or eradication of non-native invasive plant species would increase the quality and quantity of native wildlife habitat and increase the biological diversity of native species.

Habitat changes resulting from management activities could adversely affect some species. For example, while increasing vegetative density in open rangeland would increase habitat for a wide variety of birds, it would also reduce habitat for those species adapted to more open conditions (e.g., the red-tailed hawk).

Activities on mitigation lands could disturb existing wildlife as habitat improvements are implemented, although, as a general rule, management activities (e.g., burning of reed canary grass, mechanical removal of blackberries) would be timed and placed so as to minimize disturbance to native fish and wildlife, especially during such critical periods as the breeding season for waterfowl.

Alternative 3: Biological Objectives - Potential Effects on Wildlife

This alternative provides the highest potential for short-term disturbance, displacement, and habitat loss for wildlife, but also the highest potential for long-term gains in target species and habitats. Because Alternative 3 would work aggressively to achieve wildlife objectives, local wildlife communities might be temporarily disturbed through use of the more intensive habitat improvement techniques, including water developments, large-scale vegetation planting, creation of wetlands, and prescribed burning. These techniques would involve the clearing of land and the use of heavy equipment.

Eventually, however, increased habitat values would outweigh the initial temporary disturbance. For example, prescribed fire temporarily destroys habitat, but can greatly improve wildlife habitat over time.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Wildlife

Alternative 4 has a low potential for disturbance to wildlife because of its overall emphasis on passive, rather than active, management techniques. However, for the same reason, the potential for long-term wildlife habitat improvement would be lower on an acre-by-acre basis. The provision for multiple use would reduce the total area available for wildlife habitat at new mitigation sites and would increase the level of human activities and associated disturbance to wildlife.

Alternative 5: General Environmental Protection - Potential Effects on Wildlife

Under Alternative 5, only minor disturbances to wildlife at new mitigation sites would be expected because the more intensive habitat improvement techniques (e.g., large-scale wetland creation or vegetation plantings) would be used infrequently. For the same reason, the potential for major changes in habitat quality would be lower than under the other alternatives. In addition, the multiple-use allowance of Alternative 5 would: (1) reduce the amount of land available for wildlife habitat improvement, (2) introduce or maintain a higher level of human activity across new mitigation lands, and (3) divert management time and resources away from wildlife and toward management of multiple use. Application of program-wide mitigation measures, as appropriate, would minimize impacts on wildlife.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Wildlife

Under BPA's preferred alternative, projects might include a wide range of techniques that could potentially disturb wildlife habitat. Yet, with the program-wide measures applied, as appropriate to protect sensitive wildlife areas (**Section 4.3.4**, below), no significant adverse impacts are

expected. As with all alternatives, implementation of wildlife mitigation projects would provide a net benefit to wildlife. In addition, Alternative 6 emphasizes natural revegetation rather than the more intensive techniques of seeding and transplantation; the short-term effects of ground disturbance would therefore be low.

4.3.3 Impacts of Techniques

Land Acquisition Techniques

In general, land acquisition does not in itself have adverse effects on wildlife. Land use changes, however, would adversely affect some species, while benefiting others. For example, converting irrigated cropland to non-irrigated natural vegetation could reduce wetland habitat created by irrigation drainage. Species affected would include those associated with wetlands and cropland (such as red-winged blackbird, ring-neck pheasant, waterfowl, and amphibians). Some native species that have been adversely affected by the development of croplands would increase on lands taken out of crop production (such as pygmy rabbit, jackrabbits, sharp-tailed grouse, and loggerhead shrike).

Land acquisition does not necessarily involve future actions that would dramatically change wildlife habitat value. In some cases, high-quality habitats would be designated as mitigation areas without the need for significant improvements. In such cases, wildlife would benefit from the protection of habitat from possible future losses that could occur if the areas were not protected from development.

Plant Propagation Techniques

Active programs to increase desired plant communities would increase plant diversity and prevalence of native plant species and communities. This in turn would benefit most native wildlife species, including those listed as threatened or endangered and many Federal candidate or state-listed species of concern.

Planting activities conducted during spring and early summer can disturb nesting birds (including bald eagle and other species, such as Swainson's hawk, a species recognized as sensitive in several states) that nest in agricultural areas and are sensitive to disturbance during spring and early summer.

Irrigation runoff can create wetland habitats that benefit waterfowl, amphibians, and other wetland-associated species.

Fertilizers alter nutrient cycles and can change invertebrate, bacteria, and fungi communities and interactions. Some of these changes are related to changes in soil pH, which can increase bacteria and decrease other microflora, such as fungus (Hunter 1990). These effects cause generally negligible impacts on wildlife, but may affect some food species, such as earthworms. Applications of municipal wastes (referred to as biosolids or sludge) can introduce heavy metals into the environment, leading to the accumulation of toxins in some animals.

However, most fertilizers pose no harm to wildlife. Robinson and Bolen (1989) cited a study in which pheasants were force-fed granular fertilizers in capsules. The results showed no adverse effects, leading to the conclusion that pheasants are not adversely affected by fertilizers.

In many cases, fertilization has been shown to increase forage palatability (preference and use) for big game species. Payne and Bryant (1994) listed many potential benefits of using fertilizer in wildlife habitat in rangelands, including increased cover, better distribution, and increased carrying capacity.

Habitat Creation and Conversion

Habitat creation and conversion would increase target species diversity and abundance; however, in many cases, some wildlife species may be adversely affected.

Creating or expanding wetland areas, while increasing habitat for wetland species, would decrease habitat for upland species. In some cases, high-quality upland habitats could be removed. Artificial islands would provide good nesting habitat and increase shoreline habitat, a type that tends to be used heavily by several types of wildlife. However, islands could also concentrate nesting and provide opportunities for increased predation. Development of artificial nest structures would allow for increases of species where nesting habitat is limited, but nest structures can also attract predators, risking both lower reproduction and survival rates.

Overall, the effects on wildlife from habitat creation and/or conversion would be positive because the sole intent would be to benefit wildlife. Nevertheless, the potential adverse effects should be considered during design of mitigation projects.

Water Development and Management Techniques

Making water available where it has previously been absent can increase the distribution and abundance of many wildlife species in arid environments. Adverse effects may include the reduction of some drought-tolerant wildlife species, as less-tolerant species expand their range and compete with existing residents.

Development of wells, diversion dams, springs, check dams, impoundments, and guzzlers can all result in the direct loss of wildlife habitat through clearing and incidental disturbance from machinery and from placement of materials and equipment at work staging areas.

Guzzlers, springs, ponds, and other water developments may concentrate some wildlife species, which would make them more vulnerable to predation.

Water Distribution Techniques

Development of pipelines, culverts, drainage ditches, and conveyance channels can result in the direct loss of wildlife habitat through clearing and incidental disturbance from heavy equipment and from placement of materials and equipment at work staging areas. However, these structures are often placed in already disturbed areas, so the loss of habitat would likely be minimal.

Deep-sided drainage ditches and canals can attract wildlife, which may fall in and be unable to escape. Crossing structures, escape ramps, and fences have been used to reduce mortality in some hazardous canals, but proper design (e.g., low-sloped banks and presence of riprap or other material that can serve as escape routes) is usually the best approach to avoid possible problems.

New water distribution systems can connect previously isolated water bodies, inadvertently introducing carp to new areas. Carp can seriously damage aquatic vegetation, thus reducing many types of wildlife, including amphibians and marsh birds (e.g., marsh wren, sora).

Fire Management Techniques

Large, intense fires can have long-term effects on wildlife and habitat, including potential direct mortality, loss of habitat, and lowered soil productivity. Fuels management can reduce these effects by minimizing the chance of high-intensity wildfires. However, considering the typically high fuel-loads of forests within the Columbia River Basin, reliance on natural fire management would increase the risk of high-intensity fires, which severely damage soil, wildlife habitat, and water quality.

Vegetation Management: Enhancement and Control

Active control of exotic annuals and other undesirable plants can provide long-term increases in the abundance and distribution of native wildlife species, including those with significant population decline in the Columbia River Basin.

The temporary loss of ground cover may reduce small mammal populations or destroy habitat for ground-nesting birds.

Herbicides can be toxic to some wildlife species.

The effects of prescribed burning on wildlife are variable and depend largely on the intensity of the fire, magnitude of the area burned, topography, type of soils, and the type of past fire management. Prescribed fire temporarily destroys habitat, but can result in better wildlife habitat over the long term. Prescribed fire could kill smaller, less mobile animals. However, most animals are sufficiently mobile to escape the characteristically "cool and slow" burns of prescribed fire, either by moving out of the area or by retreating underground.

If allowed to invade riparian areas, prescribed burning can remove streamside shade. Water temperatures consequently increase, thus harming aquatic organisms, including fish.

Prescribed burning can be used in place of grazing as a habitat management strategy, thereby avoiding grazing's adverse effects on wildlife (e.g., loss of riparian vegetation and increased competition for forage plants).

Species Management Techniques

Populations of target species would increase. Predator control, if used, would temporarily reduce predatory species abundance and increase prey species targeted for protection. Management programs for threatened or endangered species generally provide side benefits to other wildlife. Protection of nesting and foraging habitat for listed species such as bald eagle also benefits other species that occur in similar habitats (e.g., red-tailed hawk, kingfisher, and otter). In some cases, where hunting is used as a management tool (e.g., to protect desirable vegetation), populations of selected species would be reduced.

Reintroducing species to an area usually adversely affects resident species to varying degrees. For example, reintroduced peregrine falcon can displace prairie falcon nesting, and reintroduced pronghorn could reduce deer populations. In both cases, the reintroduced species would somewhat overlap and thus compete with resident species for food and habitat, eventually lowering carrying capacity for resident species. The degree to which the capacity is lowered depends on the amount of overlap. In addition, moving animals from one place to another can transmit wildlife diseases.

