Southwestern Crown of the Continent Landscape Restoration Strategy

Prepared by

Southwestern Crown Collaborative*

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*****The Southwestern Crown Collaborative is a diverse group of people who have come together out of a shared commitment to the Southwestern Crown landscape. The following organizations and agencies are members of the Collaborative, and we are working to expand our membership:

American Wildlands
Blackfoot Challenge
Clearwater Resource Council
Ecosystem Management Research Institute
Flathead National Forest
Helena National Forest
Lolo National Forest
Montana Community Development Corporation
Montana Department of Natural Resources and Conservation
Montana Forest Restoration Committee
National Wildlife Federation
The Nature Conservancy
Northwest Connections
Pyramid Mountain Lumber, Inc.
Rocky Mountain Elk Foundation
Swan Ecosystem Center
Trust for Public Land
United States Forest Service, Northern Region
University of Montana
Wild West Institute
The Wilderness Society

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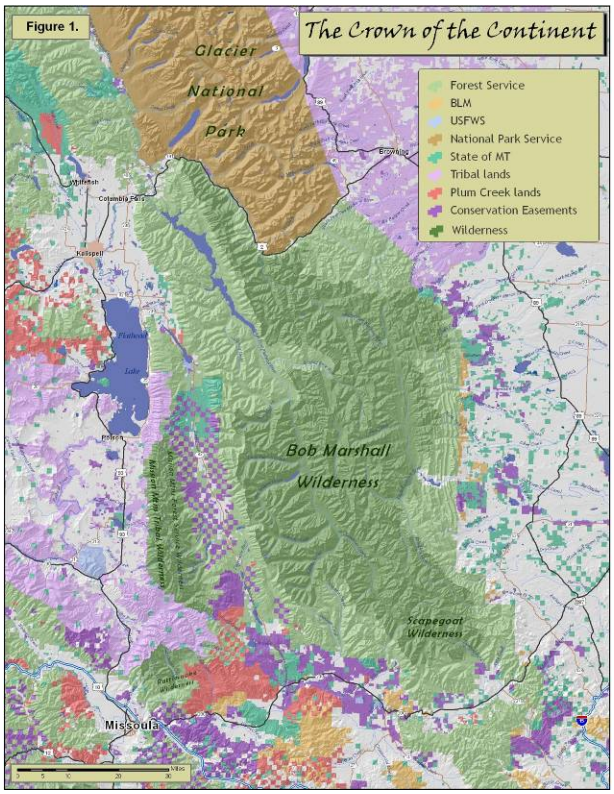
Introduction: The Crown of the Continent

The 10 million acres where Montana, British Columbia, and Alberta converge are known collectively as the Crown of the Continent (See Figure 1). The Crown has been described as one of the premier mountain regions of the world and contains many of the largest remaining blocks of roadless lands in the contiguous US (USGS 2005). The Crown is a remarkable assemblage of high peaks, aspen glades, dense conifer forests, clear, cold rivers, native grasslands, and numerous small communities heavily invested in the land and its health. The Crown also contains many thousands of acres of forest lands that have been heavily logged and roaded and are in need of significant ecological restoration treatments (Arno and Fiedler 2005; Quinn and Broberg 2007).



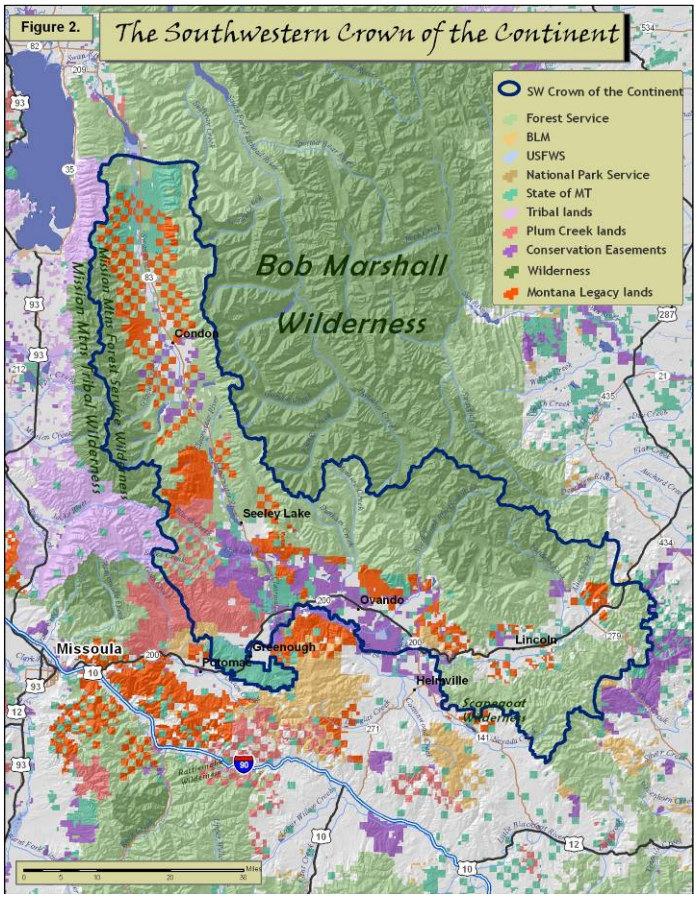
At a landscape scale, the Crown of the Continent links the Canadian Rockies with the Greater Yellowstone Ecosystem and Selway-Bitterroot Wilderness areas to the south. Approximately 20% of the Crown is in private ownership, and many of these lands are being protected through conservation easements and ongoing traditional uses (Long 2007). The remaining 80% of the Crown consists of public land managed as parks, wilderness, roadless areas, and working forest lands. Wilderness and roadless areas make up most of the high country and provide summer range and refuge for wildlife as well as clean, cold water for fish and other aquatic organisms. The working forests on public and private lands bridge the gap between the region's well-protected wilderness landscapes. These wildlands and working forests are prime habitat for several high-profile or threatened and endangered species, including grizzly bears, gray wolves, wolverines, lynx and bull trout, and they also provide tracts of undeveloped lower-elevation habitat and winter range for other wildlife, including elk, moose and deer (Quinn and Broberg 2007). Such areas are increasingly rare in the rapidly growing Intermountain West.

The Southwestern Crown of the Continent

Location and Significance

The southwestern sub-region of the Crown of the Continent (Southwestern Crown) consists of the Blackfoot, Clearwater, and Swan watersheds located northeast of the city of Missoula and is home to the small communities of Condon, Seeley Lake, Greenough, Ovando,

Helmville, Potomac, and Lincoln (See Figure 2). It boasts working landscapes, craggy peaks, abundant wildlife, and pristine lakes and streams and is defined by a thriving culture of collaborative conservation across all land ownerships. Together, the Southwestern Crown covers almost 1.5 million (1,449,670) acres, approximately 70% of which is publicly owned. The Lolo, Flathead, and Helena National Forests manage 59% of the region, including most of the middle and high elevation forested lands within the landscape.



The Southwestern Crown is one of the most biologically diverse and intact landscapes in the western U.S. It supports an estimated 250 species of birds, 63 species of mammals, five species of amphibians, six species of reptiles, and 25 species of fish. Because of its rural nature, the extent of its wilderness lands, and conservation activities, the Southwestern Crown supports its full complement of native wildlife, many of which have been extirpated from portions of their historic ranges. The landscape provides important habitat for grizzly bear, black bear, elk, mule deer, white-tailed deer, mountain lion, Canada lynx, bobcat, gray wolf, coyote, wolverine, fisher, and a wide variety of small mammals. It also provides high quality breeding, nesting, migratory, and wintering habitat for a diversity of bird species, many of which are Species of Concern in Montana. There are currently 12 native fish species, including westslope cutthroat trout and bull trout, and 13 non-native fish species in the Southwestern Crown, as well as several hybrid salmonids.

While the Southwestern Crown's ecological integrity is quite high compared to other landscapes in the Lower 48 states, substantial areas of its public and private forests have been intensively managed during the past century. These management activities, coupled with a century of fire exclusion and accelerating climate change impacts, present significant opportunities for ecological restoration.

Land ownership patterns in the Southwestern Crown have changed in recent years due to large-scale transfers of Plum Creek Timber Company (PCTC) lands into public ownership. The US Forest Service (USFS) has acquired 56,253 acres in the Blackfoot, Clearwater, and Swan watersheds. Additional lands are slated to be transferred to the State of Montana and USFS.

