

4 Environmental Consequences

This chapter assesses the environmental impacts expected to occur from the implementation of alternatives A or B, as described in chapter 2. Environmental impacts are analyzed by issues for each alternative and appear in the same order as discussed in chapter 2.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

This section describes the estimated effects on climate change, wildlife habitat, and water resources of carrying out alternatives A and B.

CLIMATE CHANGE

Climate change is the pre-eminent issue for conservation in future decades. Current trends in climate change are expected to affect high mountain ecotypes and lower elevation, snow-melt dependent watersheds, such as those found in the Swan Valley, more acutely than some other landscape ecotypes. Predictions regarding the specific effects of climate change in the Swan Valley are in the early stages. Empirical data indicates that during the twentieth century, the region has grown warmer, and in some areas drier. Annual average temperature has increased 1–3 degrees over most of the region. This seemingly modest increase masks much larger shifts in minimum winter temperatures (10°F) and shifts in maximum summer temperatures (7°F). In the 2007 Introduction to the Summary for Policy Makers Synthesis Report, the Intergovernmental Panel on Climate Change stated that average air temperatures may rise by up to 6°C by the end of

this century, according to regionally downscaled models from the Pacific Northwest (USFWS 2009c).

Changes in temperature and precipitation are expected to decrease snowpack and will affect stream flow and water quality throughout the Swan Valley. Warmer temperatures will result in more winter precipitation falling as rain rather than snow throughout much of the region particularly in mid-elevation basins where average winter temperatures are near freezing. This will result in

- Less winter snow accumulation;
- Higher winter streamflows;
- Earlier spring snowmelt;
- Earlier peak spring streamflow and lower summer streamflows in rivers that depend on snowmelt (USFWS 2009c).

As glaciers and alpine snow fields melt and winters warm in Montana, specialized habitat for fish and wildlife species is expected to diminish. Snow conditions that facilitate hunting success for forest carnivores, such as Canada lynx, are now changing due to winter warming (Stenseth 2004). High elevation forest plants such as whitebark pine (an important food source for grizzly bears) and other birds and mammals throughout the Crown of the Continent and Greater Yellowstone ecosystems (Kendall and Arno 1989) will also be negatively impacted by winter warming. Whitebark pine is susceptible to increased mortality as the incidence of drought, high elevation wildfire, and mountain pine beetle attacks, all associated with a warming climate increase (Hanna et al. 2009).

This warming may also have impacts on grizzly bears. Important food resources are expected to decline as warming causes an increase in whitebark pine blister rust, reducing the availability of the pine to bears. This may result in shifts in foraging elevations and a potential increase in grizzly bear conflict with humans and livestock.

According to Service Grizzly Bear Recovery Coordinator, Chris Servheen (University of Montana, Missoula, MT; personal interview in person, 11 June 2008), it is highly likely that grizzly bear delayed fall den entry dates and earlier spring-emergence dates will begin occurring in the Swan Valley as they have in the Greater Yellowstone area, related to climate change. This will also potentially increase their likelihood of human-caused mortality from increased encounters (Endangered Species Coalition 2009).



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Coniferous forest of the Swan Valley.

As late summer flows are affected by global warming, fewer rivers will be able to supply ample cold water required by species such as bull trout. Bull trout distribution is expected to be interrupted by the heightened ambient air temperatures (Endangered Species Coalition 2009).

The impacts of climate change will extend beyond the boundaries of any single refuge or easement program and will require large-scale, landscape level solutions that extend throughout the CoCE. The collective goal of each of the proposed project areas (Blackfoot Valley, Rocky Mountain Front, Swan Valley) is to build resilience in ecological systems and communities, so that, even as climate conditions change, the CoCE will continue to support its full range of native biodiversity and ecological processes. Building resilience includes maintaining intact, interconnected landscapes, and restoring fragmented or degraded habitats.

ADAPTATION, MITIGATION, AND ENGAGEMENT

The Service strategic response to climate change involves three core strategies: adaptation, mitigation, and engagement (USFWS 2009c). Through adaptation, the impacts of climate change on wildlife can be reduced by conserving habitats that are expected to be resilient.