Multiple Use Techniques

Lands under intensive crop production typically provide little habitat for non-game wildlife, other than for common species associated with agricultural lands (e.g., raven, vesper sparrow, crows, meadowlarks, and swallows). However, crop production can be managed to provide seasonally important food sources for migrating or wintering waterfowl; for game birds, such as pheasant (non-native) and quail (both native and introduced); for small mammals; and for raptors. Crop lands co-managed for wildlife are most likely to employ conservation farming practices such as no-till or minimum-tillage methods and the establishment of buffer strips. These practices tend to mitigate some of the potential adverse effects that active crop production may have on wildlife.

Allowing public access for recreational or educational opportunities on mitigation lands could disturb some wildlife, so that they avoid otherwise suitable habitat. Human activity can disturb nesting birds, feeding or resting waterfowl, and wintering deer, causing increased energy expenditure and decreased survival and reproductive success.

Some types of recreation are more likely to have adverse effects on wildlife. Bird watching, hiking, and photography are generally low-impact activities, while developed camping, boat use, and off-road vehicle use (including motorcycles, ATVs, and snowmobiles) can significantly disturb wildlife and wildlife habitat. One surprising exception is that occasionally people on foot are more disturbing to wildlife than are people in motor vehicles. For example, one study found that wintering deer allowed snowmobiles to travel closer to them than they did people on foot (Freddy et al. 1986).

Hunters may have a greater chance of disturbing wildlife than non-hunters because they add directly to wildlife mortality and they tend to venture into more remote areas. Non-hunting visitors tend to remain near trails in a forested environment. However, in more open environments, photographers, bird watchers, and hikers may travel well beyond trails.

Public access can allow vegetation to be trampled. While motorized vehicles provide the greatest potential for habitat degradation, persons afoot can also trample vegetation and compact soils. Even controlled visitor use, including group tours, can damage habitat (Purdy et al. 1987).

Public access can also indirectly affect wildlife habitat and populations, by diverting management time and resources away from wildlife and toward recreation management.

Development of facilities on mitigation lands could adversely affect wildlife directly through removal of habitat or indirectly through increased human activity and associated disturbance.

When carefully controlled, grazing can improve habitat for mule deer and pronghorn (Anderson et al. 1990). However, intensive grazing can damage habitat by removing desirable plants, by displacing native species, and by decreasing vegetative productivity by increasing soil erosion and compaction (Kennedy 1991). Riparian and other habitats can be successfully protected with proper timing and stocking of cattle, such as limiting cattle use to dry seasons, when riparian soils are less vulnerable to physical disturbance (Marlo 1987).

Forest management, including conifer tree planting, selective tree harvesting, tree thinning, and timber sales, can have both beneficial and adverse impacts on wildlife. In general, timber harvest favors those species (such as quail and white-tailed deer) adapted to earlier successional forest or open habitats. Species adversely affected by timber harvest include those associated with late-successional forest, such as cavity-nesting birds (e.g., woodpeckers), bats, forest owls, and northern goshawk.

On wildlife mitigation lands, most (if not all) forest management would be intended to improve wildlife habitat and would, therefore, benefit target species (e.g., cavity nesting birds, northern spotted owl, and/or mule deer).

Transportation/Access Techniques

Restricting access could protect sensitive wildlife areas, including recently planted areas, riparian areas, nesting areas (e.g., heron colonies), and wildlife concentration areas (e.g., wintering areas for waterfowl or for deer).

Fences can restrict animal movements, such as mule deer migration routes (Wallmo 1981). Specific fence designs are available that restrict cattle but do not restrict wildlife. However, it is difficult to construct a fence that allows deer, but not people, to pass. In such cases, restrictive fences can be placed near where people are expected to encounter them, while less restrictive fences can be placed away from areas where people are expected to travel.

Road construction removes wildlife habitat directly and can indirectly remove habitat by increasing human presence. Several types of animals, such as American marten, wolverine, woodland caribou, wolf, and grizzly bear, typically avoid areas containing roads. Road maintenance generally has little effect on wildlife use other than adding human disturbance along the road corridor. Road decommissioning can improve habitat directly and can also reduce human disturbance in areas containing sensitive wildlife species.

4.3.4 Potential Program-Wide Mitigation Measures — Wildlife

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Before implementing any active management technique, identify sensitive wildlife habitats or features (e.g., eagle and other raptor nests, mule deer winter range) and establish buffers and timing restrictions in consultation with state and/or Tribal wildlife biologists.
- Restrict access, either seasonally or spatially, to protect sensitive wildlife areas, including recently planted areas, riparian areas, nesting areas (e.g., heron colonies), and wildlife concentration areas (e.g., wintering areas for waterfowl or for deer).
- Use interpretive signs and on-site custodian care to reduce adverse impacts of recreation on sensitive wildlife habitats.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations, test animals for diseases before release.*
- Coordinate wildlife control efforts with state wildlife agencies and with Animal Damage Control, U.S. Department of Agriculture, Animal and Plant Health Inspection Service. If threatened or endangered species are involved, coordinate with the USFWS.
- Avoid vegetation removal during the nesting season for birds. Where such removal is unavoidable, conduct nest surveys for sensitive bird species before disturbing lands.
- Conduct inventories and establish fire breaks around riparian areas before conducting prescribed burns (unless riparian areas are expected to benefit from the treatment).
- Inventory vegetation in areas proposed for land-disturbing activities and avoid high-quality native vegetation communities (as defined by state or Tribal agencies).

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4.4 VEGETATION

4.4.1 Context

- **Legal.** As described under the **Wildlife** and **Fish** sections, Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered plant or animal species. Officially designated critical habitat for listed species cannot be adversely modified. Counties typically have jurisdiction over weed control. County Noxious Weed Control Boards may cooperate with project planning to ensure that wildlife mitigation activities do not promote or spread noxious weeds.
- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adversely affecting a plant species listed or proposed for ESA listing; adversely modifying designated critical habitat for a listed plant species; adversely affecting plant species that are listed by state or Tribal agencies as species of special concern (such as endangered, sensitive, monitor, etc.); removing or disturbing plant communities that have been identified by state or Tribal agencies as unique or rare (such as late-successional forest or native shrub-steppe); or promoting or spreading noxious weeds.

4.4.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Vegetation

Under No Action, new wildlife mitigation projects would continue to be developed without a standardized program to protect vegetation. Overall, however, native plant communities would continue to benefit (after some initial impacts) from the activities associated with wildlife mitigation, which include protection of relatively large areas of habitat.

Alternative 2: Base Response - Potential Effects on Vegetation (Common to All Action Alternatives)

Activities at new mitigation sites implemented under any of the alternatives would initially disturb vegetation as habitat improvements are implemented. Over time, vegetation communities associated with target species and habitats would increase, including riparian/riverine, old growth forest, wetlands, and shrub-steppe communities.

Alternative 3: Biological Objectives - Potential Effects on Vegetation

While use of active management techniques (seeding, fertilizing, irrigating) under Alternative 3 would accelerate the development of desired plant communities, a narrow focus on biological objectives could potentially reduce those plant communities that do not support the target wildlife

species or habitats. For example, native upland habitat could be flooded to create wetland or riparian habitat.

Because intensive management techniques would be used frequently under this alternative (e.g., large-scale tilling operations), a greater proportion of land at new mitigation sites would be disturbed under Alternative 3 than under the other alternatives. This increased level of disturbance would increase the potential for (1) invasions of noxious weeds and other undesirable plants, and (2) direct loss of native plant communities and rare, threatened, or endangered plant species.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Vegetation

Compared to the other alternatives, Alternative 4 would disturb the least amount of vegetation at new mitigation sites because of the heavy reliance on natural revegetation (rather than the use of more intensive methods). Over the long term, because native vegetation communities would not always regenerate by themselves, some damaged communities could remain in a disturbed condition indefinitely, if active efforts to restore them were not taken because of cost constraints. In most cases, native vegetative conditions would improve naturally; however, results would generally take much longer to achieve than under the other alternatives.

Alternative 5: General Environmental Protection - Potential Effects on Vegetation

Alternative 5 would include a relatively low amount of initial disturbance to vegetation because the more intensive habitat improvement techniques (e.g., large-scale wetland creation or vegetation plantings) would be used infrequently. Application of program-wide mitigation measures, as appropriate, would further serve to minimize impacts on vegetation. The multiple-use allowance of Alternative 5 would reduce the amount of native plant communities protected at new mitigation sites; it would also introduce or maintain a relatively high level of human activity across new mitigation lands, thereby increasing the amount of vegetation trampling and potential introductions of unwanted vegetation that can occur with multiple use.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Vegetation

BPA's preferred alternative would include program-wide measures, as appropriate, to control the spread of weeds and to protect high-quality native plant communities and rare, threatened, and endangered plants. Projects might include a wide range of techniques that could disturb vegetation (e.g., prescribed burn, clearing/seeding), although the amount of ground disturbed would be minimized because this alternative emphasizes natural revegetation rather than the more intensive techniques of seeding and transplantation.

4.4.3 Impacts of Techniques

Land Acquisition Techniques

Land acquisition does not necessarily involve activities that would dramatically change vegetation. In some cases, high-quality habitats would be designated as mitigation areas without the need for significant improvements. In such cases, native vegetation communities would benefit from the protection from possible future losses that could occur if the areas were developed or intensively grazed.

Conversion of cropland without active management would encourage weed invasions that could spread to adjacent croplands.

Plant Propagation Techniques

The propagation of plants changes vegetation patterns over time. In general, biological diversity would increase as multiple native species replace single-species crops or lands dominated by a few species of weeds.

Active propagation techniques (seeding, fertilizing, irrigation) accelerate development of desired plant communities over what would occur if no active efforts were taken. In places where the land has been severely disturbed, native vegetation may not naturally regenerate, and habitats may remain disturbed if active efforts are not taken.

Propagation of native species may not work on soils that have been severely disturbed. Likewise, native plants from non-local stock may not adapt to site-specific conditions and may not survive. In addition, introduction of non-endemic stock (plants from different regions) may dilute the genetic composition of existing vegetation over time through cross-pollination.

Planting activities have the potential to remove threatened or endangered plant species directly.

Transplanting vegetation can have a high success rate relative to other techniques, especially where seeding has failed. Therefore, use of this technique in problem areas would accelerate restoration or enhancement of native vegetation.