These land conservation deals are largely a result of community-led partnerships involving years of collaborative work among public agencies, private industry, private nonprofit organizations, and hundreds of residents committed to sustaining working forests and ranchlands, wildlife habitat, and recreation access. Once transferred into public ownership, these lands are eligible for and in need of significant restoration activities (See Figure 2).

Physical Environment and Climate

The Southwestern Crown was shaped primarily by continental glaciations when the Cordillerian ice sheet advanced through northern Montana. The soils that have developed as a result of this glaciation are moderately well drained but are not prime farmland. The elevation of the landscape ranges from 3,280 feet at the confluence of the Blackfoot River into the Clark Fork River to 9,356 feet at Holland Peak.

The Southwestern Crown is characterized by a continental climate with a strong Pacific maritime influence. Moderately moist and cool conditions prevail, and cloudy weather is most frequent from late fall through early spring. The average annual temperature in the landscape is 41.3°F with temperature extremes ranging from -40°F to 100°F. Average total annual precipitation ranges from 15 inches to 21 inches, much of which falls as snow. Recent trends in the Southwestern Crown climate have been consistent with predicted effects of global and regional climate change, including general warming, reduced snowpack and streamflows, and drier summers resulting in larger, more frequent wildfires. Such climatic changes are expected to have profound implications for both aquatic and terrestrial systems in the Southwestern Crown as the 21st century progresses (Fagre 2007).

The Swan, Blackfoot, and Clearwater rivers are the key surface water features in the Southwestern Crown. The Blackfoot flows 132 river miles from its headwaters at Rogers Pass southwest to its confluence with the Clark Fork River at Bonner. There are several major tributaries to the Blackfoot River, including the Clearwater River. The Clearwater River flows for 45.8 miles from the outlet at Clearwater Lake to its confluence with the Blackfoot River and connects a series of lakes in the Valley: Rainy Lake, Lake Alva, Lake Inez, Seeley Lake, Salmon Lake, Elbow Lake, and Blanchard Lake. The Swan River flows more than 70 miles from Graywolf Lake near the Clearwater-Swan divide at the southwestern end of the Swan Valley north to Flathead Lake.

Vegetation and Fire

Geologic, hydrologic, and geographic features in the Southwestern Crown combine to produce a diversity of vegetation communities, including grasslands, sagebrush steppe, coniferous forest and extensive wetland and riparian areas. The vast majority of the landscape is covered with mixed species conifer forests dominated by ponderosa pine, lodgepole pine, Douglas-fir and western larch at the lower to mid elevations and subalpine-fir, whitebark pine, and Englemann spruce in the mid to higher elevations. The remaining portions of the landscape

consist of native bunchgrass, pastures of introduced grasses, agricultural lands, and a combination of shrublands, wetlands, lakes, and streams. A significant contributor to biological diversity in the landscape arises from wetland features such as glacial lakes, vernal ponds, fens, basin-fed creeks, spring creeks, marshes, and riparian areas.

Fire was historically the primary disturbance agent in this landscape, directly influencing large-scale changes in forest species composition, structure, and spatial distribution. Much of the Southwestern Crown was influenced by the mixed severity fire regime (Keane and Key 2007). That is, depending on site conditions or position in the landscape, both low- and high-intensity fires could occur within a mosaic of diverse stand conditions (Agee 1993). This was common through the transitional portion of the environmental gradient where the lower elevation, drier sites were dominated by low-severity fire regimes and the higher elevation, mesic sites were dominated by the high-severity fire regime. The forested communities and ecosystems in this landscape depend on fire, as experienced in these specific fire regimes, for their continued perpetuation (Arno and Fiedler 2005).

Pre-settlement wildland fires burned through the summer season until extinguished by fall precipitation. In the settlement period before 1941, wildland fire suppression efforts were often not successful and resulted in fire burning thousands to tens of thousands of acres. Suppression efforts since then have altered pre-settlement fire regimes and reduced the number of forested acres burned each year. The National Interagency Fire Management Integrated Database identified 1007 ignitions (682 lightning-caused and 325 human-caused) between 1990 and 2009 in the Southwestern Crown landscape. These fires burned a combined total of 91,179 acres, and 98% of these fires were suppressed on initial attack. More recently, closely monitored fires have been managed for resource objectives within wilderness boundaries and, to a limited extent, outside those boundaries. Lightning-ignited fires have been and will continue to be used within these areas as a tool to manage resource values identified in the agency's approved land management plans and fire management plans.

The combination of past logging practices, fire suppression, and natural disturbance processes has caused alterations in forest ecosystem composition, structure, and function of the Southwestern Crown landscape (Keane and Key 2007). The structure of many low elevation forests has been altered by the increase in tree densities, especially by the growth of more shade-tolerant Douglas fir (Arno and Fiedler 2005). Compositions have shifted to greater amounts of Douglas fir and lodgepole pine. In mid-elevations, forests have also increased in numbers of trees and in more consistent spatial patterns rather than the spatial heterogeneity created by mixed-severity fire regimes (Haufler, unpublished data).

Economy and Rural Communities

The Southwestern Crown includes the rural communities of Lincoln, Helmville, Ovando, Seeley Lake, Greenough, Potomac, and Condon and spans portions of Missoula, Powell, Lewis

& Clark, and Lake Counties. Approximately 9,000 people live on this landscape, which amounts to less than one person per square mile. The population is spread throughout the landscape, with population densities reaching 300 people per square mile in Seeley Lake and Potomac. The middle- and high-elevation portions of the Southwestern Crown remain largely unpopulated.

Like many western Montana valleys, the Southwestern Crown has experienced significant population growth over the past 20 years. Much of the population increase in the landscape is attributable to in-migration from other states. New residents are attracted to the area because of its outstanding scenic beauty, intact landscapes, abundant wildlife, recreational opportunities, rural character, and proximity to the urban centers of Missoula, Helena, and Kalispell.

Land use and land use change within the Southwestern Crown is the result of complex interactions between geographic, socioeconomic, and legal (ownership) characteristics of the landscape. Consistent with its largely rural nature, dominant land uses in the region include agriculture, timber harvest, and recreation. The majority of non-industrial private land in the Southwestern Crown is located on the valley floor of the Blackfoot River, where ranching remains the principle land use, while the majority of landowners live in forested areas, such as in Lincoln and Seeley Lake, on relatively small lots both within and outside the wildland-urban interface (WUI). Public lands in the landscape are mixed-use areas for recreation, wildlife habitat, grazing, timber management, and research. The presence of expansive open space in the Southwestern Crown provides an abundance of outdoor recreational opportunities, from hunting and fishing to hiking and snowmobiling. Public access to streams, lakes, and private and public lands is highly valued.

Many businesses in this region are reliant on proximity to well-managed public and private forest land. Agriculture, timber processing, and tourism dominate the local economy, including many family ranches, post and pole processing facilities, and the oldest surviving family owned and operated lumber mill in Montana, Pyramid Mountain Lumber in Seeley Lake. All of these wood processing businesses are tied to a larger regional timber economy that is facing an uncertain future and would be bolstered by CFLRP funds.

Like many rural communities, the traditional resource extraction economy in the Southwestern Crown is starting to be augmented by a service-based economy and an emphasis on biomass utilizations. Recreation, tourism, and new businesses have been made possible due to advances in telecommunications and biomass utilization technology. Tourism tied to public lands, which helps support retail trade, accommodations, and food service in the landscape, has been expanding.

Ecological, Economic and Social Threats

While the ecological integrity of the Southwestern Crown remains relatively high, it faces numerous threats to its ecological, economic, and social sustainability. The century-long absence

of natural fire processes, spread of noxious and invasive plants, introduction of aquatic invasive species, loss of forest management infrastructure, impairment of water quality, and climate change all threaten to reduce ecosystem resilience and diversity (see citations in Prato and Fagre 2007).