Increased landscape connectivity is one of the most effective methods to help wildlife adapt to climate change. Large landscapes, especially those within mountains, and the ability to move between them, provide the best chances for plant and animal species, as well as ecosystems and ecological processes, to survive changing conditions. The ability to migrate to higher latitudes, higher elevations, or cooler exposures can make possible the successful adaptation of plants and animals. The Yellowstone to Yukon ecosystem, which includes the CoCE, is the most intact mountain ecosystem remaining on earth and is one of the world's few remaining areas with the geographic variety and biological diversity to accommodate the wide-scale adaptive responses that might allow whole populations of animals and plants to survive (Yellowstone to Yukon Conservation Initiative Yellowstone to Yukon 2009).

One of the results of changing climates is the alteration of the habitats upon which wildlife depend. Wildlife will have to adapt to changes in habitat to survive. Protecting and linking contiguous blocks of unfragmented habitat will facilitate movement of wildlife responding to climate change.

Carbon sequestration forms one of the key elements of mitigation. The Swan Valley CA will protect large forested areas from subdivision. Forests are critically important in the efforts to remove CO₂ from the atmosphere and mitigate climate change. The CO₂ from the atmosphere is absorbed by trees through photosynthesis and stored as carbon in the tree

trunk, branches, foliage, and roots, with oxygen as a byproduct. The organic matter in forest soils, such as the humus produced by the decomposition of dead plant material, also acts to store carbon.

Engagement involves cooperation, communication, and partnerships to address the conservation challenges presented by climate change (USFWS 2009c). The proposed project is located in an area that is designated as a high priority for conservation and linkage protection by many of our partners including Montana Fish, Wildlife and Parks; The National Fish and Wildlife Foundation; The Nature Conservancy; The Kootenai River Network; The Swan Ecosystem Center; The Northwest Connections; Vital Ground; Trout Unlimited; Trust for Public Lands; and The Yellowstone to Yukon Initiative. Many of these organizations are involved in trans-boundary conservation, protecting and connecting habitat in the United States and Canada. Strong partnerships have already been developed to meet the challenges of climate change and wildlife resources.

Given the level of public and private partnerships focused on land protection within the Swan Valley CA, this landscape is an extremely promising large-scale opportunity in North America to improve species resiliency and adaptation in the face of climate change.

WILDLIFE HABITAT—ALTERNATIVE A

Although efforts by the Service's Partners for Fish and Wildlife (PFW) program and other partners would continue to enhance habitat on some private lands, degradation of resources on many unprotected lands would continue. These potential impacts could result in the further decline of migratory birds, resident wildlife, and listed species.

Increasing urbanization which causes increased fragmentation of habitat from housing developments and associated road development is a major threat to Swan Valley. Most current published statistics (2000–2009) by the U.S. Census Bureau reported Missoula and Lake counties experiencing a 13.4% increase in population from 2000. Montana as a whole experienced a 10.5% increase within that same period (U.S. Census Bureau 2010).

Many acres of land would likely be developed for recreational home sites or isolated commercial uses, as economic forces change in the future. In recent years, subdivision and the demand for recreational property has been present in western Montana, posing the greatest single threat to the Swan Valley. Lands adjacent to natural areas are choice home sites and are targeted for residential development.

No action would result in loss of opportunity to protect historically important upland and wetland habitats. Without the protection of private land with

conservation easements, the future of wildlife habitat in the project area would be uncertain.

Habitat fragmentation is one the greatest impacts caused by rural subdivision and residential development. In the Lake County portion of the proposed project area, the county has established density and development regulations (Lake County 2009). The private lands within the proposed project area have been restricted to between 10–40 acres per unit, depending on location. As long as these regulations are in place, this does provide some protection against high density housing units. However, some landowners did secure subdivision rights prior to the enactment of these regulations. In Missoula County, there are currently no zoning regulations and therefore rural subdivision and associated habitat fragmentation are a greater concern.

Private land subdivision results in smaller ownerships. Subsequent effects such as invasive plant infestations; increased fencing, roads, and vehicle traffic; and loss of habitat and travel corridors for wildlife would likely impact wildlife. In addition, these effects would bring increased human presence in the form of snowmobiles, predator–prey shifts, and sources of disturbance that can disrupt wildlife movement patterns and render habitat unusable.

Dispersed development leads to an increase in open road density and road use. Households in Montana are increasing faster than the population, due to an increase in second home development. An increase in the numbers of roads, cars, and truck traffic also accompanies this development. Numerous studies have shown the negative effects of open road densities on wildlife, which include wildlife displacement and increased mortality due to wildlife–vehicle collisions (Trombulak and Frissell 2000).