Tilling (to prepare seedbeds) disturbs soils and can allow establishment of noxious and other weeds.

Irrigation and fertilization generally benefit vegetation. Irrigation can reduce some native species adapted to dry conditions (e.g., sagebrush).

Habitat Creation and Conversion

Creating or expanding wetlands reduces upland vegetation, which may include high-quality native habitats or habitat for rare, threatened, or endangered plant species. Conversely, creating or expanding wetlands can increase vegetation diversity, including the creation of riparian habitat.

Water Development and Management Techniques

Water diversions from natural streams can reduce riparian vegetation.

Development of wells, diversion dams, springs, check dams, impoundments, and guzzlers can all result in the direct loss of vegetation through clearing and incidental disturbance from machinery and from placement of materials and equipment at work staging areas.

Guzzlers, springs, ponds, and other water developments may concentrate some wildlife species that (in the case of larger animals such as deer) may trample and compact vegetation and soils.

Water Distribution Techniques

Development of pipelines, culverts, drainage ditches, and conveyance channels can directly remove vegetation through clearing and incidental disturbance from heavy equipment and from placement of materials and equipment at work staging areas.

Fire Management Techniques

Natural fire management in areas of previous fire suppression presents a greater risk of high-intensity fires because much fuel has often built up. Such fires can severely damage soil, water quality, and vegetation. In these areas, fuel management programs, including prescribed burns at intervals to reduce fuels, presents less risk of high-intensity fires, and, over time, can reduce the numbers of fire-intolerant species and increase numbers of fire-tolerant species.

However, prescribed fire in areas where suppression has allowed fuels to build up must be approached with caution, because vegetation can be significantly damaged. For example, overstory trees might be killed as fires burn hotter and longer in a given place.

Vegetation Management: Enhancement and Control

Control of non-native plants would increase native plant communities. Non-native invasive plant species, such as reed canarygrass and Himalayan blackberry, would decrease on mitigation lands where vegetation control programs are implemented. Prescribed burning can be used in place of grazing as a habitat management strategy, thereby avoiding grazing's adverse effects on vegetation, such as the loss of riparian vegetation and highly palatable native plants.

However, each of the techniques available to control vegetation carries some risks of adversely affecting vegetation. Herbicides can incidentally harm desirable plant species. Mechanical removal of vegetation is typically nonselective and is likely to remove desirable plants, which may include threatened, endangered, or sensitive plant species. Biological control of vegetation can potentially disrupt natural systems. Prescribed fire can reduce desirable species, increase invasive weeds, and reduce soil productivity. Water manipulation and mechanical control can slow natural vegetative succession. Hand-pulling carries the least risk of causing adverse affects.

Species Management Techniques

Control of nuisance animals can protect vegetation or vegetation enhancement projects. For example, voles and mice can often kill significant amounts of planted vegetation by eating through the bark, and Canada geese can remove planted tubers and bulbs. Temporary control of these species may be necessary to meet certain habitat enhancement objectives effectively.

Multiple Use Techniques

Crop production on mitigation lands would continue the ongoing effects of agriculture, which include maintenance of non-native annual crops, application of herbicides and pesticides, and ongoing soil disturbance.

Provision of educational and recreational opportunities can lead to soil compaction and trampling of vegetation (Cole and Landres 1995). Wakes from speeding motor boats in lakes can disturb shoreline soils and shoreline vegetation. Increasing vehicle access can disturb soil and transport seeds of noxious and other weeds. Seeds of many species of weeds, including some that are classified as noxious weeds, can be spread by livestock, people, wildlife, vehicles, and machinery.

Facility development might require the direct removal of vegetation. Increased human activities can then disturb and remove vegetation adjacent to facilities.

Grazing decreases the population of highly palatable plants (in many cases, native plants) and increases that of unpalatable plants. High levels of grazing can also break and compact vegetation and soils through repeated walking, trampling, and lying down. Riparian areas are especially vulnerable to physical damage because the wet soils are soft and less stable.

Grazing can benefit vegetation as well. Grazing can reduce shrub density, release trees from competition, reduce fire fuels, and create habitat diversity between grazed and ungrazed areas.

Forest management activities (including conifer tree planting, selective tree harvesting, tree thinning, and timber sales) directly affect vegetation by altering forest stand composition and structure. Forest management activities also indirectly affect vegetation through disturbance while accessing stands and yarding trees. Soil compaction in skid trails can slow vegetation growth for many years. In general, tree removal favors early successional species (e.g., most types of grasses and shrubs). For example, thinning may be used to open forest understories and promote shrub and grass growth for big game foraging habitat. On the other hand, thinning or selective harvest may be used to accelerate the creation of old-growth forest conditions by removing competition. Riparian areas are highly vulnerable to disturbance from logging. However, because riparian areas have high habitat value, logging would not be conducted there unless it was specifically intended to enhance habitat values; minimal impacts would therefore be expected on vegetation.

Transportation/Access Techniques

Restricting access with fences and gates can prevent the potential vegetation loss that can be caused by recreational activities and other public uses. Restricting uses could also protect

sensitive plant communities, including recently planted areas, riparian areas, and high-quality wetlands. The development of fences and gates requires that minor amounts of vegetation be removed, through digging for fence posts. Vegetation is trampled and soils are compacted by vehicles and equipment and at material staging areas. Road construction directly removes vegetation and results in long-term soil compaction.

4.4.4 Potential Program-Wide Mitigation Measures — Vegetation

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- *For projects involving land acquisition (including leases)*, incorporate a weed control plan in consultation with local weed control officials.
- *For projects involving plantings on disturbed soils*, favor use of native vegetation but allow non-native or native cultivars to be planted where such plantings would better contribute to the long-term goals of habitat improvement.
- Use conservation tillage practices for planting and maintaining vegetation, including reduced-tillage or no-tillage where possible.
- Survey for listed or other plant species of concern before disturbing lands for planting if the USFWS identifies such species as potentially occurring in the vicinity of the project area.
- Acquire seeds and plants from stock derived under similar environmental conditions. Local stock is preferred; on-site stock is the ideal.
- *For projects involving wetland creation or expansion*, survey for and avoid sensitive features during early planning.
- Avoid developing new water sources that would reduce surface flows; where reduction is unavoidable, establish, in cooperation with state water resource staff, maximum allowable reduction in flows.
- Place guzzlers, springs, ponds, and other water developments in areas where vegetation can tolerate increased trampling from wildlife.
- Incorporate integrated vegetation management, with minimal use of herbicides.
- When a herbicide is needed, use species-selective herbicides and selective application techniques.
- *For projects involving vegetation control*, develop specific protocols for use of herbicides, mechanical, and biological methods, in cooperation with local weed control boards. Protocols could be adapted from the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).
- *For projects involving vegetation control*, conduct weed control programs more efficiently and with a greater regional effect by using joint multi-agency planning.

- *For projects involving forest management*, establish buffer strips along streams to protect riparian vegetation.



4.5 LAND AND SHORELINE USE

4.5.1 Context

- **Legal.** Land use regulation is most commonly carried out at the county level, although some state land use restrictions may also apply, especially in sensitive areas such as shorelines. County regulations may include plans, policies, and ordinances that define zones where certain land uses are allowed and others are prohibited. Examples of typical county zoning and/or comprehensive plan designations include the following: multi-family residential, single-family residential, commercial, industrial, agricultural, forestry, mining resource lands, and open space. Additional zones may also identify special emphasis on environmental protection, such as view protection districts, scenic design areas, floodplain zones, and natural areas.

Counties typically review projects occurring within their jurisdiction for consistency with their plans, policies and ordinances, and may require conditional use permits for projects affecting private lands, as well as formal mitigation agreements as part of permit approval.

Section 1539 of the Farmland Protection Act, Public Law 97-98 (December 22, 1981), was established to minimize Federal actions that result in the unnecessary and irreversible conversion of farmland to non-agricultural purposes. Under the Act, Federal agencies must examine their actions for potential adverse effects on farmlands, as determined by applying the criteria established in Federal rules (7 CFR 658.4).

Shorelines are protected under the Clean Water Act, as well as by state acts and regulations.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: converting to nonagricultural purposes farmland rating 160 or greater according to the USDA rating system (7 CFR 658.4); establishing uses not compatible with adjacent land uses and ownerships; conflicting with adopted environmental plans and goals of the community where the project is located; or disrupting or dividing the physical arrangement of an established community.

4.5.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Land and Shoreline Use

Without a standardized program, impacts on land and shoreline use could vary widely, depending on the circumstances surrounding each project. As a general rule, however, BPA project managers would continue to work with project proponents, local authorities, and the public to address land and shoreline use issues, thereby minimizing potential conflicts.

Alternative 2: Base Response - Potential Effects on Land and Shoreline Use (Common to All Action Alternatives)

Any of the alternatives would change land and shoreline use at future wildlife mitigation sites. Conversion of properties to designated wildlife mitigation lands could infringe on existing land uses on the property and/or adjacent lands, and could eliminate some uses altogether. On balance, although grazing, timber production, and farming would be reduced on mitigation lands, the amount of land removed from these uses would be minor in relation to the remaining lands available in the vicinity of new mitigation sites.

Alternative 3: Biological Objectives - Potential Effects on Land and Shoreline Use

Under Alternative 3, Project Management Plans would focus narrowly on obtaining the biological objectives. Land and shoreline use issues would be considered mostly as they relate to achievement of biological objectives, rather than to compatibility with local land uses. Therefore, changes to land and shoreline use at new mitigation sites might be greater than under the other alternatives.

In addition, Alternative 3 has the greatest potential for notable changes in land use and management practices, such as access restrictions, increased prescribed burning, and/or elimination of existing land uses, such as dispersed recreation and commercial forestry or agriculture.

On the other hand, the amount of land that would be converted to wildlife mitigation might be lower under this alternative because project managers could employ intensive management techniques that can achieve biological objectives on less land than would be required with use of more passive techniques.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Land and Shoreline Use

Alternative 4 has a low potential for significant changes in land or shoreline use. High-quality farmland or commercial forests would most likely be avoided because of their high purchase costs and, in the case of farmland, the costs associated with habitat improvements. Existing farming and/or forestry within portions of proposed mitigation sites might continue under this alternative, in order to provide revenues for the mitigation site.