As mentioned earlier, fire has been suppressed in the Southwestern Crown for more than a century. Fire suppression, in combination with past unsustainable logging practices, has altered the historical structure of many forest stands and reduced ecosystem diversity across the landscape. Altered stand structure and reduced landscape-level diversity may limit the resilience of forests in this region to future stressors, including increases in fire severity, forest pest outbreaks, and predicted climate change. Additionally, fuel loadings have significantly increased in the absence of fire, and current conditions in portions of the landscape, particularly at low and mid-elevations, have produced fire intensities that are dramatically different from historical fire regimes. The combination of dead fuel, continuous live vegetation from the forest floor to the canopy, and reduced stand diversity creates a complex of fuel that, when ignited under severe fire conditions, would leave little or no above-ground vegetation. This poses a threat to people living in the region, as well as the ecosystem integrity of some forest and riparian/wetland ecosystems. Intense fires caused by unnaturally high fuel loads could lead to a reduction in water quality in aquatic ecosystems. Current efforts to address ecosystem restoration and fuel thinning programs are designed to mitigate this concern, but more resources and treatments are needed to reduce wildfire management costs, restore pre-suppression old growth conditions, and improve the landscape's resiliency in the face of climate change.

The fire seasons of 2000, 2001, 2003, and 2007 had both direct and indirect impacts on the safety, well being, and economies of the Seeley Lake, Condon, and Lincoln communities within the Southwestern Crown. The entire town of Seeley Lake was threatened for six weeks and evacuated for periods of up to two weeks during the Jocko Lakes Fire in August 2007. Severe fires like this one have large economic impacts on both local and state economies. Daily lives are disrupted when evacuation is required. Health and discomfort costs increase with the dense smoke. Fewer out-of-state tourists and sportsmen visit. Homes are damaged or destroyed, and, in the worst cases, lives are lost. These impacts are exacerbated in the Swan and Clearwater valleys due to that fact that Montana Highway 83 is the only through-fare. A fire at one end or the other of these valleys can restrict travel to the detriment of local businesses and, in some cases, of human lives. In addition, restoration and repair costs that occur after the fire are high. These include repair of damaged forest facilities, such as campgrounds and fences, control of invasive weeds, and remarking boundaries. While wildfire hazard cannot be eliminated in this landscape, some of the risk and effects from wildfires can be mitigated in the WUI. Several community wildfire protection plans (CWPPs) cover the entire Southwestern Crown landscape, and the Seeley-Swan, Greenough/Potomac, North Powell, and Lincoln Fuels Mitigation Task Forces have been immensely successful in mitigating fuels on private land in their respective areas of concern. However, in order to be effective at keeping the Southwestern Crown

communities safe from wildfire, fuel mitigation efforts on public lands within the WUI need to be expanded.

The spread of noxious and invasive plants as well as non-native fish pose other threats to the ecological and economic sustainability and resilience of the region. Numerous invasive plant species, including spotted knapweed, are out-competing native species of wildflowers and grasses (Callaway and Aschehoug 2000; Callaway et al. 2004), resulting in altered ecosystem structure and function. Landowners, managers, and biologists are particularly concerned because noxious weeds reduce diversity and abundance of native species and diminish the ecosystem services the region provides – including high quality forage for wildlife and domestic livestock (DiTomaso 2000). Noxious weeds can also contribute to soil erosion through mass movement by outcompeting native bunchgrasses that naturally stabilize the soil.

The declining timber market, evidenced by low prices, closure of numerous mills, and decreases in volume processed, poses a threat to the rural economies of the Southwestern Crown. Timber harvest on public lands has declined substantially in the past three decades. Recent market-driven fluctuations continue to impact the amount of timber harvest in the landscape. In 2008, the Stimson Mill in Bonner ceased operations, laying off over 100 employees. The mill had been active since 1886. In December 2009, Smurfit-Stone announced the closure of its pulp mill in Missoula. It had been the only active pulp mill in the state. In Seeley Lake, Pyramid Mountain Lumber and several smaller mills on the landscape face the same market pressures as other mills across the northwest. Maintaining a forest products component in the economy requires having sufficient amounts of land in active forest management to provide the needed wood or fiber to support this industry and sufficient forest product demand to keep prices up.

The declining timber market has adversely affected unemployment in the Southwestern Crown. The unemployment rate in the four counties of the Southwestern Crown ranged from a low of 5.8% in Lewis and Clark County to 11.3% in Lake County, compared to an average unemployment rate in Montana of 8.0% (Figures for March 2010, source Montana Department of Labor and Industry, Research and Analysis Bureau; Powell County rate 10.2 % and Missoula County 5.8%). Rural unemployment rates recently have been generally higher than urban rates, and so unemployment rates in Seeley Lake, Conden, and Lincoln are likely higher than the rates given above.

In 2008, personal income in the four counties of the Southwestern Crown was generally lower than the national average. Powell County's personal income averaged $24,161 (in 2008, the latest figures available), making it one of the poorer counties in the nation. The other counties' incomes are as follows: Lewis and Clark $38,243, Lake $27,156, and Missoula $35,108. (Source: Bureau of Economic Analysis, Regional Accounts, U.S. Department of Commerce)

While overall water quality in the Southwestern Crown remains fairly high, ongoing and increasing human activity in the landscape is cause for concern (Byrne and Kienzle 2007). The major human-caused water quality issues identified in this landscape include excess sediment and siltation, instream flow and riparian habitat alterations, elevated water temperature, and elevated nutrients and metals concentrations. Water quality impairment has resulted from a variety of land uses, including past and present mining, excessive timber harvest or grazing, excessive irrigation diversions, poorly designed roads, reduced ground cover following noxious weed invasion, and unplanned residential development. The impacts of diminished water quality are most often reflected in the poor health of fisheries, which makes fishery health a good measure of overall watershed health. Impaired water quality can impact recreational uses, crop yields, wildlife health, and threatened and endangered species survival.

Climate change is another significant threat to the Southwestern Crown that is already influencing aquatic and terrestrial ecosystems in important ways. Spring and summer temperatures between 1987 and 2003 in Montana were the warmest since records began in 1895. In the Southwestern Crown, these temperature changes have resulted in rapidly disappearing glaciers, the increasingly frequent arrival of winter precipitation as rain instead of snow, earlier snowmelt each spring, and declines in stream flows during the typically bone-dry summers (Fagre 2007). Hotter summer temperatures, combined with reduced amounts of soil moisture in the forests, have led to larger, more frequent, and more severe wildfires since the mid-1980s, and today, fire seasons last 11 weeks longer each year compared with the 1970s.

Predictions from current climate models are for warmer, wetter winters and warmer, drier summers throughout the region during this century (Running, unpublished data). Snow packs are likely to continue declining and melting earlier in the year, changing the timing and availability of water and potentially aggravating conflicts between human needs and natural uses of water. Biologists anticipate that both plant and animal communities will respond to climate-driven changes with some species contracting and others expanding their distributions (Jackson and Sax 2009). Recent research with bull trout, for example, suggests that populations will likely contract into the largest and highest (and coldest) stream networks, making the conservation of larger core areas particularly important (Rieman et al. 2007). It will be important to improve ecosystem resiliency in the Southwestern Crown in order to adapt to the effects of climate change.

The combined effect of these threats, if left unaddressed, will certainly lead to changes in native ecosystems, their diversity and resilience, and the services they provide. The loss of some of the region's biological diversity is also likely. Working proactively to maintain and restore forest ecosystem resilience will be important to the overall maintenance and enhancement of landscape-level biodiversity (Dobson et al. 1997), as well as human resiliency and adaptation to these changes, in the Southwestern Crown. In other words, conservation and restoration of broad ecological diversity across all systems may be the best hedge possible against the uncertainties of climate change (sensu Lindenmayer et al. 2008). For example, because streams and watersheds

are tightly linked to riparian and upland forests, forest ecosystem diversity and health will contribute directly to the maintenance of diverse and productive aquatic ecosystems.

Unfortunately, some forest vegetation types that occurred historically in the landscape are not well represented today. Fire as an important forest process has been largely eliminated and has impacted the composition, structure, and function of a number of forest ecosystems. Forest management and silvicultural practices that strive to achieve ecosystem restoration objectives on appropriate lands address this need (Agee and Skinner 2005; Noss et al. 2006). Through implementation of this landscape strategy, incorporating ecosystem integrity and forest stewardship considerations in fuel thinning and forest harvesting activities will address desired forest conditions. In sum, the future resilience of the region's ecosystem faced with predicted changes in climate will depend on maintaining and restoring ecological structure, function, and diversity across the Southwestern Crown landscape (sensu Hobbs et al. 2010).