Increased human settlement can also result in increased human–wildlife conflicts, a known cause of increased mortality to bears. In addition, these effects would bring increased human presence in the form of snowmobiles, predator–prey shifts, and sources of disturbance that can disrupt wildlife movement patterns and render habitat unusable.

Loss of habitat and travel corridors for wolverine, Canada lynx, grizzly bear, gray wolf, and other species would likely have a negative impact on these species' populations in Swan Valley. These key geographic and biological linkages can be lost and wildlife populations can be isolated once an area is fragmented by subdivisions or other development.

Dispersed development results in expansion of the wildland–urban interface (WUI). The WUI is the zone where structures and other human development are within the vicinity of forests and other wildlands.

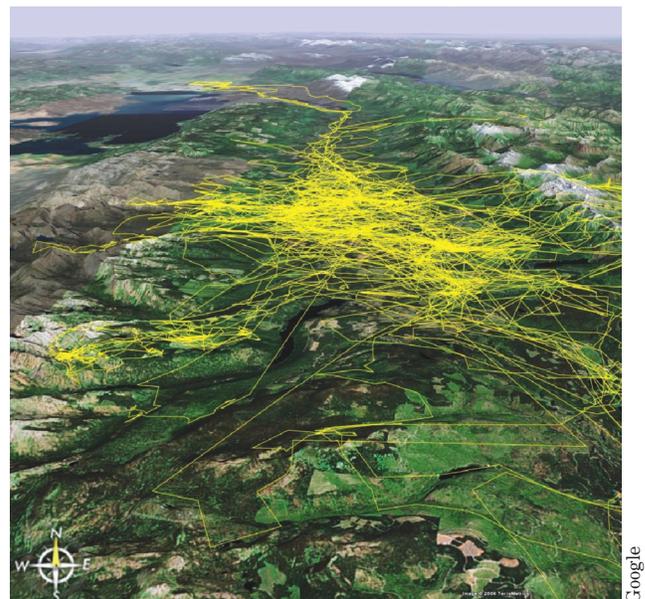
In the 1990s mining, logging, and wood product industries were declining while health services,

trade contractors, business services, and real estate development were growing. A major difference between the old economy (timber, mining, and ranching) and the new economy (residential development and amenities) is the level of permanence. Impacts from logging, and to a lesser extent, mining can be reclaimed; trees and other vegetative cover can regenerate and logging roads can be closed and obliterated. However, subdivisions and developments are more permanent and offer fewer possibilities of wildlife habitat restoration in the future.

Riparian habitat loss due to development is also a concern. Riparian habitat is a key component to grizzly bear movement between the mountains and valley. Riparian areas also provide nest sites for many species of migratory birds that may be negatively impacted by development. In addition, riparian habitat in the Swan Valley is important for the threatened bull trout.

When development occurs in close proximity to streams and rivers, riparian vegetation may be impaired and the natural flooding regime that helps to maintain riparian communities may be altered. Dispersed residential development can have multiple impacts on riparian communities, particularly if there is no stream setback zoning in the county where the watershed is located.

Residential and resort development, and its associated human activity near streams, lakes, and rivers can also impact native salmonids. Salmonids are a family of fish containing salmon, trout, and whitefish. Increased water use because of development can lead to reduced stream flows, elevated stream temperatures, and further constraints on rearing habitats and migratory corridors. Additionally, deforestation and



Grizzly bear movements.

development along the stream banks can contribute to surface runoff and subsequent soil erosion which can cause excessive sedimentation. Sedimentation can degrade water quality and instream and riparian habitats, and can impact the health of fish, aquatic invertebrates, and aquatic plants.

WILDLIFE HABITAT—ALTERNATIVE B

Establishing the Swan Valley CA would provide for the conservation of up to 11,000 acres of important habitat on private land. This program would help maintain the uniqueness of the Swan Valley and complement conservation efforts of the MFWP, TNC, TPL, Montana Land Reliance, Vital Ground, Swan Valley Ecosystem Center, and other federal and state agencies.

Conservation easements within the Swan Valley would help alleviate habitat fragmentation issues. Key biological linkages would facilitate wildlife movement and provide for wildlife habitat requirements. The potential for human—wildlife conflicts would be greatly reduced.