Alternative 5: General Environmental Protection - Potential Effects on Land and Shoreline Use

Under Alternative 5, potential conflicts in land or shoreline use would be avoided or minimized during early project planning, which would involve a high degree of stakeholder involvement. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on land and shoreline use. Project Management Plans would include measures to protect sensitive land uses and to minimize or eliminate conflicts with local land use laws.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Land and Shoreline Use

With the proposed standard planning process in place, and with BPA's preferred requirements under Alternative 6, conflicts with land and shoreline use would be avoided or minimized. Project managers would apply potential program-wide measures, as appropriate, to avoid inconsistencies with local land use regulations and to avoid disruption of land use on lands adjacent to mitigation areas (see **Section 4.5.4**, below).

4.5.3 Impacts of Techniques

Land Acquisition Techniques

Wildlife mitigation actions can modify existing land use by reducing the amount of grazing, timber production, and crop production. These changes in land use may conflict with local and multi-jurisdictional land use plans and policies. If a project is inconsistent with local comprehensive land use plans, a variance amendment or special use permit may be required, along with public review. Implementation of large-scale mitigation programs in conjunction with other ecosystem management efforts taking place on Federal lands may eventually reduce regulatory pressure on private lands. For example, regional enhancement efforts may help the recovery of threatened or endangered species as well as help prevent the listing of some species under the ESA.

Plant Propagation Techniques

Major shifts (reductions) in irrigation practices may affect adjacent landowners by potentially reducing available water or by raising the water table. Water available to adjacent landowners could be reduced if, for example, senior water-right holders were to sell some or all of their water rights for use on the wildlife project. Then, in dry years, the state water management authority might suspend junior water rights so that the senior right, now for wildlife, would be maintained. This would be a change in kind and place of use, at most, but not a change in duty or quantity of water.

Habitat Creation and Conversion

Careful coordination with state water resource agencies would serve to prevent inadvertent creation of wetlands or wetland buffer areas on lands adjacent to created wetland mitigation projects, potentially causing unintended land use restrictions. Placement of artificial nesting structures within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response**.)

Water Development and Management Techniques

As mentioned above (**Plant Propagation Techniques**), major water developments and shifts in irrigation practices may affect adjacent landowners by possibly reducing available water or by increasing the water table.

Placement of guzzlers within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Water Distribution Techniques

The establishment of pipelines, culverts, and drainage ditches/conveyance channels generally do not directly conflict with land or shoreline use. These developments could potentially interfere with utility rights-of-way or traditional or emergency access routes.

Fire Management Techniques

Reliance on natural fire management would increase the risk of high-intensity fires, which can cause substantial risk of property damage, loss of human life, or injury.

Prescribed burning can temporarily interfere with adjacent land use in some cases, such as would occur if smoke drifted to recreation areas or to areas where people are working. Over the long term, fuel reduction programs decrease the risk of high-intensity wildfires and the associated land use impacts. Prescribed burning to control fuels carries the risk of possible spread to adjacent lands.

Vegetation Management: Enhancement and Control

Prescribed fire can affect adjacent landowners if fire escapes, burning adjacent lands, or if smoke drifts. Under certain conditions, smoke can drift onto roadways and cause serious traffic accidents. Careful consideration of weather, fuel, and other conditions can significantly reduce the potential for smoke drifting onto roadways. Water level manipulation may unintentionally affect adjacent landowners by increasing or decreasing the water table and restricting land use.

Species Management Techniques

Introduction, reintroduction, and augmentation of wildlife populations may affect adjacent landowners because many species of wildlife are highly mobile. Reintroduction of threatened or endangered species could increase regulatory protection on nearby lands, should these species disperse there from release sites. At the same time, large-scale reintroduction programs may eventually reduce the regulatory pressure on private lands by helping the recovery of threatened or endangered species as well as helping to prevent the listing of some species under the ESA.

Introduction of large mammals carries with it potential concerns for nearby sheep and cattle operations. Wildlife can carry diseases that may be harmful to sheep and cattle (and vice versa). Bison at Yellowstone National Park have been suspected as responsible for the spread of brucellosis to domestic animals (Robinson and Bolen 1989). Wildlife also compete with sheep and cattle for forage. Predators, such as wolves, can pose a threat to livestock if introduced in or near areas being grazed.

Multiple Use Techniques

Allowing crop production, timber harvest, and grazing on mitigation lands (consistent with mitigation objectives) can allow historic land use to continue, while providing benefits for wildlife. Provision of educational and recreational opportunities can attract visitors to rural areas that are not accustomed to heavy recreational use. Such increases in visitors can change the character of local communities.

However, development of wildlife mitigation areas is not likely to result in noticeable changes in tourist/recreation uses or activity because (1) the primary management emphasis would be on wildlife mitigation and not recreation, and (2) other areas managed primarily for recreation would most likely continue to attract the majority of recreational users.

Transportation/Access Techniques

Access and use restrictions could violate Tribal rights by restricting access to treaty or traditional use lands. However, under Step 2 (Involve Stakeholders) such potential problems can be avoided early in the planning process. For example, harvest agreements developed between the implementing agency and affected Tribe could serve to prevent potential violations of Tribal rights.

4.5.4 Potential Program-Wide Mitigation Measures — Land and Shoreline Use

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Meet with county officials during early planning of mitigation areas, to try to develop the project in a manner consistent with county zoning and planning efforts.
- *For projects involving land use changes*, meet with county commissioners and land use officials, who can provide local wisdom and help ensure coordinated, efficient, and effective use of multi-jurisdictional resources.
- Elicit public input, which allows for application of local knowledge and for development of plans consistent with the local land use values.
- Survey proposed alignments of water distribution systems to ensure that no rights-of-way or access routes are blocked.
- *For projects involving prescribed burns*, identify acceptable weather conditions and air quality concerns, and develop contingency plans in the event of fire escaping to adjacent lands.

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4.6 CULTURAL AND HISTORIC RESOURCES

4.6.1 Context

- **Legal.** The National Historic Preservation Act requires that Federal agencies take into account the potential effects of their undertakings on properties on or eligible for the National Register of Historic Places (National Register). The Native American Graves Repatriation Act (NAGPRA) requires that Federal agencies consult with Native American Tribes when activities and operations encounter cultural items or when cultural items are inadvertently discovered. The Archeological Resources Protection Act prohibits the purposeful excavation and removal of archeological resources on Federal land without a permit from the Federal land manager. The American Indian Religious Freedom Act encourages Federal agencies to protect the integrity of Native American religious places and opportunities for the exercise of Native American religions on lands under Federal jurisdiction.
- **Desired condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adverse effects on properties on or eligible for the National Register, or disturbance of Native American cultural items or religious places, or adverse effects on the exercise of Native American religion, pending consultation with the appropriate Tribe(s).

4.6.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Cultural and Historic Resources

Under No Action, BPA would continue to lead cultural resource protection efforts on a project-by-project basis.

Alternative 2: Base Response - Potential Effects on Cultural and Historic Resources (Common to All Action Alternatives)

Wildlife mitigation sites are generally compatible with cultural resource protection. Establishing new mitigation sites can reduce existing or future land uses with a high potential to disturb archaeological, cultural, and historic resources (e.g., road construction and other ground-disturbing activities associated with timber harvest, cattle grazing, and development).

Potential impacts from ground-disturbing activities would occur to varying degrees under any of the alternatives. Program-wide mitigation measures would be applied, as appropriate, to protect cultural resources.

Alternative 3: Biological Objectives - Potential Effects on Cultural and Historic Resources

Because Alternative 3 has the highest potential among the alternatives for ground-disturbing activities related to habitat development, it therefore has the highest potential to disturb cultural resources. Relatively high amounts of ground-disturbing activities would be expected during the initial phases of each new project, as a wide range of management techniques is implemented.

Over the long term, potential impacts would decrease as roads are decommissioned or closed, and timber harvest, crop production, and grazing are reduced or stopped.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Cultural and Historic Resources

Potential impacts on cultural resources would be relatively minor under Alternative 4 because it relies primarily on natural regeneration rather than on active restoration to achieve biological objectives. Ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the potential for disturbing cultural resource sites.

Alternative 5: General Environmental Protection - Potential Effects on Cultural and Historic Resources

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, the disturbance of cultural resources associated with these activities might occur over time.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Cultural and Historic Resources

Under BPA's preferred alternative, a moderate amount of ground would be disturbed at new mitigation sites as improvements are begun.

4.6.3 Impacts of Techniques

Land Acquisition Techniques

Cultural and historic resources on lands acquired for wildlife mitigation would probably benefit from increased protection. That is, project managers would have an affirmative responsibility to protect significant cultural and historic resources, whereas private landowners do not. Also, converting from private to public or Tribal land ownership would benefit Tribal cultural interests by providing Tribal access for traditional uses.

Plant Propagation Techniques

Plant propagation techniques that disturb soil may also disturb archeological resources. Planting techniques, including hand transplanting and use of machinery, can disturb surface and subsurface sites. In the long-term, plant propagation would reduce erosion and therefore the potential for site disturbance from erosion.

Propagation of native plant species would benefit Tribal traditional values because many native species are also traditional use species.

Habitat Creation and Conversion

Creating wetlands can affect archeological resources by disturbing sites where there is construction activity, or by inundating sites.

Water Development and Management Techniques

Techniques that can cause soil erosion (such as development of wells, diversions, springs, impoundments, and guzzlers) can disturb archeological sites. Impoundments can also affect sites by inundation. Water features that draw wildlife can also lead to trampling of surface sites, and compaction of subsurface sites.

Water Distribution Techniques

Installation of pipelines, culverts, and drainage ditches/conveyance channels may disturb archeological sites, either by construction or by erosion.