Collaborative Restoration Vision for the Southwestern Crown of the Continent

The Southwestern Crown Collaborative group envisions a sustainable landscape that provides for the full array of ecosystem services and economic and social benefits. The vision considers and plans for the long-term effects of climate change and is closely coordinated with other public and private landowners to encourage collaborative solutions through landscape-scale operations. In our vision of the Southwestern Crown landscape:

- Ecosystem diversity is maintained to support the integrity and complexity of this unique setting.

- Fish and wildlife habitats support the full complement of species and also provide for linkages/corridors that connect to other important areas outside the Southwestern Crown.

- Forest restoration includes prescribed fire and natural ignitions as tools to restore species composition and structure in a predictable and beneficial manner. As climate change modifies forest ecology, fire management is appropriately adjusted. Forest restoration and fuel management activities facilitate the reduction of wildfire management costs while re-establishing natural fire regimes.

- Clean, cool, connected, and abundant water supports high quality aquatic habitat, human uses, and recreational demands. Historical fish passage to upstream areas is maintained or restored. Other stream restoration activities help increase the resilience of native fish in the face of climate change.

- A well-planned transportation system maintains access to the public for recreational activities and to land management personnel for administrative activities while supporting fish, wildlife, water quality, and other resource values.

- Healthy, ecologically diverse forest lands are valued as the basis for a viable local tourism economy which compliments and supports forest restoration efforts.

- The Southwestern Crown supplies wood products and by-products that help sustain a sound forest products industry and sustainable local economies. Sustainably scaled and suitably located biomass utilization facilities improve ecosystem health while offsetting treatment costs, thus contributing to the local economy.

- Communities in the project area are committed to conservation efforts that support vibrant economies and reduce the risks from catastrophic fire within the WUI. Communities are enhanced by the recreational opportunities and aesthetics, and other factors sustain a diverse local economy, thus enhancing these communities. This creates a desirable living environment with quality education, health care services, law enforcement, and other social needs.

- Decisions are made using the best available science through a collaborative process involving agencies, organizations, businesses, private landowners, and members of the interested public. There is an open and transparent process for determining where restoration treatments are prioritized. Such decisions include information generated by an effective monitoring process, are based on learning from ongoing management practices, and rely on leveraging local funding and human resources with national and private sources.

- The above measures maintain and improve the human presence in this unique environment such that an appropriate balance of sustainable use and resource protection is achieved. This setting and the balancing of human and environmental needs is resilient in the face of ecological and economic threats, including climate change impacts.

Landscape Strategy for the Southwestern Crown of the Continent

In order to achieve the vision outlined above, the Southwestern Crown Collaborative has developed a landscape strategy to guide restoration actions over the next ten years. The strategy is built on a long, successful history of collaborative conservation across the landscape and informed by the best available ecological science. Community groups have been working with numerous public and private partners over the last 20 years to improve habitat, restore streams, improve fisheries, restore and manage wildlife, mitigate weeds, and keep large landscapes intact. Their efforts have produced significant results. Over 2,600 acres of wetlands and 2,300 acres of native grasslands have been restored. Thirty-eight miles of in-stream restoration and 62 miles of riparian restoration treatments have been implemented on 39 streams. Fish barrier removal has restored fish passage to over 460 miles of stream. Conflicts between humans and grizzly bears have been reduced by 93%, and trumpeter swans have been reintroduced. More than 60,000 acres of noxious weeds have been mitigated, and GIS weed mapping has taken place on over 500,000 acres. Over 110,000 acres of private lands have been kept undeveloped through conservation easements.

Recognizing that collaborative conservation is well established in the Southwestern Crown (MFRC 2007), this landscape strategy links to and coordinates with all interested landowners and managers in the landscape and with ongoing related efforts, such as the three CWPPs covering the landscape, the Lolo Restoration Committee, the Lincoln Restoration Committee, the Seeley-Swan Fuels Mitigation Task Force, the Greenough-Potomac Fuels Mitigation Task Force, the North Powell Fuels Mitigation Task Force, the Clearwater Valley Weed Mitigation Task Force, the Blackfoot Community Conservation Area, and the Multi-Agency Integrated Restoration Strategy (MA-IRS).

Goals

The goals of the restoration actions recommended in this strategy are as follows:

- Restore functioning ecosystems by enhancing ecological processes
- Improve terrestrial and aquatic habitat and connectivity
- Protect and improve overall watershed health, including stream health, soil quality and function, and riparian function
- Re-establish fire as a natural process on the landscape, thereby reducing wildfire management costs and the risk of uncharacteristic wildfire
- Engage communities and other interested parties in the restoration process
- Encourage utilization of forest restoration by-products to offset treatments costs, to benefit local rural economies, and to improve forest health
- Maximize retention of large trees and fully maintain or contribute to the restoration of pre-suppression old growth conditions
- Encourage ecological, economic, and social sustainability
- Establish and maintain a safe road and trail system that is ecologically sustainable
- Use the appropriate scale of integrated analysis to prioritize and design restoration activities
- Incorporate adaptive management

Recommended Restoration Activities

Recommendations for the types of restoration activities to be performed across the Southwestern Crown landscape incorporate the best available science regarding ecological restoration, local knowledge about the landscape, and the long history of collaborative

conservation across the landscape. The Southwestern Crown Collaborative's recommendations for restoration of this landscape are as follows and are delineated by forest type:

Low elevation forest historically characterized by frequent, low-severity fire

Restoration will consist of thinning young understory trees followed by prescribed fire. In many cases, the stand structure of low elevation ponderosa pine and Douglas fir forests has been altered through past logging practices (e.g., 'high-grading' or the removal of the largest and profitable trees while leaving less valuable trees), livestock grazing, and fire exclusion (Crist et al. 2009). Contemporary stands often include high densities of small diameter trees that create conditions susceptible to uncharacteristic wildfires (Arno and Fiedler 2005) and potential loss of ecosystem services (e.g., soil retention and productivity). Treatments will include removal of many of these small diameter trees and retention of large trees (when present). Reducing the density of small trees increases the vigor of larger trees (Sala and Callaway 2001) and reduces the vulnerability of crown fires (Fielder et al. 2009). Thinning small trees should increase the resilience of old-growth structure to drought and uncharacteristic fire. In some cases, where risk of crown fire is low, the use of prescribed fire alone can accomplish thinning objectives.

At sites where few large trees are present and stands are characterized by a high density of small to medium sized trees, thinning of less vigorous trees or trees in lower canopy positions will help facilitate development of late successional structure. Where appropriate, prescribed fire will be used following mechanical treatments to remove fuel loadings and begin the process of restoring fire to its natural ecological role. In some cases, mortality of large trees may occur and will be retained as snags for their wildlife and eventual soil productivity values.

Other restoration activities in this forest type include noxious weed mitigation and road and trail restoration or obliteration as appropriate.

Mid-elevation forest historically characterized by mixed-severity fire

Models of restoration in forests characterized by mixed-severity fire regimes (i.e., forests where both stand replacing and low intensity fires burned in a complex mosaic pattern) are less well developed (Noss et al. 2006). Fire regimes classified as mixed severity arise from complex interactions between forest types, fuel loadings, landscape patterns of vegetation and topography, and climate (Schoennagel et al. 2004). In some cases, fire exclusion and past harvesting methods have resulted in higher fuel loadings in areas that may have been characterized by lower severity fires (Haufler, *unpublished data*). In these cases, thinning of small diameter trees through mechanical methods or using small hand tools in conjunction with prescribed fire may restore forest structure and fire as a functional ecological agent. In areas where intensive harvesting has occurred (e.g., on lands formerly owned by PCTC), no active treatment may be needed at the stand level, but a checkerboard landscape consisting of square mile patches of heavily managed forests adjacent to square miles of lightly managed forests creates unnatural landscape mosaic. Some thinning of small diameter trees may 'soften' these hard boundaries that are apparent from

satellite images of the region. These square miles of logged forests contain many roads, which will be targeted for decommissioning and restoration including exotic plant removals.

Recent mixed severity treatments in the area by BLM, DNRC, and USFS, in coordination with private landowners, will be useful as examples for restoration treatments on NFS lands. The Elk Creek drainage is immediately adjacent to the SW Crown landscape.