Compatible agricultural practices such as livestock grazing or haying would continue, while sodbusting (breaking up of native rangeland) and wetland drainage would be prohibited. Easements would maximize the connectivity with other protected lands and decrease the negative impacts of habitat fragmentation on grassland birds (Owens and Myers 1972).

WATER RESOURCES—ALTERNATIVE A

The prospect of residential development in the Swan Valley represents a potentially significant threat to aquatic habitat. Sewage-derived nutrient additions to streams and lakes could have detrimental effects of the aquatic ecology (Wernick et al. 1998).

Housing developments can also result in additional wetland drainage, water diversion, and introduction of invasive species. Development could also change drainage patterns or rate of surface runoff, increasing soil erosion and nonpoint source pollution.

As demand for potable water increases for new subdivisions, water rights could be questioned and challenged to a greater extent in the future. Groundwater aquifers would receive more demand, resulting in potential degradation to the hydrology of some wetland areas.

WATER RESOURCES—ALTERNATIVE B

Water resources on the 11,000 acres of conservation easements and the additional fee-title acquisitions would be protected from increased nonpoint source pollution from residential subdivision, commercial

development, and draining of wetlands, all of which are prohibited under the proposed easement program. This protection would also improve water resources throughout the Swan Valley watershed.

Landowners participating in the conservation easement program would continue to own and control water rights.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

This section describes the estimated effects of alternatives A and B on land ownership and land use, the value of intact ecosystems, wind energy development, public use, and economic impacts.

LANDOWNERSHIP AND LAND USE—ALTERNATIVE A

The resources studied by the Service for conservation easements and fee-title acquisition in the Swan Valley would remain in private ownership with no restrictions.

Landowners that subdivide could increase their revenue by developing recreational home sites. With subdivision, tracts could potentially increase in value if there is desire to cluster housing or to keep open space for future housing developments.

The community would lose open space and the aesthetics of the Swan Valley would diminish significantly. Subdivision and development would reduce hunting and wildlife observation opportunities and diminish revenue associated with these activities to local communities.

LANDOWNERSHIP AND LAND USE—ALTERNATIVE B

The Swan River watershed includes the communities of Condon, Salmon Prairie, Swan Lake, Ferndale, and Bigfork and spans portions of Lake and Flathead counties.

The remaining private land in the Swan Valley is relatively undeveloped except for two small communities totaling less than 400 people.

The Service will purchase up to 1,000 acres of fee-title land, and approximately 10,000 acres of conservation easements. Only willing sellers would be considered and paid appraised market value for these lands. Buffer areas will be maintained around rural communities to provide them with the ability to meet their community development goals and objectives.

VALUE OF INTACT ECOSYSTEMS

Humans influence every ecosystem on earth, leading to impairment of natural ecosystem structure and function (MEA 2005). Converting native land to row-crop agriculture, suppressing fire, diverting water flow, increasing nutrient and toxic pollution, altering global precipitation patterns and gas concentration, and homogenizing and lowering global biodiversity are a few of the ways humans have altered ecosystems. North American forests, savannas, and grasslands have experienced substantial losses, whereas woody savanna, shrubland, and desert areas have expanded because of desertification and woody expansion into grasslands (Wali et al. 2002), inevitably leading to changes in ecosystem function (Dodds et al. 2008).

Alternative A (no action)

Under the no action alternative, the threat of habitat fragmentation will continue unabated. Landowners may continue to face economic pressures to subdivide their property. Habitat fragmentation would compress the project area, leaving fewer larger parcels of intact habitat.

Alternative B – Proposed Action

Conserving native land cover is an important component of maintaining ecosystem structure and function. Under the proposed action, native forest habitats would remain intact, continuing to provide ecosystem goods and services to landowners and local communities. Ecosystem services include: soil erosion control, water supply, biodiversity, and carbon sequestration. The proposed action would help protect valuable ecosystem services (see figure 4). The Swan Valley is a relatively intact system. Protecting this system is cheaper than the prohibitively high cost of restoration.

WIND ENERGY DEVELOPMENT—ALTERNATIVE A

Wind development within the Swan Valley may occur; however, the valley is not conducive to large scale commercial or industrial development of wind energy. Wind energy effects on the landscape include habitat fragmentation and vertical structural barriers. The Service would focus on assisting with proper sighting of towers, because the placement of towers and associated infrastructure is critical in reducing impacts to habitat and wildlife.