Fire Management Techniques

Fire can affect archeological sites by exposing them to discovery, or by disturbance caused by potentially increased erosion. As discussed in **Potential Effects on Soil (Section 4.1.3)**, natural fire management would have greater potential for causing erosion than would prescribed burn management.

Fire can also damage or destroy historic buildings. Because prescribed burns would be conducted under controlled conditions, there would be less likelihood of adversely affecting historic buildings than with natural fire management.

Vegetation Management: Enhancement and Control

Mechanical removal of vegetation can directly disturb archeological sites. Grazing can compact archeological sites, and can also cause exposure by erosion. Water level manipulation can also cause site exposure by erosion.

Prescribed burns for vegetation management would have the effects described above (**Fire Management Techniques**).

Managing vegetation with preference for native plant species would benefit Tribal traditional values because many native species are also traditional-use species. Use of herbicides during plant harvest times can conflict with Tribal traditional uses, and/or create health concerns.

Species Management Techniques

Introducing large herding animals, such as elk, can compact soils and archeological sites within them. However, improving conditions for or reintroducing traditional use animals, such as bear, elk, deer, antelope, and bighorn sheep, would benefit Tribal traditional values.

Multiple Use Techniques

Activities that can compact soils, such as grazing, timber yarding, and recreational vehicle operation, can also compact archeological sites. Activities that can disturb soils, such as crop tilling, timber yarding, and facility development, can also disturb archeological sites.

Facility development can destroy or alter historic property qualities: for example, refurbishing a historic building in a manner inconsistent with the building's historic character, or introducing a manufactured structure into a historic landscape. However, careful planning and implementation can protect historic qualities while making a building or landscape suitable for contemporary uses.

Recreational use can also expose cultural and historic resources to vandalism. Recreational harvest of Tribal traditional use plants can conflict with Tribal interests.

Transportation/Access Techniques

Fencing can disturb archeological sites, or lead to compaction caused by cattle trailing along the fence line.

Road development can also disturb archeological sites, and also encourage public access which can lead to vandalism of sites. Conversely, closing and decommissioning roads can reduce public access and associated site vandalism.

4.6.4 Potential Program-Wide Mitigation Measures — Cultural and Historic Resources

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Consult with the SHPO and affected Tribes to identify potential occurrences of cultural resources.
- Where there is potential for adversely affecting cultural resources, conduct cultural resource surveys to document any resources present.

- Where properties on or eligible for the National Register are under management control, incorporate a cultural resource management plan.
- Identify opportunities to foster public appreciation of the relationship between natural resources and Tribal culture.
- Coordinate project activities with the appropriate and affected Tribe(s) to ensure that Tribal interests are addressed.



4.7 ECONOMICS

4.7.1 Context

- **Legal.** Executive Order 12898 of February 11, 1994, directs all Federal agencies to identify and address disproportionately adverse environmental or human health effects on minority and/or low-income populations. Federal agencies must analyze the environmental effects, including human health, economic and social effects, of their actions, including effects on minority communities and low-income communities.
- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: involuntary displacement of property owners or restriction of commercial uses, disruption of traffic or business activities during construction or ongoing operation, reducing local tax revenues, either directly or indirectly, to the extent that greater than 1% of total annual revenues are lost.

4.7.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Economics

Under No Action, no standardized program would be applied to provide side benefits to local economies. However, experience with previous projects indicates that most lands selected for mitigation would already be under Tribal, state, or Federal jurisdiction, and that the loss of tax base and related concerns would be minimal. Lost landowner revenues from cessation of timber, grazing, and development would be generally offset by BPA's funding to acquire the land or to purchase easements. Some commodity production (e.g., timber) would continue to take place on mitigation lands as part of wildlife mitigation activities (e.g., created openings to provide sharp-tailed grouse habitat). However, as a whole, commercial use of mitigation lands would decrease. Implementation of management activities would continue to provide some temporary employment, service, and supply revenues to the local economies.

Alternative 2: Base Response - Potential Effects on Economics (Common to All Action Alternatives)

Implementation of mitigation projects can provide some temporary and/or seasonal local employment, services and supplies revenues. However, few, if any, full-time employees would be required for most mitigation projects.

Use of water for mitigation projects could potentially reduce water available to other water users who currently have no water rights or whose rights are junior to those of the mitigation project(s). These reductions could correspondingly reduce agricultural productivity or other water-dependent revenues. Conversion of private lands to public or loss of commodity production on

public lands could diminish local tax bases. Wildlife mitigation projects would not be sufficient in scale to cause broader impacts within regional economies.

Alternative 3: Biological Objectives - Potential Effects on Economics

Alternative 3 provides the greatest potential for short-term economic benefits derived from local employment and use of services, supplies, and equipment. Over the long term, however, economic benefits would be minimal because (1) project activities would likely taper off after initial implementation and (2) little or no commercial use of mitigation lands would occur. In some instances, local services and supplies might be used indefinitely (e.g., for projects that require long-term maintenance).

Management techniques would be implemented under Alternative 3 to best achieve biological objectives. Impacts on the local economy, including loss of tax base or reduced water supplies, would not be a major design criterion used by project managers to develop projects. Commodity production on mitigation lands and associated revenues would be reduced or eliminated.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Economics

Alternative 4 would likely have little effect on local or regional economies. To reduce costs, Alternative 4 would require that public lands be used for mitigation sites whenever available, so loss of property tax would be minimal. Loss of county timber or grazing revenues would also be minimal because the commercial use of mitigation lands would be encouraged to help offset costs to the government. Should private lands be required to meet the biological objectives, high-quality commercial forest or agricultural lands would be avoided because these properties would be expensive.

Alternative 5: General Environmental Protection - Potential Effects on Economics

Alternative 5 would assist local economies as a major goal; therefore, this alternative would generally benefit local economies. In addition, adoption of program-wide mitigation measures would minimize impacts on local economies.

Commercial uses that are compatible with biological objectives would be encouraged, including crop, livestock, and timber production. Project managers would identify opportunities to support and assist local economic activities. Project managers would also monitor local economic indicators and adapt management to better benefit the human environment, including local conditions. Project managers would have to obtain funding for these monitoring and assistance activities from entities other than BPA, because BPA has no legal authority to provide funding for economic mitigation.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Economics

BPA's preferred alternative would include application of program-wide mitigation measures, as appropriate, to minimize impacts on local economies. This alternative would provide only minor increases in local revenues from employment, services, and supplies, because natural revegetation would be emphasized rather than the more labor- and supply-intensive techniques of seeding and transplantation.

4.7.3 Impacts of Techniques

Land Acquisition Techniques

Changes in grazing, crop production, and timber harvest methods and extent can reduce the economic return of resource lands. In general, commercial use of lands acquired for mitigation actions would occur only as they are consistent with the overriding wildlife management goals and objectives. Because commodity production is secondary (or, in some cases, irrelevant), local economic activity can be reduced if farming and associated economic activities are lost (i.e., equipment sales, local services). In most cases, the amount of land removed from commercial purposes would be very minor in relation to lands remaining available for these uses in the general area of mitigation sites.

For fee-title acquisition of private property, the property is converted from taxable private ownership to nontaxable governmental ownership. Property and other taxes would be lost to the county and state in which the property is located and possibly to established special districts that receive funds from tax assessments. However, Federal and state land management agencies commonly do make payments to counties. When governmental agencies make such payments, they are made as in-lieu payments or other payments that generally compensate the county for any potential revenue loss. Severity of the impact would depend on the size, value, and tax revenue generation of the property relative to the overall county tax base. Counties with a large proportion of public land could be especially hurt by conversion of private land to the public domain because the tax base of these counties is already limited.

If the property acquired for mitigation land is currently used for crop, forage, or timber production or other forms of income, the associated local benefits (e.g., employment and local product consumption) and taxes (e.g., sales taxes, business and occupation taxes, and income taxes) would also be lost. If Federal land is currently producing timber, and timber production is reduced or eliminated as part of the mitigation area plan, then the county share of timber revenues produced from the land would be lost. Tax losses may be somewhat offset by an increase in economic activity associated with increased recreational visitation and land management activities (as described below).

For easement acquisition, some tax revenues could also be lost if the restriction resulting from the easement were to decrease property value and/or commodity production.

When Tribes would manage mitigation lands, local governments may have lower public service costs if the Tribes were to assume responsibility for police, fire, and road maintenance services.

Plant Propagation Techniques

Employment and income generated by vegetation transplanting and reseeding could temporarily benefit local economies. Transplanting would provide more long-term employment than would reseeding, which is less labor-intensive but which can provide more funds for equipment rental. The employment generated by these activities is likely to be only temporary, or at best seasonal.

In addition, because positions would likely be low-skill, income generated by these two vegetation programs would not be likely to benefit local retail businesses or governmental tax revenues significantly.

Habitat Creation and Conversion

The creation of wetlands, artificial islands, and artificial nests would also provide some temporary employment, as well as funds for equipment rental (e.g., excavators, backhoes, and graders) during construction. The creation of artificial nests would likely be the least expensive, because relatively minimal labor and equipment would be required.

Water Development and Management Techniques

Construction and long-term maintenance of wells, diversions, spring development, check dams/impoundments, and guzzlers would generate some income through local labor, equipment, services, and supplies. The amount generated depends strongly on the size of the structures, their design, the materials used, and other factors. Dams/impoundments have the greatest potential for costs and associated income.

Employment and income generated by these activities would vary from very short periods to 1 or 2 years. Construction would thus provide employment opportunities ranging from temporary to year-long full-time jobs. Types of employment would range from low-skill laborer positions to management positions, with associated variation in income.

Depending on the size of the construction project, these structures could require substantial purchases of rock, concrete, pipe, and other materials, as well as water rights. These activities also would provide funds for equipment rental (e.g., excavators, backhoes, and graders) during the construction activities. These purchases and the additional employment would benefit local retail businesses and would increase governmental tax revenues.

Much of the economy of the Pacific Northwest (i.e., agriculture, navigation, power, industry, domestic supplies, and recreation) is closely tied to or dependent upon the availability of water. Conflicts over these rights and access, as evidenced during recent debates about hydropower generation versus fisheries mitigation, are common during periods of reduced annual precipitation. Thus, additional use of water caused by water development projects at mitigation areas could

raise concerns regarding economic impacts on other users (such as ranchers or producers of irrigated crops).