Other restoration activities in this forest type include noxious weed mitigation and road and trail restoration or obliteration as appropriate.

High elevation forest historically characterized by infrequent, high-severity fire

Some forests occurring at higher elevations in the region were typically characterized by infrequent, high-severity fires. In fact, many tree species (e.g., lodgepole pine) possess life histories or traits that reflect their long relationship with fire. Stand structure in high elevation forests in some areas may have been influenced by fire suppression, which has created conditions where stand replacing fires could occur across greater proportions of the landscape (Haufler, unpublished data). These forests are mostly unpopulated with few roads and represent a much lower priority for restoration. However, where ecologically appropriate and under collaborative consensus, hand slashing by crews using existing trails followed by prescribed fire will help to restore natural landscape mosaics. Ultimately creating patches of burned forests will benefit wildlife, reduce fuel loadings, and create natural patchiness on the landscape.

Other restoration activities in this forest type include noxious weed mitigation and road and trail restoration or obliteration as appropriate.

Grasslands

Grasslands in the region have been invaded by various exotic plant species, including a number of introduced grasses. Removal of exotics followed by planting of native species will be used to restore native species composition to the landscape (see Anjozian 2008). Removal of exotics will include chemical and biological controls, consistent with accepted integrated weed management protocols. Restored grasslands will need to be retreated to continue to suppress exotic plant dominance. The resulting grassland habitat will support greater plant species diversity, provide better forage for native and domesticated animals, and create more suitable habitat for various grassland birds.

Streams, riparian areas, and wetlands

Riparian areas in the region have been altered through livestock grazing, roads, and invasion by exotic plant species, which in some cases results in soil erosion, loss of native plant communities, and reduced quality of wildlife habitat. Restoration treatments in these areas will include removal of exotic plant species, planting of native vegetation, bridge and culvert

replacements and upgrades, road restoration and upgrades, removal of fish barriers, and stream channel manipulation.

Prioritizing Vegetative Restoration Treatments

Vegetative restoration projects to be developed for this landscape will be chosen based on several factors that will be discussed below. In sum, the following prioritization will be applied:

1. Projects within the WUI on lands considered to be at high risk for uncharacteristic wildfire and those areas of moderate risk that are adjacent to the high risk areas will receive the highest priority.

2. Projects within low-elevation forest outside the WUI will receive the second highest priority.

3. Where consensus about appropriate restoration treatments exists, projects within mid-elevation forest outside the WUI will receive the third highest priority.

Explanation of Prioritization

The Southwestern Crown Collaborative has employed an all-lands approach to forest restoration and fuels reduction with an emphasis on fuel reduction within the WUI and an emphasis on ecological restoration outside the WUI. For the Southwestern Crown, the WUI is defined as an "Intermix Community" (Category 2) because there is no clear line of demarcation between the urban and wildland area. Wildland fuels are continuous within and outside of the developed area. For some forest types, such as the low-elevation dry forest type, ecological restoration and fuel mitigation can both be accomplished through the same treatment prescriptions because historical fire regimes produced open stands with small fuel loadings. However, for the other forest types, restoring historical stand conditions and fire regimes will not sufficiently reduce fuel loadings to fully address fuel mitigation objectives. The historical mixed severity fire regimes that occurred in mid-elevation forest types produced varying stand densities and higher amounts of fuels that would not sufficiently reduce fire risks to homes and communities. For this reason, it is important to identify areas targeted for fuel mitigation and separately target areas for ecological restoration objectives.

Within the WUI, the Collaborative's primary goals are fuel management to reduce the risk and costs of high-intensity fire to communities, mitigate exotic weeds, and improve watershed health. Outside the WUI, the primary goal is active restoration, both vegetative and non-vegetative, to assist the recovery of degraded ecosystems within the Southwestern Crown landscape. Treatments within the WUI will focus on removing small diameter trees, widening crown spacing, adjusting basal areas in order to reduce the risk of crown fires and broaden the range of options for fire fighters, reducing noxious weed infestations, and improving riparian and aquatic habitat. Treatments outside the WUI will focus on restoring ecological structure and

processes. These treatments can contribute to community prosperity by delivering saw logs to existing wood products infrastructure and, possibly, woody biomass to proposed facilities.

The highest treatment priority focuses on high-risk fuels that have been identified in the local CWPPs for several reasons. Fires are more costly to fight closer to communities. Further, fires that burn structures and infrastructure are more costly than those burning in forests farther away from communities. To identify fuel treatment priorities for high-risk WUI areas, the Collaborative relied on the fuels risk classification identified in the CWPPs. The high risk class was selected as the top priority within the WUI.

The second treatment priority focuses on low-elevation forest types characterized by the low-severity fire regime outside the WUI. While these forest types do not dominate the Southwestern Crown landscape, there is broad consensus about the restoration treatments appropriate in these forest types, and several collaborative restoration projects have already been successfully implemented in these forest types in this landscape. The Southwestern Crown Collaborative's strategy builds on these successes by prioritizing lands where collaborative restoration has a high likelihood of success.

The third treatment priority focuses on mid-elevation forest types characterized by mixed-severity fire regimes outside the WUI. While these forest types dominate the working forest lands in the Southwestern Crown, consensus regarding appropriate ecological restoration treatments in these forest types is currently being addressed. The Collaborative recognizes that, in order to effect any lasting change on the landscape, restoration treatments will need to be applied to these mid-elevation forest types. The Collaborative is committed to pursuing consensus in this area. As this work to build consensus progresses, the Collaborative will implement restoration treatments on the lower elevation end of the mixed severity fire gradient where thinning of many forest stands has broad support. By focusing on lower elevation mixed severity, no new road networks will be created, and restoration treatments that protect large trees while allowing fire to burn in a natural mosaic will be employed. Because the landscape approach focuses on protecting communities and restoring ecological conditions, combinations of thinning, prescribed fire, and wildland fire will be used to meet restoration goals of creating landscape mosaics (Aplet and Wilmer 2010).

Filters for WUI and Non-WUI Vegetative Treatment

This prioritization was determined by a consensus of the Southwestern Crown Collaborative's members and is based on a logical sequence of spatial data filters that were developed consistent with the Montana Forest Restoration Principles (http://www.montanarestoration.org), Forest Landscape Restoration Act, and the best available data for the landscape. Filters were determined based on a landscape-scale analysis for several reasons. First, a landscape analysis helps collaborative groups communicate, discuss, and eventually reach consensus on why and where restoration projects should be implemented. The

process is crucial for stakeholders to understand the priorities of others in determining what is feasible and in developing the means of communicating "why here, why now" to the public. Second, landscape analysis facilitates a wide-ranging consideration of the greatest ecological needs for restoration. Rather than being confined by what had been done in the past or what is currently feasible, landscape analysis helps determine the greatest ecological and community needs from a broad perspective. Third, landscape analysis allows rapid calculation of how many acres are appropriate for treatment in order to make progress toward a specific ecological or community goal. Fourth, all relevant data can be collected, maintained, and displayed in a common format and quickly integrated with new information. In sum, by using a landscape-scale analysis of restoration priorities, the Collaborative can ensure that funds are allocated where the group has determined is most appropriate.

It is important to recognize that, as in any landscape analysis, the resulting map of priority areas should not prescribe the specific type or location of treatments. Rather, this sequence of filters is useful for narrowing the set of priorities where restoration and community goals can be pursued, and, just as importantly, the filters identify where treatments are inappropriate. Landscape analysis helps identify where field assessments should be conducted to determine more precisely where and what restoration treatments might occur with allocated funds. Fortunately, several of the Forest Restoration committees within the Southwestern Crown landscape have the capacity to accomplish much of this finer-scale field assessment. They have been actively involved in the development of this prioritization strategy and can help ensure that individual restoration projects are designed to accomplish tangible restoration goals on the ground.

In order to identify restoration-appropriate forest stands outside the WUI from landscape datasets, the following sequence of five spatial data filters was employed to exclude stands not appropriate for restoration treatments:

1. Infrequent fire regimes: All high-severity, low-frequency fire types are excluded because they naturally burn catastrophically and natural fire regimes cannot be restored through small diameter thinning. Pure and mixed stands of ponderosa pine, Douglas-fir, and western larch remain after this filter has been applied.