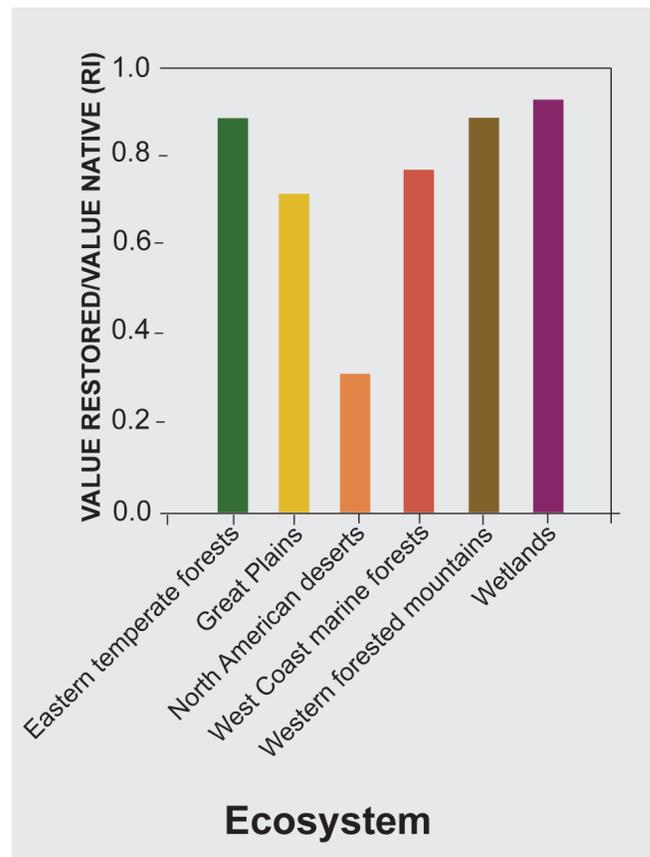
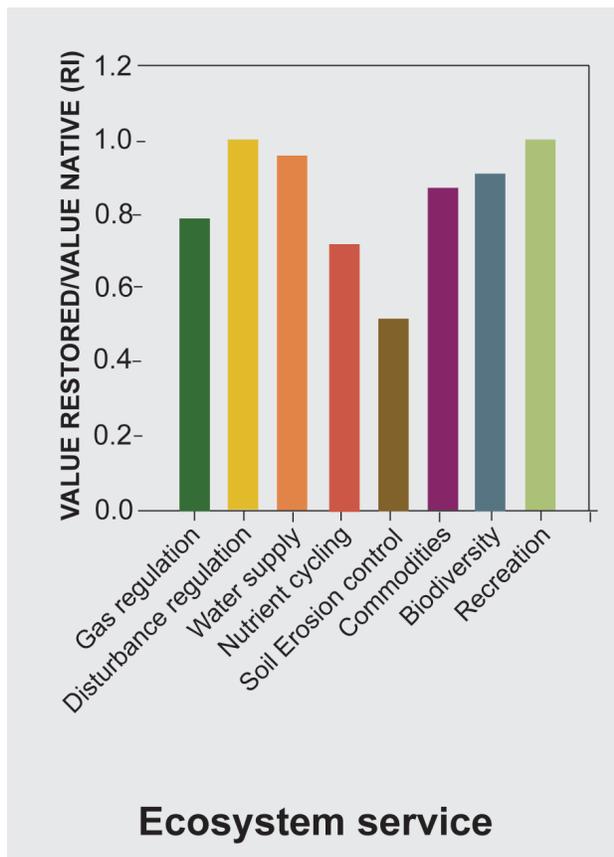


Figure 4. Relative native and restored benefits of ecosystem goods and services. The relative value, RI, is determined as the ratio of estimated benefits derived from native and restored acreages per year.

(Source: Dodds et al. 2008)

WIND ENERGY DEVELOPMENT—ALTERNATIVE B

Wind development within the Swan Valley Conservation Area would not occur on conservation easement and fee-title properties due to restrictions on wind development. This reduces fragmentation within the valley from the placement of towers and associated infrastructure development. This improves wildlife corridors’ integrity throughout the valley and helps reduce human-bear conflicts. Restricting wind towers also prevents mortality from direct strikes of towers by migratory birds and other avian wildlife species.