Water Distribution Techniques

Construction of pipelines, culverts, and drainage ditches/conveyance culverts to convey water from various sources to the irrigation system are short-term activities. Associated revenues would also be short-term, and would not generate significant long-term income, local retail business, or governmental tax revenues.

Fire Management Techniques

Reliance on natural fire management would increase the risk of high-intensity fires, with a much greater chance of burning adjacent lands and adversely affecting economic values, including loss of cash crops and potential long-term loss of productivity.

The use of prescribed fire generally has little effect on regional or local economies. Potential concerns could stem from the risk of escaped fires damaging crops, livestock, timber, or property. Prescribed burning would have minimal positive impacts on employment.

Vegetation Management: Enhancement and Control

Aerial spraying of herbicides would benefit crop-dusting businesses, while vehicle-mounted herbicide application and mechanical removal would benefit commercial applicators or farmers and others already possessing tractors and trucks with the appropriate equipment.

Hand-pulling of weeds and backpack herbicide application are the most labor-intensive of the vegetation management techniques. However, as with transplanting, seeding, and habitat creation, they would involve the short-term, low-paying laborer positions, and would not result in noticeable positive economic impacts to the area.

Fencing of riparian areas may reduce range value by eliminating stock access to water. Solar-powered springs, hydro rams, or guzzlers can be used to replace water for stock. Large-scale reduction of available grazing land could increase the economic value of remaining grazing land nearby.

Species Management Techniques

Increasing the numbers of browsing/grazing wildlife species may increase wildlife crop damage offsite. Predator/nuisance control can be contracted out to local residents, or the state wildlife agency may open a special season to allow shooting or trapping of the target species. These activities would not likely result in noticeable employment opportunities because they would be short-term.

Multiple Use Techniques

Multiple-use management options include integration of habitat management with crop and/or timber production, provision of educational and recreational opportunities, restricted access for recreation, facility development, and agricultural grazing. In general, allowing multiple-use management would provide greater opportunities for economic benefits at the local level.

Many of these techniques represent no or little minor change to existing uses of the properties. Crop production, restricted access for recreation, and grazing might not vary much from existing practices. Habitat and crop production merely alters timing of harvest and the planting of uncultivated areas to improve habitat, a slight change in land use or management practices. Because most lands purchased would likely be privately owned or otherwise involve some form of restricted access, restricting access for recreational purposes would likely have a negligible impact on local economics.

In most cases, where commercial forest land is converted to wildlife mitigation properties, the dominant land use would change away from commercial forest. While some opportunities for logging would remain, traditional forest practices would generally be curtailed, as management emphasis shifts from commodity production to wildlife habitat enhancement.

Providing educational and recreational opportunities would expand tourism and recreational opportunities and associated positive economic impacts. This increase in opportunities for sight-seeing, camping, picnicking, swimming, boating/canoeing, and walking/hiking would likely represent additional options for participating in activities (i.e., at one local site versus another), but would not likely result in noticeable changes in overall recreation uses or activity.

Facility development would have the greatest impact on the implementing agency and the local economy of all of the multiple-use management options. Constructing interpretive centers, observation stations, office space, parking, housing, garages, and storage sheds would have minimal to major costs to agencies to purchase building materials. These purchases would benefit local lumber yards, hardware stores, electrical and plumbing stores, and other related retail businesses. Additional temporary employment would also be provided to construction company employees, but would likely represent only part of their existing business activities, and would not require adding staff.

Transportation/Access Techniques

Transportation and access management options include land-use restrictions through fences and gates, road construction, road maintenance, road decommissioning. These activities can be fairly labor-intensive. The employment generated by these activities would likely be only temporary.

4.7.4 Potential Program-Wide Mitigation Measures — Economics

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Encourage the use of available local supplies and labor to accomplish project goals and objectives.
- *For projects involving land acquisition (including leases)*, acquire lands not currently under commercial agricultural use.
- *For projects involving land acquisition, in counties already containing a large amount of Federal lands*, favor selecting existing Federal lands.
- *For projects involving land acquisition (including leases)*, allow revenue-generating activities consistent with biological objectives.
- *For projects involving prescribed burns*, develop a specific plan that outlines measures to minimize risk of escape and impact on adjacent land uses and other resources.
- Train and maintain a qualified and adequate work force to plan and implement prescribed burn projects safely and effectively.
- Establish inter-local agreements with fire districts, the USFS, and other appropriate agencies to assist in controlled burn activities.
- Involve local and downstream water users and local water agencies to ensure that project water users do not significantly affect productivity or production costs of water-dependent agriculture.
- *For projects involving prescribed burns*, develop a specific plan that outlines measures to minimize risk of escape and impact on adjacent land uses and other resources.
- Where traditional stock watering areas are fenced to protect riparian habitat, provide alternate sources of water, including solar-powered springs, hydro dams, or guzzlers.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, involve local landowners early in the planning process to develop consensus regarding specific management parameters of wildlife introductions.

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4.8 RECREATION/VISUAL

4.8.1 Context

- **Legal.** Hunting is generally regulated by Federal and state fish and wildlife agencies, or by Tribes. Off-road vehicle use is regulated by local and state law enforcement and may also be regulated by local, state, Tribal, or Federal land management agencies.
- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: creating hazards that might pose a risk to the public; disrupting recreational activities on lands adjacent to lands acquired for mitigation, or recreational activities that conflict with biological objectives, or recreational activities that conflict with Tribal rights.

4.8.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Recreation/Visual

Without a standardized program, recreational opportunities would be developed on a case-by-case basis. In most cases, existing recreational use would continue (based on past mitigation projects). Some wildlife-oriented developed opportunities may be provided, such as wildlife viewing stations and trails. Recreational access would continue to be restricted near sensitive wildlife habitat (e.g., bald eagle nesting areas).

Alternative 2: Base Response - Potential Effects on Recreation/Visual (Common to All Action Alternatives)

While changes in recreational uses would depend greatly on the various approaches outlined in the alternatives, some general consequences would be expected for all of the alternatives. Access would be restricted to some degree under any alternative, including restrictions near bald eagle nests (a threatened species), sensitive cultural resources, or areas undergoing active management (e.g., seeding). On the positive side, reduction of timber or crop production would often increase recreational opportunities or improve recreational experiences at new mitigation sites (e.g., less crowding, noise, dust, or commercial traffic).

Development of structures such as water catchments (guzzlers), signs, and public facilities could alter the visual setting at some new wildlife mitigation sites.

Alternative 3: Biological Objectives - Potential Effects on Recreation/Visual

Under Alternative 3, recreational use at mitigation sites would be minimized because the cost to develop and manage public use would subtract from funds that could otherwise be used to better achieve biological objectives. Therefore, conversion of properties with a high level of previous recreational use would result in a net decrease in recreational opportunities under this alternative.

In addition, the likelihood of intensive management over the first several years of new project implementation has the potential to interfere with recreational uses on nearby lands and might detract from the visual setting (e.g., smoke from prescribed burning, traffic and dust from on-site activities).

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Recreation/Visual

As with Alternative 3, the costs associated with recreation management would limit the amount of available resources to maintain or increase recreation on lands obtained for mitigation. Therefore, recreational opportunities would likely be minimal at new mitigation sites developed under Alternative 4.

Alternative 5: General Environmental Protection - Potential Effects on Recreation/Visual

Recreational use of mitigation lands would be encouraged under Alternative 5. This alternative would therefore potentially provide a net increase in recreational opportunities on lands selected for new mitigation projects. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on recreation. Alternative 5 does allow access fees to be charged to visitors, and these charges could discourage recreational use in some cases. Placement of recreation-related structures (e.g., restrooms, garbage containers, traffic signs) could detract from the visual setting at some areas.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Recreation/Visual

Under BPA's preferred alternative, recreational uses would be allowed, providing they do not interfere with achieving wildlife mitigation. In many cases, access would be restricted to protect sensitive habitats, cultural resource areas, or other environmentally sensitive areas. Alternative 5 does allow access fees to be charged to visitors, and these charges could discourage recreational use in some cases. Some roads might be permanently closed at new mitigation sites. Program-wide mitigation measures would be applied, as appropriate, to protect recreation and visual resources.

4.8.3 Impacts of Techniques

Land Acquisition Techniques

In some cases, resource acquisition through fee-title acquisition, easement acquisition, or long-term lease could result in the shift of habitat mitigation areas from private to public management. Once the land is under public management, mitigation decisions can increase, maintain, or decrease recreational opportunities. By itself, the acquisition of land does not directly affect recreation; however, the individual techniques employed following acquisition can do so, as described under the other techniques in this section.

Overall, each of the techniques would result in the long-term improvement or maintenance of wildlife and habitat and would likewise result in the long-term increase and enhancement of recreational opportunities for hunting, wildlife viewing, hiking, and other wildlife-related recreation.

Plant Propagation Techniques

Recreational opportunities may be temporarily or permanently lost in areas undergoing active habitat enhancement through plant propagation. Areas may need to be protected to avoid incidental damage to recently planted areas, which typically are vulnerable to disturbance.

In the long-term, improvement of vegetation on communities and associated wildlife populations may increase wildlife-related recreational opportunities, as well as improve the natural character of mitigation lands.

Habitat Creation and Conversion

Recreational opportunities may be temporarily or permanently lost in areas undergoing active habitat creation or conversion. Opportunities may increase as habitat develops into more natural ecosystems and provides improved wildlife habitat.

Placing artificial nesting structures within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Water Development and Management Techniques

Placing guzzlers within natural settings can detract from the visual experience of people. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Habitat improvements from water development and management could increase wildlife-associated recreation and enhance recreational experiences where access is allowed.

Water Distribution Techniques

The establishment of pipelines, culverts, and drainage ditches/conveyance channels generally does not directly conflict with recreational use. These developments could potentially interfere with recreational access, and could detract from the natural setting and associated recreational experiences. Deep ditches with swift flows could pose a potential hazard to recreationists.