2. Stand Age: All stands that are not identified as containing medium or large trees are excluded (e.g. seedling, sapling, herbaceous) because stands with mature, large trees should be protected by removing ladder fuels and reintroducing fire.

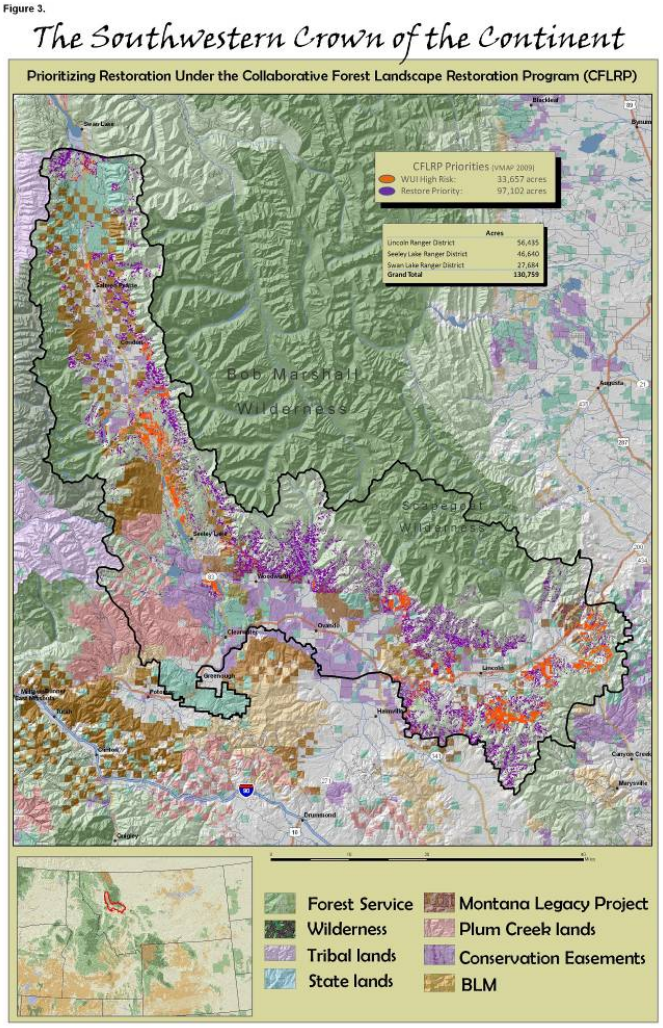
3. Fire History: All stands exposed to fire within the last 25 years are excluded because conditions should now exist in these stands that would allow natural fire regimes to be re-established without additional fuel or stand treatments. Additionally, any stands having received some form of fuels mitigation are removed from consideration as a priority for fuels treatment.

4. Habitat Types: In order to further refine our assessment of appropriate conditions where fuels treatment may achieve some restoration goals, and to take advantage of numerous datasets and suggestions from the collaborative, a map of habitat types from the Ecosystem Management Research Institute (EMRI) was overlaid on the landscape. Stands that fell within Hot, Dry Ponderosa Pine; Warm, Moist and Warm, Dry Douglas fir; Cool, Moist, and Cool Dry, Subalpine fir, and the Warm, Moist Grand fir habitat types were retained.

5. Regional Integrated Restoration Protection Strategy (IRPS): The USFS's Regional IRPS dataset of priority level was overlaid on the landscape, and stands were ranked according to the regional restoration priorities.

The above filtering process was used to identify stands that, with field verification, would be high priorities for fuel mitigation or ecological restoration. Figure 4 displays the resulting priority acres based on this filtering process. Treatments in these stands would be designed to reduce the amounts of small diameter trees and other vegetation to achieve either fuel reduction or ecological restoration prescriptions. Additional restoration work not identified through the above filtering process is also expected to be a priority. Road decommissioning, culvert repair or replacement, stream restoration, invasive weed control, and restoration of stands that have previously received heavy management may all be important for ecological restoration in the landscape. Data sources are currently incomplete to serve as consistent filters for identification of additional priority areas based on these additional objectives, although the need for each of these treatments at some locations is known to occur. Efforts are underway to complete the following data layers so that additional restoration needs can be consistently prioritized for the entire landscape and incorporated into landscape planning:

Figure 3.



- Second growth structure/diversity

- Water quality and watershed integrity
- Aquatic species habitats, connected passage, and culverts
- Key wildlife habitat (abundance, connectivity, meta-population dynamics)
- Exotic species
- Status of transportation system
- Future Cost savings (apart from estimating costs to accomplish restoration of prioritized stands)
- Predicted alterations of fire behavior within and outside WUI
- Vegetative condition

Implementing Restoration Treatments

Restoration treatments will be implemented as prioritized over the next ten years. For the first two years, implementation will focus on fuels reduction and restoration projects that have already been identified and that are consistent with this strategy. Table 1 details our program of work for FY 2010 and FY 2011. For subsequent years, projects will be collaboratively developed across ownerships and will be consistent with this strategy. Table 2 details the expected outcomes and funding needs for FY 2010 – FY 2019.

Members of the Southwestern Crown Collaborative will engage in restoration project development in their areas of expertise. For example, the Swan Ecosystem Center, Northwest Connections, the Swan Lake Ranger District of the Flathead National Forest, and other interested landowners and interest groups will play a leadership role in project development in the Swan watershed. The Clearwater Resource Council, Blackfoot Challenge, Seeley Lake Ranger District of the Lolo National Forest, Lincoln Ranger District of the Helena National Forest, Lolo Restoration Committee, Lincoln Restoration Committee, The Nature Conservancy, and other landowners and interest groups will play a leadership role in project development in the Blackfoot and Clearwater watersheds.

Table 1. Southwestern Crown Collaborative Program of Work for FY 2010 and 2011.

District	Project Name	Outputs								
		Units of Output								
		WUI High Risk Acres	Fire Restoration Acres (non-WUI)	Invasive or Exotic Acres	Fish Habitat Miles	Habitat Acres	Watershed Acres	Structures (culvert, bridge, sites, etc)	Monitoring Acres	Road or Trail Miles
Fiscal Year 2010										
Swan Lake	Smith Landscape Burning Fuelbreak & Slashing		458							
	Cooney #2 East Landscape Burning Fuelbreak/Slashing		160							
	Swan Lake Bull Trout Working Group					3000				
	LWCF - Holland Crk Native Bridge Abutment							1		
	NFSR 966 Bridge over Swan River Replacement DESIGN							1		0.1
	Treated Timber bridge replacement DESIGNS							1		
	Holland Pierce Weed Treatment			200						
Seeley Lake	Mtn Cr. Fuels Reduction Mastication / Removal (Auggie Mtn)	146								
	Weed Treatments (Auggie Mtn)			150						
	Horseshoe Hills 1 Weed Treatments			1500						
	Cave Creek Weed Treatments			100						
	Monture Fuels Effects Monitoring								30	
	Seeley Fuels Effects Monitoring								100	
	Hidden Lake Fuels Effects Monitoring								30	
	Dick Creek Prescribed Burning	1075								
	Monture Fuels Prescribed Burning	70								
	Hidden Fuels Slashing and Handpiling	69								
	Seeley Fuels Slashing and Handpiling	140								
	Double Arrow Fuels Slashing and Handpiling	21								
	N Fork Trailhead Fuels Slashing and Handpiling	14								
	Dunham Restoration Streamside Weed Treatments			5						
	Cottonwood Lakes Stream Restoration Survey and Design				1					
	Colt Cr Roadside Brushing #4366 & #16553									5
	Colt Summit Landline Survey									3
Lincoln	Snowbank Lake Trail Reconstruction				4					4
	BMP Trail Work (Arrastra #482, Nevada #466, Mainline #481)				50					15
	BMPs and Road Improvements (District-wide)				75					40
	Alice Cr Rx Pretreatment		375							
	Alice Cr Rx Burn		375							
	Fisheries Monitoring - high risk roads for BMP work				50					