PUBLIC USE—ALTERNATIVE A

The Service would not purchase conservation easements, and landowners would manage public use. No additional public use opportunities in the Swan Valley would occur.

PUBLIC USE—ALTERNATIVE B

Conservation easements purchased on private tracts would not change the landowner’s right to manage public access to their property. Under the proposed easement program private landowners would retain full control over their property rights, including allowing or restricting hunting and fishing on their lands.

Lands purchased in fee-title would be managed as part of the Swan River NWR, which is provides public use. Wildlife-dependent recreation opportunities at the Swan River NWR include hunting, fishing, wildlife observation and photography, interpretation, and environmental education. Fee-title acquisition would provide additional recreational opportunities on the refuge.

ECONOMIC IMPACTS—ALTERNATIVE A

Under alternative A, the no-action alternative, economic impacts will remain at current levels.

The Swan Valley CA does not currently exist; therefore there are no FTE employees or operating expenditures. There are no current economic impacts associated with the Swan Valley CA.

ECONOMIC IMPACTS—ALTERNATIVE B

Under alternative B, increases in employment, annual operating expenditure and easement purchases would contribute to the economic activity that the Benton Lake National Wildlife Refuge Complex generates in the project area. The socioeconomic impact of visitor expenditure is not included in this analysis as historical public visitor data at conservation areas is not available, and visitor increases due to public awareness of conservation activities is difficult to quantify.

According to Service staff, new employment associated with alternative B will require 1.67 FTE employees and \$91,518 in salaries or an average of \$54,911 per new employee. Assuming employees spend 79 percent of their earnings locally, the direct socioeconomic impact of increased employment at Swan Valley CA is \$72,299 annually.

Alternative B would add approximately \$15,210 in operating expenditures associated with landowner management, employee training and travel expenses. These funds are spent on local goods and services and therefore directly impact the economy in the study area.

The direct economic impact of easement acquisitions are more difficult to attribute to the study area as it is less obvious where landowners may spend this income. In the Swan Valley CA, easements are worth an estimated \$25,000,000. Table 4 presents a summary of annual operating costs and salaries associated with Alternative B.

Table 4. Swan Valley Conservation Area economic impacts.

	<i>Current Impacts</i>	<i>Alternative B Impacts</i>
Salaries	-	\$72,299
Operations	-	\$15,210
Total Impacts	-	\$87,509
Increase above baseline	\$87,509	

As shown above, the total direct economic impacts related to the Swan Valley CA under management Alternative B are estimated at \$87,509.

UNAVOIDABLE ADVERSE IMPACTS

Any adverse effects that may be unavoidable while carrying out alternatives A and B are described on the following page.

ALTERNATIVE A

The adverse impacts of degradation and habitat fragmentation would be expected to be more widespread and prevalent in the project areas.

ALTERNATIVE B

No direct or indirect unavoidable adverse impacts to the environment would result from the selection of alternative B. The easement program would not result in unavoidable adverse impacts on the physical or biological environment. The selection of an approved boundary would not, by itself, affect any aspect of land ownership or values.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Any commitments of resources that may be irreversible or irretrievable as a result of carrying out alternatives A and B are described below.

ALTERNATIVE A

There would be no additional commitment of resources by the Service if no action is taken.

ALTERNATIVE B

There would not be any irreversible or irretrievable commitments of resources associated with establishing the conservation easement program, as lands will only be acquired as funding is available. Once easements are acquired, irreversible and irretrievable commitments of funds to protect these lands (such as expenditure for fuel and staff for monitoring) would exist.

SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

This section discusses the short- and long-term impacts for alternatives A and B.

ALTERNATIVE A

Properties may be sold to developers for short-term gains, which would have a negative impact on the long-term biological productivity of the area.

Over the long term, the costs to counties to sustain development in rural areas could be significant (see the “Landownership and Use” section on page 20).

ALTERNATIVE B

The proposed conservation easement program would maintain the long term biological productivity of the Swan Valley and increased protection of endangered and threatened species and maintenance of biological diversity.

The nation would gain the protection of a variety of wildlife species for future generations of Americans. The public would gain long-term opportunities for wildlife-dependent recreational activities from the continued presence of wildlife in the Swan Valley.