Fire Management Techniques

Prescribed burning to reduce fuels can temporarily conflict with recreational use on or near mitigation lands. Recreation opportunities may be temporarily lost while sites are closed for prescribed fire operations and during the immediately following recovery period. Drifting smoke could disturb downwind recreational use. Over the long run, fuel reduction programs reduce the

risk of high-intensity fires, which have a much greater chance of creating a long-term loss of recreational opportunity as well as short-term losses of scenic resources.

Vegetation Management: Enhancement and Control

Flooding of areas to control reed canarygrass or otherwise to manage vegetation can restrict recreational access, but can also increase some opportunities associated with water, such as bird watching or hunting. Prescribed burning to control fuels carries the risk that fire might spread to adjacent lands, with associated potential loss of recreational opportunities. (See also **Fire Management**, above.)

Species Management Techniques

Introduction, reintroduction, and augmentation of wildlife populations on mitigation lands could affect both on- and off-site recreation opportunities. Reintroduction of threatened or endangered species could require that some areas be closed to public use. Such reintroductions can also provide opportunities for the public to see rare species. Introduction of large mammals can increase hunting opportunities on mitigation areas and adjacent lands. In addition, the use of hunting as a management tool would provide increased hunting opportunities.

Multiple Use Techniques

Allowing multiple use on mitigation lands would generally increase or maintain recreational opportunities. Developing public facilities, interpretive trails and signs, wildlife viewing stations, and interpretive centers can enhance recreational opportunities and visitor experience, including opportunities for disabled individuals who would not otherwise be able to access these areas.

Transportation/Access Techniques

Transportation and access management options include land-use restrictions through fences and gates, road construction, road maintenance, and road decommissioning. Fences, gates, and road decommissioning can limit (and potentially reduce) the amount and types of recreational activities. Where unrestricted access has been allowed, newly imposed restrictions may diminish recreational opportunities. Road construction and maintenance can also enhance recreation access. Because most private lands involve some form of restricted access, such restriction under the mitigation program on lands acquired from private ownership would have a negligible impact on recreation in most instances.

Providing educational and recreational opportunities and developing facilities might expand tourism and recreational opportunities for sightseeing, camping, picnicking, swimming, boating/canoeing, and walking/hiking. However, noticeable changes in tourist/recreation uses or activity would be unlikely, because (1) the primary management emphasis would be on wildlife mitigation and not recreation, and (2) other areas managed primarily for recreation would most likely continue to attract the majority of recreational users.

4.8.4 Potential Program-Wide Mitigation Measures — Recreation/Visual

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- *For projects involving property acquisition (including leases), identify safe public recreational opportunities that do not jeopardize project biological objectives.*
- *For projects involving property acquisition (including leases), identify recreational opportunities suitable for physically disabled persons.*
- *For projects involving artificial nesting structures, screen structures from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.*
- *For projects involving installation of guzzlers, screen guzzlers from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.*
- *For projects involving the development of water conveyance channels, ensure that these areas are safe for public access or else restrict public access.*
- *For projects involving prescribed burns, identify recreational use areas within the affected environment and develop burn plans that avoid significant smoke drift into these areas during high-use periods.*
- *For projects involving the reintroduction of threatened or endangered species, establish reintroduction sites consistent with species management and/or recovery plans.*



4.9. AIR QUALITY

4.9.1 Context

- **Legal.** Several air quality programs under the Clean Air Act regulate prescribed burning and other activities. The National Ambient Air Quality Standards (NAAQS) are established to protect human health and welfare. Pollutant concentrations that exceed the NAAQS are considered injurious to public health. Air pollutants for which NAAQS have been established are called "criteria" pollutants and include particulates (PM₁₀), carbon monoxide (CO), ozone (O₃), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and lead (Pb).

The Clean Air Act requires each state to develop, adopt, and implement a State Implementation Plan (SIP) to ensure that the NAAQS are attained and maintained for each criteria pollutant. These plans must contain schedules for developing and implementing air quality programs and regulations. SIPs also contain additional regulations for areas that have violated one or more of the NAAQS (non-attainment areas). In general, non-attainment areas are located near large, urban centers with large traffic volumes and heavy industrial sources, although some rural areas are non-attainment for PM₁₀ as a result of blowing dust.

The Clean Air Act established the Prevention of Significant Deterioration (PSD) program: it prevents areas that currently have clean air from being degraded. Class I areas are subject to the most limiting restrictions on how much additional pollution can be added to the air while still protecting air quality. All National Parks and Wilderness areas are designated as Class I areas. Other jurisdictions that wish to limit degradation and that implement a plan approved by EPA can also qualify as Class I areas. Other areas not in Class I are considered Class II areas.

State and local governments have the authority to adopt their own air quality rules and regulations. These rules can be incorporated into the SIP if they are equal to, or more protective than, the corresponding Federal requirements. For example, many states have incorporated smoke management provisions for prescribed burning into their SIPs.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: violating Federal, state, or local ambient air quality standards; causing or contributing to a new violation of the NAAQS; increasing the frequency or severity of an existing violation; delaying the timely attainment of a standard; emitting more than the threshold amount of a criteria pollutant in a non-attainment area; contributing to an existing or projected air quality violation; exposing sensitive receptors (e.g., campgrounds, businesses, or residences) to irritating or harmful pollutant concentrations.

4.9.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Air Quality

Under No Action, burning levels would be prescribed on a case-by-case basis. No standardized program would be established to prevent impacts on air quality, although existing state and local regulations would be followed.

Alternative 2: Base Response - Potential Effects on Air Quality (Common to All Action Alternatives)

Prescribed burning, which would be used to varying degrees under all alternatives, can adversely affect air quality. Under some conditions, burning can reduce visibility, sometimes to a point of posing a safety hazard on public highways. Under all alternatives, project managers would be required to coordinate with state officials to ensure that impacts on air quality would be minimal and within state-defined limits. In addition, because burning already occurs on some land types expected to be selected for wildlife mitigation (e.g., crop-, range- and forest lands), burning levels might remain similar to current conditions. Each alternative involves some risk to air quality associated with aerial application of fertilizers and herbicides, as described below.

Alternative 3: Biological Objectives - Potential Effects on Air Quality

Alternative 3 has the greatest potential use of prescribed burns among the alternatives because fire is often one of the best methods to obtain the vegetation change necessary to meet biological objectives. Therefore, this alternative could generate some of the highest levels of smoke at new project sites, especially during the first few years of each new project's implementation, when prescribed fires may be used with greater frequency. Likewise, the potential for dust and emissions from heavy equipment and ground disturbance would be greatest under this alternative.

Fertilizers and herbicides would be used as needed to promote vegetation development. Techniques employed might include aerial application over relatively large areas (greater than 16 ha or 40 ac.). Agricultural use of chemicals would be low because crop production on mitigation lands would not be encouraged.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Air Quality

Relatively few impacts on air quality would be expected under this alternative because cost constraints would reduce the amount of acres burned or treated with fertilizer or herbicides.

Alternative 5: General Environmental Protection - Potential Effects on Air Quality

Alternative 5 would include a relatively low level of use for fire, fertilizers, and herbicides because protecting the environment would be a high priority. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on air quality.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Air Quality

Relatively minor impacts associated with drifting smoke would be expected under this alternative. Program-wide mitigation measures would be applied, as appropriate, to minimize potential air quality impacts.

4.9.3 Impacts of Techniques

Land Acquisition Techniques

Conversion of cropland to wildlife habitat could, over the long-term, reduce aerial application of pesticides and herbicides intended to benefit crop production, and their associated impacts on air quality.

Plant Propagation Techniques

Aerial application of herbicides can temporarily deteriorate air quality within the lands being treated and the immediate vicinity (within approximately 50 m or 164 ft.).

Habitat Creation and Conversion

Creating wetlands, artificial islands, and artificial nest structures does not significantly affect air quality. Dust and vehicle emissions during construction could temporarily reduce local air quality.

Water Development and Management Techniques

Development and management of water resources does not affect air quality. Dust and vehicle emissions during construction of water improvements could temporarily reduce local air quality.

Water Distribution Techniques

Water distribution techniques generally do not affect air quality, although dust and vehicle emissions during construction could temporarily reduce local air quality.

Fire Management Techniques

Fire can significantly degrade air quality. Smoke effects are typically local, although the cumulative effects of burning on lands acquired for wildlife mitigation, considered with agricultural and silvicultural burning or wind-blown erosion, could cause regional effects, especially in Class I areas with pristine views.

Over the long term, prescribed burning decreases the risk of high-intensity wildfires and the associated air quality impacts. High-intensity fires generally create more smoke than prescribed burns because more fuel is burned per unit of area and greater areas of fuels are burnt.

Vegetation Management: Enhancement and Control

Aerial application of herbicides can locally deteriorate air quality. Prescribed fire can reduce air quality in the short term, as described under **Fire Management Techniques**, above.

Species Management Techniques

Species management techniques do not significantly affect air quality.

Multiple Use Techniques

Allowing crop production on mitigation lands could reduce local air quality associated with farming, including aerial application of herbicides and emissions of dust through wind erosion.

Providing educational and recreational opportunities can attract visitors, which may cause temporary increases in very local dust and automotive emissions in and near parking lots. In addition, forest management on mitigation lands may require some use of prescribed burns, which would temporarily reduce local air quality.

Transportation/Access Techniques

Transportation and access techniques do not significantly affect air quality.

4.9.4 Potential Program-Wide Mitigation Measures — Air Quality

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Restrict prescribed fire to specific conditions, such as when (1) weather conditions and forecasts are favorable to a controlled burn, (2) air quality is sufficiently high to allow local smoke emissions, and (3) smoke dispersion conditions are favorable.
- Use state-defined smoke management direction to determine allowable smoke quantities.
- *For projects involving the aerial application of herbicides*, develop specific protocols for use of herbicides, including protocols to protect air quality. Protocols could be adapted from the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).
- Do not conduct prescribed burns unless (1) weather conditions and forecasts are favorable for a controlled burn, and (2) predicted emissions will not violate local air quality standards.