	Wildlife/fuels pre-treatment monitoring for Stonewall Project								3000	
	Pine Grove Campground fence install for riparain exclosure					1200				
	Indian Meadows TH watershed improvement work							1		
	Survey & Design for Culvert Upgrades (#4106 & 1800)							2		
	Weed treatment with Ponderosa Snow Warriors			200						
	Weed treatment inside Weed Management Area			2500						
	Weed treatment - aerial along Helmville Face			5000						
	Weed treatment - ROWs, THs, CGs			5000						
	Totals	**1,535**	**1,368**	**14,655**	**180**	**4,200**	**0**	**6**	**3,160**	**67**
	Fiscal Year 2011									
Swan Lake	Holland #3 Landscape Burning		500							
	Barber #3 Landscape Burning		135							
	Hemlock Elk Units 11 & 12 Aspen Burning					10				
	Cooney #1 West Landscape Burning		312							
	Legacy Lands Fuel Management - Chip/mast/fuels inventory	300								
	Whitebark Pine Seed Production Monitoring					5				
	Whitebark Pine Verbenone Treatment					30				
	Summit Thinning Verbenone Treatment					150				
	Brook Trout Suppression on Lion Creek									
	Windfall Creek, FSR 9590									0.5
	NFSR 10257 Wetland Protection				1.5					
	FSR 516F - Kraft Creek				1					
	LWCF NW 1/4 Section 1				2					
	LWCF Van Lake Access									
	LWCF Section 9				2					
	Swan River RNA						690			
	TES Populations			640						
	Piper Creek Landscape Burning/Mission Upland Burning		1000							
	Smith Landscape Burning		160							
	Cooney #2 East Landscape Burning		366							
	Cooney McKay Fuels Reduction		335							
	Hemlock Elk Fuels Reduction	400								
	Meadow Smith Thinning	400								
	Precommercial Thinning	125								
	Cooney McKay Unit 3-36	2								
	Precommerical Thinning Hand Piling	125								
	Whitebark Pine Planting					25				

	Swan Valley Comprehensive Cutthroat Trout Monitoring				5					
	Elk Creek Trailhead BMP Work (wct habitat)				2.5					2
	FSR 9767 Cold Creek - Abutment removal									0.1
	LWCF - NE 1/4 Section 15									1
	NFSR 966 Bridge Swan River Replacement CONSTRUCTION									0.1
	NFSR 10181 at Fatty Cr replace bottomless arch pipe DESIGN									0.1
	Reconstruction of the Holland-Gordon Trail System									3
	TES Populations			40						
	SL Weed Treatment			2300						
	Legacy Land Weed Treatment			400						
	Aquatic trophic linkages monitoring from lake trout suppression						4,400			
Seeley Lake	Trail Creek Culvert Replacement (Auggie Mtn)							1		
	Colt Cr Road Relocation Survey and Design									7
	Colt Creek Road Culvert Replacement							1		
	Colt Creek Road Decommissioning Survey and Design									5
	Colt Summit Fuels Reduction Mastication / Removal	871								
	All Project Support Weed Treatments			1000						
	Horseshoe West Landline Survey									8
	Monture Fuels Effectiveness Monitoring								30	
	Seeley Fuels Effectiveness Monitoring								100	
	Hidden Lake Fuels Effectiveness Monitoring								30	
	Spring Creek Road Relocation Survey and Design									1
	West Side Bypass Road Gravel Surfacing Survey and Design									3
	Trail Maintenance									15
	Dispersed Site & ATV Trail Rehabilitation									10
	Horseshoe West Effectiveness Monitoring					1500				
	Auggie Mtn Effectiveness Monitoring					50				
	Hidden Fuels Prescribed Burning	50								
	Seeley Fuels Thinning and Handpiling	100								
	N Fork Trailhead Handpile Burning	11								
	Horseshoe Hills II Weed Treatments			2000						
	Hawkweed Weed Treatments			56						
	Chain of Lakes Aquatic Exotic Weed Prevention			5000						
	Horseshoe Hills 1 Weed Treatment Monitoring			750						
	Cave Creek Prescribed Burning (#24)	370								
	Morrell Road Slump Repair									1

	Cottonwood Bridge Removal							2		
	Kozy Cottonwood Road Reroute Survey and Design									1
	NF Blackfoot Road Gravel Surfacing									7
	Seeley Fuels Handpile Burning	250								
	Dick Creek Weed Treatments			200						
	Dunham Restoration Streamside Weed Treatment Effectiveness Monitoring								5	
Lincoln	Trail reconstruction									2
	Campsite rehab - in wilderness						1	5		
	Trail reconstruction - in wilderness									2
	Yukon culvert upgrade #4106				10			1		
	Theodore culvert upgrade #4106				5			1		
	Culvert removal #4106				5			1		
	Sucker Cr culvert upgrade #1800				5			1		
	Fisheries Monitoring - high risk roads for BMP work				50			1		
	South Fork Poorman re-route				20					0.5
	BMPs and Road Improvements (District-wide)				75					40
	Aspen pre-treatment					25				
	Aspen Rx burn					50				
	Channel reconstruction				10					0.5
	Placer mine rehab				10					0.5
	Crossing structure for snow trail - Beaver Cr				12			1		
	Stonewall Rx - pre-treatment	250				250				
	Alice #7 and A-2	375				375				
	Rx Burn monitoring								2000	
	Hydroseeding - Snow trails			2500						
	WMA monitoring								2500	
	Weed treatment - ROWs, THs, CGs			5000						
	Weed treatment with Ponderosa Snow Warriors			200						
	Survey & Design for 2012 Culvert Upgrades									3
	Re-paving Copper Creek Road									5
	Totals	**3,629**	**2,808**	**20,086**	**216**	**2,470**	**5,091**	**15**	**4,665**	**118**

Table 1. Southwest Crown Collaborative Proposed Costs & Outputs for Fiscal Years 2010-2019. (Note: Implementation and monitoring only with outputs itemized below. Outputs have multiple objectives)

WUI & Non WUI Vegetation Restoration
• 80% of high risk WUI treated or approximately 27,000 acres which includes commercial & non-commercial (Rx fire including pretreatment - hand slashing, piling etc.) • 50% restoration treatments applied to the low & mid elevation forest types (outside WUI) or 46,000 acres which includes commercial & non-commercial **Total of 73,000 acres treated, 50% with commercial removal = 100 MMBF – 160 MMBF Total** • 5,000 acres of vegetation restoration through re-vegetation & reforestation
Invasive and Exotic Treatments
• 81,600 acres of weed treatment (this is also wildlife habitat improvement, 50% of these acres or 40, 800 will be re-treated within the 10 year timeframe) • 3 fish barriers installed (keep non-natives moving upstream) • 3000 acres of lake acres restored with removal of non-native fish species
Fish and Wildlife Habitat Restoration
• Rx fire for habitat improvement included above as those acres have integrated objectives • 937 miles of stream restored (restored as a result of work listed in next section • 9500 wildlife security acres restored with road decommissioning (for elk, lynx, and grizzly bear specifically)
Watershed Restoration, Road, Trail, Other Restoration Work
• 650 miles of road BMP work and maintenance • 400 miles of road storage or decommissioning • 149 stream crossing structure upgrades • 280 miles trail improvement for water quality and drainage • 6 trailhead improved for water quality • 33 campsites rehabilitated and restored (in BMWC for LAC) • 40 acres placer mine reclamation (not Mikehorse) • 50 miles of trail decommissioning

Monitoring Restoration Treatments

Monitoring the effects of treatments via quantitative, repeatable measures is an essential part of landscape restoration and a core activity of an adaptive management approach (Lindenmayer et al. 2008). Monitoring contains two major, interlocking components, implementation monitoring and effectiveness monitoring (DeLuca et al. in press), both of which will be applied within the Southwestern Crown. Implementation monitoring will be conducted by the USFS as an ongoing, required element of project implementation to observe whether treatments are completed according to prescriptions, and its costs and requirements are anticipated to be fulfilled within normal project portfolios. Of greater interest is the expansion of effectiveness monitoring, where additional attention and resources will be devoted to observe whether identified treatments advance landscape conditions toward articulated restoration goals (Nichols and Williams 2006; Lindenmayer and Likens 2010). This effectiveness monitoring is the focus of the following description.