CUMULATIVE IMPACTS

This section describes the cumulative impacts that may result from the combination of expected actions in alternatives A or B, together with other biological and socioeconomic conditions, events, and developments.

ALTERNATIVE A

Current Service program work such as Partners for Fish and Wildlife would continue within the Swan watershed. The Service would continue to work cooperatively with landowners to voluntarily improve habitat on private land and minimize bear-human conflicts.

ALTERNATIVE B

Through the proposed easement program and limited fee-title purchase, approximately 11,000 acres of privately owned biologically important habitats would be added to the 332,000 acres within the Swan Valley watershed project area that already have some level of protection. This would have long term positive impacts on wildlife habitat and result in the long term conservation of migratory birds, threatened and endangered species, native plants, and the overall biological diversity of the Swan River watershed.

Within the CoCE, areas that were not suitable for homesteading and settlement were designated as federal lands. Settlers selected the milder and fertile valleys for homesteading. Land use was predominately ranching, a lifestyle which maintained economic feasibility for the landowners and prevented the loss of habitat for residential or commercial development. These areas are now currently under the greatest developmental pressure as cattle prices continue to decline and developers offer large cash incentives.

The Swan Valley CA is one project area within the CoCE. All project areas within the CoCE focus on (1) maintaining biological diversity related to wildlife values, (2) linking together existing protected areas, (3) preserving existing wildlife corridors, and (3) protecting a large, intact, functioning ecosystem, while maintaining the rural character and agricultural lifestyle of western Montana. Funding would come primarily from the Land and Water Conservation Fund and potential conservation partners. Table 5 shows the proposed acquisition acreage, type of acquisition tool, focal species, and key partners for each of the three project areas, Blackfoot Valley Wildlife Management Area expansion, Rocky Mountain Front Conservation Area expansion, and Swan Valley Conservation Area.

The annual operations budget related to the current easement programs within the Benton Lake National Wildlife Refuge Complex is \$22,123. These funds are spent on local goods and services and therefore directly impact the economy in the study area. An estimated 6.167 FTE are devoted to the two existing project areas (Blackfoot Valley Wildlife Management Area and the Rocky Mountain Front Conservation Area). These 6.167 FTEs have an average salary of \$46,838 per employee or a total of \$288,832. Using the Bureau of Labor Statistics Consumer Expenditure

Survey data for individuals in these income categories, roughly 79 percent of annual income is spent locally. Assuming employees spend 79 percent of their earnings locally, the socioeconomic impacts of increased employment among all conservation areas is \$228,177 annually.

Combining the effects of USFWS employment and operations, the total economic activity generated by the conservation areas is approximately \$250,300 annually.

If all three conservation area proposals occur, as described by Alternative B, new total direct economic impact would be \$531,620 annually, an increase of \$281,320 from current baseline impacts.

Table 5. Summary of project proposals for the Crown of the Continent ecosystem.

<i>Project Area</i>	<i>Proposed Project Area</i>	<i>Potential New Acreage</i>	<i>Type of Acquisition Tool</i>	<i>Focal Species</i>	<i>Key Partners</i>
Rocky Mountain Front Conservation Area Expansion	Expand existing area from 527,000 acres to 918,000 acres	125,000 acres	Conservation easement	Grizzly bear, migratory birds, long-billed curlew, Sprague's pipit, McCown's longspur	Private landowners, The Nature Conservancy, The Conservation Fund, Richard King Mellon Foundation
Blackfoot Valley Wildlife Management Area Expansion	Expand existing area from 165,000 acres to 824,024 acres	80,000 acres	Conservation easement	Grizzly bear, Canada lynx, bull trout, westslope cutthroat trout, migratory birds	Private landowners, The Blackfoot Challenge, The Nature Conservancy, Trout Unlimited
Swan Valley Conservation Area	New proposed area of 187,400 acres	11000 acres	Conservation easement and limited fee-title (less than 1,000 acres)	Grizzly bear, Canada lynx, bull trout, migratory birds: Lewis' woodpecker, black tern, trumpeter swan, olive-sided flycatcher	Private landowners, The Nature Conservancy, Trust for Public Lands, Swan Valley Ecosystem Center, Plum Creek Timber Company, Vital Ground, Trout Unlimited, Northwest Connections