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4.10 CUMULATIVE IMPACTS

Cumulative impacts can result from "individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). This section examines two levels of cumulative effects that may result from implementing BPA's proposed wildlife mitigation program:

(1) impacts of all future BPA wildlife mitigation projects considered together, and (2) impacts of all future wildlife mitigation projects considered collectively with other past, present and future activities within the Columbia River Basin.

4.10.1 Cumulative Impacts of All Future Wildlife Mitigation Projects

The five action alternatives analyzed in this EIS would establish a standard planning process under which BPA could carry out a large number of projects. BPA could implement 50 or more individual wildlife mitigation projects within the Columbia River Basin over the next decade.

Individual projects would range in size from tens of hectares to several hundred hectares (a few hundred acres to several thousand acres). Relatively minor impacts that may occur at individual projects could occur over many hundreds of hectares/acres when all individual projects are considered together.

However, when examined within the broad geographic extent of the project area, adverse impacts of each project would be localized and relatively minor. Overall, wildlife mitigation throughout the Columbia River Basin would provide a net benefit to wildlife habitat and other natural resources, such as soils, water quality, vegetation, and fish. Other impacts, as described in this chapter (e.g., reduction of available land for grazing), would affect only a small portion of lands available for such uses within the Columbia River Basin.

4.10.2 Cumulative Impacts of All Future Wildlife Mitigation Projects Considered Together with Past, Present, and Future Human Actions in the Columbia River Basin

Impacts from developing new mitigation sites across the Columbia River Basin would add to past, present, and future impacts occurring from other human activities in the region. For example, reduction in timber production at new wildlife mitigation sites, although minor in relation to the total amount of land available for these uses, would nonetheless aggravate existing and reasonably foreseeable reductions in available timber. Timber harvest on Federal forest lands, and, to a somewhat lesser degree, on private forest lands, has steadily declined in recent years because of poor forest health and because of increasing environmental and regulatory constraints (e.g. riparian habitat protection for water quality and anadromous fish runs).

Available grazing lands might also decline in the future as some rangelands are developed, as Federal fee structures are reexamined, and as best management practices (BMPs) are implemented to ensure compliance with the Clean Water Act (Bureau of Land Management 1994). Reduction of available range resulting from wildlife mitigation projects would add to these declines.

Prescribed burning at mitigation lands might add to existing or future regional air quality problems. Under certain climatic conditions, air pollution from field burning in the central Columbia Basin, wildfires or prescribed burning on forest lands, dust blown from exposed soils on agricultural lands, and urban air pollution from human population centers might combine to reduce visibility and general air quality over large areas.

The extent to which wildlife mitigation projects would create or aggravate negative cumulative effects on any given resource would be mitigated by establishing the eight-step ecosystem planning process with the associated prescriptions of the alternatives, which include coordinated planning with other Federal and State agencies, Tribes, and private landowners as part of watershed activities. Negative cumulative impacts may be further minimized or avoided by applying, as appropriate, potential program-wide mitigation measures to protect the environment.

Wildlife mitigation activities would have numerous beneficial effects on the wildlife and other resources throughout the Columbia River Basin. For example, the process of securing and managing lands for wildlife would provide both short-term and long-term benefits to wildlife. The acquisition of lands for wildlife would protect existing wildlife habitat values and ensure habitat availability for wildlife species in the future. Human populations would also benefit from lands acquired for wildlife as opportunities for recreation (e.g., wildlife viewing) are maintained. Acquisition of private lands would also provide additional protection of cultural resources not required of private landowners.

Plant propagation also would benefit resources within the Basin. Plant propagation techniques (e.g., seeding, planting) would increase vegetative diversity, thus providing wildlife with greater habitat diversity. Also plant propagation would decrease soil erosion by stabilizing exposed soils. This would benefit water quality which is important to fish and wildlife, as well as to human populations. The removal of livestock would improve habitat conditions, increasing wildlife populations.

Habitat restoration/enhancement techniques would also benefit fish, wildlife, and human populations. Where wetland habitats are restored or enhanced, the quality of ground and surface waters is expected to improve. Restoration of wetlands may also raise groundwater levels (which may allow agricultural practices to occur with less irrigation or result in new naturally occurring vegetated areas) and buffer the effects of floods. Island restoration and other habitat enhancement projects would increase habitat diversity, thus benefiting wildlife populations.

Water development, management, and distribution techniques would bring water to areas previously without water. These new sources of water would benefit wildlife populations; the increased presence of vegetation would improve wildlife habitat diversity. Opportunities for agricultural development may be extended, possibly generating revenue for farmers and providing habitat for certain wildlife species.

Vegetation management techniques would help control invasive species that are currently limiting vegetative diversity. Thus, wildlife would benefit from improved habitat diversity. The re-establishment of native species would benefit fish and wildlife, as well as traditional Native American cultural uses. Implemented fire management techniques would help protect wildlife

habitats and areas of human concern (e.g., facilities) from the risk of high-intensity fires. Prescribed burns would benefit wildlife by creating and maintaining habitat diversity.

Species management techniques such as species introductions or the control of certain species would be beneficial by creating a more natural ecosystem in the Columbia River Basin. The reintroduction of certain species would help ensure their long-term survival. Humans would benefit from these efforts as well, since the intrinsic and aesthetic values of wildlife would be preserved for future generations.

Multiple use techniques implemented in conjunction with wildlife mitigation activities would also provide benefits to resources throughout the Columbia River Basin. For example, grazing by cattle and crop production would create and maintain habitat types required by wildlife species while also providing economic benefits. The preservation of undeveloped areas in the Basin would provide short-term and long-term benefits to wildlife habitat and populations, protect aesthetic values, and provide recreational opportunities.”

4.11 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires that EISs consider the effects of short-term uses on long-term productivity. *Short-term uses* of the environment are those that occur as discrete events or that can occur on a year-to-year basis. Examples include cattle grazing, timber harvest, recreation, and irrigation. New wildlife mitigation projects may include a variety of short-term uses to achieve mitigation goals: these may include irrigation, controlled grazing, and selective harvesting of trees.

Long-term productivity refers to the capability of the land to provide resources, both market and non-market, for future generations. In the vast majority of cases, development of new wildlife mitigation projects would increase the long-term productivity of the land in terms of capacity. Soils, which play a critical role in nutrient, water, and atmospheric cycles, are equally critical to the long-term productivity of the land. Because soil conditions would be maintained or improved at new mitigation sites, these sites would also support or enhance the production capacity of the land. However, market use of resources on mitigation land would be allowed only as they support the project's biological objectives; therefore, long-term production in terms of commercial products such as timber, beef, and crops would be reduced or lost at new mitigation sites.

4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources refers to use of non-renewable resources such as minerals and petroleum-based fuels. Wildlife mitigation projects may include the use of gravel, sand, and other non-renewable materials to construct access roads, trails, or other features. Materials may come either from on-site borrow pits or from outside sources. Projects would also require some petroleum-based fuels for vehicles and equipment, although wildlife mitigation projects generally require few non-renewable resources.

Irretrievable commitment of resources are those commitments that result in the lost production or use of renewable resources, such as timber or rangeland. Development of wildlife mitigation projects would result in such commitments because some lands currently providing renewable resources would be allocated to wildlife mitigation. For example, forests on mitigation lands would be managed to benefit wildlife rather than to produce timber. Because of this, increased volume growth that could have been achieved through silvicultural prescriptions would be foregone, an irretrievable commitment of timber resources. Other irretrievable commitments include land lost to grazing, crop production, and (in some cases) recreational use. These commitments are irretrievable rather than irreversible, because management direction could change in the future so as to allow these uses.

4.13 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Some adverse environmental impacts associated with new wildlife mitigation areas are unavoidable (i.e., cannot be fully mitigated). These impacts are disclosed in the "Alternative 2: Base Response" section of each resource impact assessment (e.g. soils, land and shoreline use, etc.) and are summarized below.

4.13.1 Soils

Soils would be disturbed during the initial phases of most new projects. Depending on the level of human use allowed at each individual project site, and on the aggressiveness of mitigation actions taken (e.g., planting programs), soils could be disturbed to various degrees over several years. On the whole, wildlife mitigation programs would serve to stabilize soils and provide long-term protection, especially at riparian areas (where soils are typically most susceptible to erosion).

4.13.2 Fish and Water Resources/Quality

Activities at some new wildlife mitigation sites would contribute sediments to adjacent surface waters during the short-term implementation period. However, because state water regulations would be followed under all alternatives, and because program-wide mitigation measures would be applied, as appropriate, under Alternatives 5 or 6, no significant impacts are expected. Eventually, sediment contributions would decrease as riparian and other vegetation zones become established.

4.13.3 Vegetation

Removal of some existing vegetation as part of wildlife habitat improvement activities would be unavoidable in many cases. Under all alternatives, rare, threatened, or endangered plant species or high-quality native plant communities would be protected.

4.13.4 Wildlife

All alternatives would benefit target wildlife species, as well as numerous other native species. With application of program-wide mitigation measures, as appropriate, only minor disturbance of wildlife would occur under Alternatives 5 or 6.

4.13.5 Land and Shoreline Use

For most new mitigation projects, change in land use would be unavoidable. In some cases, however, lands acquired for mitigation purposes may previously have been fallow or otherwise not actively used, and conversion to mitigation lands would not significantly change land use.

4.13.6 Cultural Resources

Wildlife mitigation sites are generally compatible with cultural resource protection. However, ground-disturbing activities such as wetland construction or installation of pipelines can adversely affect archeological resources. Program-wide measures would help to protect cultural resources under Alternatives 5 and 6, but inadvertent impacts are possible.

4.13.7 Economics

Some loss in local revenues and taxes would occur wherever commercial land uses are halted, as part of new wildlife mitigation projects.

4.13.8 Recreation

Access restrictions would be necessary in some areas to protect sensitive wildlife habitats.

4.13.9 Air Quality

Smoke from prescribed burning conducted to improve wildlife habitat or to manage fuel loads would cause local reductions in visibility and air quality.

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