Effectiveness monitoring activities will engage collaborative partners in meaningful ways to build understanding of treatment outcomes and generate trust to advance future cooperative activities. Effectiveness monitoring of treatments in the Southwestern Crown will model the collaborative processes utilized to design these restoration activities. Monitoring programs will incorporate citizens, agency staff, and partner organizations to collect relevant, quantitative information on treatment effects that will identify both the immediate impacts of treatments and the long-term trajectory of restorative, ecosystem processes (DeLuca et al., in press). Further, monitoring activities will be coordinated with ongoing monitoring programs conducted by the USFS and State of Montana agencies to gain maximum efficiencies in recognizing the benefits of restoration actions.

Attributes Measured within the Effectiveness Monitoring Program

The initial set of indicators to measure treatment effectiveness can be grouped into five overarching categories: fire and fuel dynamics; biodiversity; soil and water effects; economic impacts (including the cost of fire management), and social implications. Multiple attributes will be monitored within each category, and the measurement of indicators will take advantage of the existing, ongoing monitoring programs already conducted by state agencies, the USFS, and other science-based organizations that operate in the Southwestern Crown ecosystem to gain maximum efficiencies and more robust knowledge of landscape change.

Fire and fuel dynamics are of particular significance as affirmed by earlier descriptions in this strategy. Pre-treatment measurement of fuel distributions through remote sensing and ground-based tools will guide the selection and prioritization of treatments across the landscape, and for each fuels management project, pre- and post-treatment fuel measurements will be completed. Effectiveness of these treatments at the landscape scale will apply more

sophisticated tools that examine fuel connectivity and suppression capabilities based on identified fire regimes and predicted/actual fire behaviors.

The broad category of biodiversity relates to a series of restoration interests, including the distribution of native vegetation, the threats posed by invasive species, and the interactions of biotic and abiotic factors to create habitats for both terrestrial and aquatic wildlife species. Four areas of special attention for monitoring programs have already been identified: the amount and distribution of old growth habitats; the specialized habitat needs for endangered species; the spread of exotic, invasive species; and the patterns of vegetation/habitats under changing climate conditions. Existing vegetative mapping protocols, permanent inventory plots, and applied forest successional models will play an important role in characterizing vegetation and its trajectory based on treatment locations and relative intensities of management applications, but new, original measures at the project level will be vital to identify successes of the ongoing management interventions.

Monitoring at project locations will also take advantage of ongoing, existing monitoring programs within the landscape. For example, the Avian Science Center at the University of Montana (UM) conducts ecological effects monitoring within the landscape area and has high quality, landbird occurrence data that has been in place for nearly 20 years (http://avianscience.dbs.umt.edu). The Montana Department of Fish, Wildlife, and Parks (FWP) has been involved in fish monitoring for several decades in the project area and has established programs to include local residents and other organizations with technical expertise, such as Trout Unlimited, to examine trends in fish populations. Patterns of change in biodiversity at the landscape level can be detected by these forms of geospatial wildlife inventory, providing an important window into alterations affected by treatments as well as larger scale transformation such as those caused through climate change.

Soil and water effects include important considerations for sustaining watershed function and maintaining or improving water quality, and monitoring activities will direct attention toward the ability of treatments to reduce sediment transport and sustain both water quality and soil productivity. Soil and water benefits of treatments, such as the decommissioning of roads, will be directly measured at the appropriate watershed scale, combining new measurements with those already undertaken by the State of Montana. Additionally, ongoing measurements by FWP that address the health of fish populations will be supplemented by our monitoring of the effects of removals of fish blockages and other riparian zone improvements.

The economic impacts of treatments will be analyzed at several levels, including the direct opportunities provided through employment and income from National Forest goods and services, as well as the indirect effects of additional economic activity and improvements of resource qualities important to outdoor recreation. Though commonly applied measures that apply input/output modeling, the treatments will be evaluated for the contributions toward jobs created, available biomass for energy production that displace other energy costs, income

received in and around communities in the Southwestern Crown, and changes in recognized, non-market values (i.e., improved fisheries habitat).

The social implications of additional activity within the Southwestern Crown will expand prior social survey applications that were recently administered here regarding wildfire impacts, recreation opportunities, and community development issues. Pre- and post-treatment surveys that apply longitudinal measures will provide insights into specific expectations for restoration activities and the acceptability of treatments applied. Additionally, social measures using both quantitative and qualitative methods will allow for an examination of changes in trust and confidence in collaborative restoration decision and implementation processes. Finally, social survey tools will be applied to examine the impacts of treatments on attitudes toward aesthetics, appropriateness of forest uses, and the level of commitment and understanding of public land management operations.

Monitoring Operations

Monitoring activities will be conducted both prior to treatment initiation (to establish baseline status) and across post treatment time periods at regular intervals to determine the response of various ecosystem and social conditions. Monitoring activities will also be designed so measurements correspond to the periods during the year when indicator sensitivity to change is highest, and where feasible, when schedules of skilled collaborative partners allow measurements to be conducted by trained community representatives.

The practical implications of the collection of multiple forms of information will require the contributions of many actors who reside or work in the Southwestern Crown. In addition to the USFS, a primary resource will be existing educational institutions in the area, including local high schools and students at the nearby UM, who will supply well-distributed volunteers to collect several of the straightforward measures of treatment effects. Although these students will require training and direct oversight during data collection operations involved in the monitoring program, there are a series of straightforward indicators that are highly amenable to “citizen-science” data collection. Other teams will utilize trained professionals from the USFS, state agencies, and non-governmental organizations to conduct measurements.

Collaborative Management and Communication of Monitoring Information

The well established collaborative relationships within the Southwestern Crown will be applied to monitoring efforts both in the selection of indicators, the operation of field-level data collection, and evaluation of treatment effectiveness. The compilation of information collected and the coordination of monitoring operations will be assigned to a special multi-party Southwestern Crown Monitoring Committee with leadership and quality assurances supplied by UM’s College of Forestry and Conservation and its associated state agency, the Montana Forest and Conservation Experiment Station (MFCES). The multi-party Monitoring Committee will contain representatives of the embedded communities, the USFS, the MFCES, and other major

partners within local government and non-governmental organizations. Review and evaluation of the success of treatments and opportunities to apply adaptive management could be tied to annual meetings held at the MFCES Lubrecht Forest Experimental Station (http://www.cfc.umt.edu/lubrecht), a commonly used facility for the Blackfoot Challenge and other local collaborative groups. These meetings will be designed so that managers, line officers, and monitoring practitioners can view and talk about monitoring results and opportunities to modify treatment designs to improve results. This important link is missing in most forest restoration projects but has shown considerable success in cases where it has been applied. The monitoring data will be permanently stored onto electronic sites that can be continuously accessed by the public.

Funding Restoration Treatments

The Southwestern Crown Collaborative will work with multiple sources to ensure that restoration projects are funded. To fund restoration on National Forest System lands, the Collaborative has developed a proposal for funding through the Collaborative Forest Landscape Restoration Program. To fund fuels mitigation on private ownerships, the Collaborative will work with the existing fuels mitigation task forces to provide technical and financial assistance to private landowners. To fund fuels mitigation on other public ownerships, the Collaborative will work with the appropriate agency and, in particular, MA-IRS, where state and federal agencies are developing a landscape-level fire management and forest restoration plan in the middle Blackfoot watershed. To fund the development of biomass utilization facilities, the Collaborative will tap into sources such as USDA Rural Development. To assist with workforce training, the Collaborative will use such programs as the US Department of Commerce's Economic Development Administration.

To fund restoration on private and other public ownerships, the Collaborative will pursue opportunities through other federal and state sources as well as private foundations, including working with the National Forest Foundation on their Treasured Landscapes campaign. The goals of the Treasured Landscapes campaign are to implement stewardship projects that nurture more resilient forest ecosystems; restore landscapes damaged by wildfire, insects, disease and natural disasters to provide scenic, watershed, wildlife and carbon sequestration benefits; invest in the strength of communities of interest and communities of place, helping people convert their passion for forests into meaningful and sustainable conservation actions; and help the American public to fully understand, savor and appreciate all that the National Forests have to offer, building lasting connections with the lands that provide clean air and water, diversity of life, and fulfilling outdoor recreation opportunities.

The SW Crown has stable post and pole and timber manufacturing companies that provide markets for materials generated by restoration efforts, which offset treatment costs and help fund further restoration treatments. These companies are fully engaged in the collaborative

process and add practical financial information as the collaborative considers and sets priority projects.

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