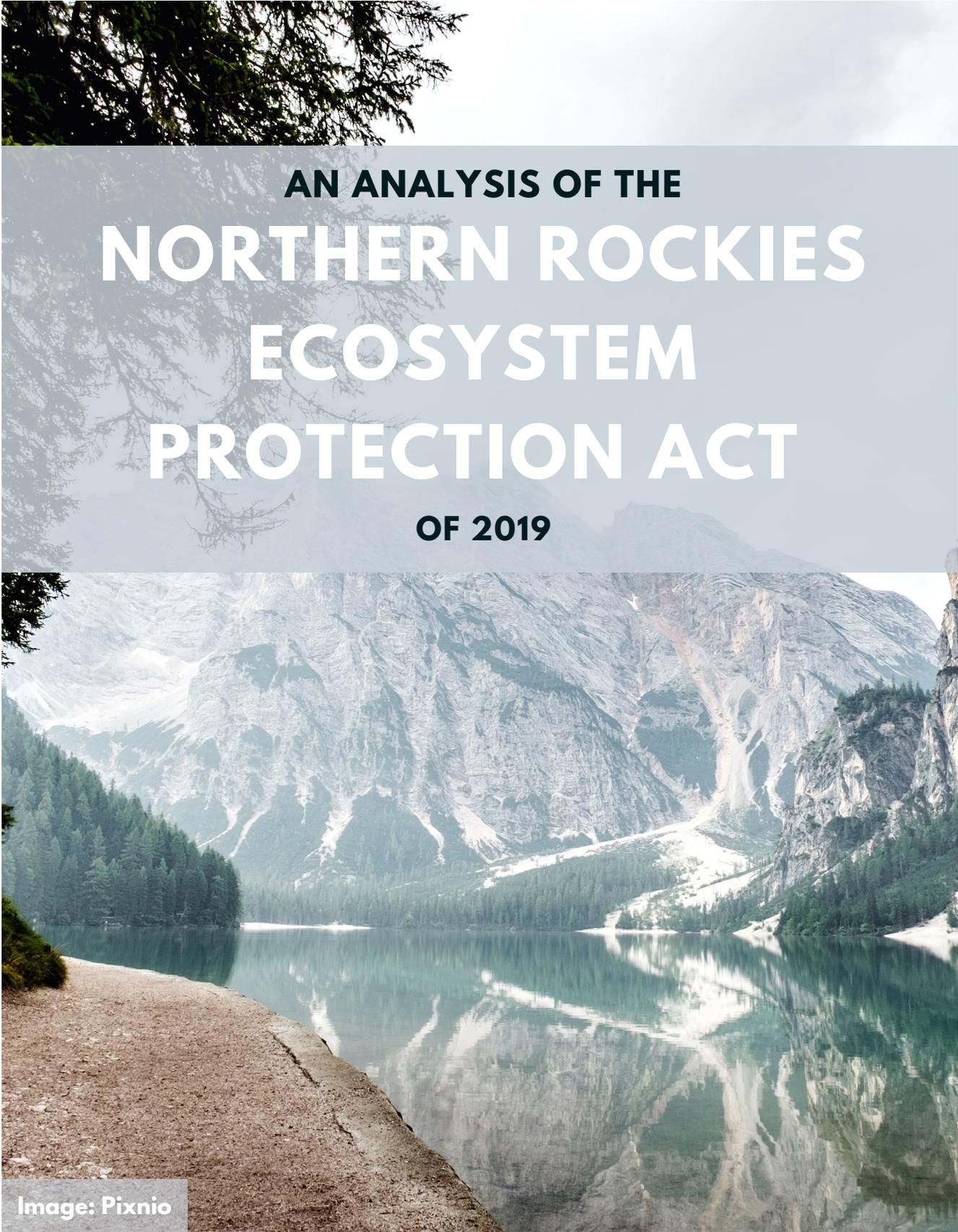


WORKSHOP IN APPLIED EARTH SYSTEMS MANAGEMENT

A scenic landscape photograph of a mountain valley. In the foreground, a gravelly path leads to a calm lake that reflects the surrounding environment. The middle ground is dominated by a dense forest of evergreen trees. In the background, majestic, rugged mountains rise, their peaks partially covered in snow and patches of light-colored rock. The sky is overcast with soft, grey clouds. The overall tone is natural and serene.

**AN ANALYSIS OF THE
NORTHERN ROCKIES
ECOSYSTEM
PROTECTION ACT
OF 2019**

Image: Pixnio

Page intentionally left blank.

An Analysis of the Northern Rockies Ecosystem Protection Act of 2019

TEAM MEMBERS

Isabelle Branco-Lo
Josefina Correa
Louise Efthimiou
Mariana Fajardo
Anastasia Gordon
Jonathan Lesser
Siti Mohd Khairi
Kelly Rose Nunziata
Shuqi Zong

DEPUTY MANAGER

Erifili Draklellis

MANAGER

Beryl Sinclair

FACULTY ADVISOR

Dr. Matthew Palmer

This document includes copyrighted material for educational purposes. These materials are included under the fair use exemption of U.S. Copyright Law and are restricted from further use. This document has been prepared on an “All Care and No Responsibility” basis. Neither the authors nor Columbia University make any express or implied representation or warranty as to the currency, accuracy, or completeness of the information in this document.

All maps are for illustrative purposes only and include legislative boundaries based on work by Save America’s Forests. This work is used with their permission.



EXECUTIVE SUMMARY

The Northern Rockies Ecosystem Protection Act of 2019 (H.R. 1321 and S. 827) was introduced by Carolyn Maloney (D-NY12) in the House of Representatives and by Sheldon Whitehouse (D-RI) in the Senate in early 2019. The Act is a sweeping piece of federal legislation that strengthens protections on public lands across Montana, Idaho, Wyoming, Oregon, and Washington that are managed by the USDA Forest Service, Bureau of Land Management, National Park Service, and US Fish and Wildlife Service. This bioregion is home to some of the country's largest remaining wildlands, but a history of natural resource extraction and human development has slowly eroded its ecological integrity. The Act aims to protect long-term ecosystem health by designating 23 million acres of roadless areas as wilderness and over 1,800 miles of waterways as Wild and Scenic Rivers. In addition, it creates a system of three million acres of biological connecting corridors to connect fragmented wildlife populations and restores one million acres of degraded lands.

This report details a hypothetical program design for implementing the Northern Rockies Ecosystem Protection Act of 2019. It outlines staffing plans, budgets, and timelines over an initial three-year period, at the end of which the legislation mandates an independent panel of scientists prepare a progress report for Congress. The USDA Forest Service manages most of the federal land in the region and, therefore, will administer the new program out of existing regional offices. The Forest Service will also facilitate an interagency team made up of an equal number of public and private representatives that will make recommendations to guide the program's success.

The program design is split into three main areas: corridor planning, restoration, and assessment and monitoring. Corridor planning teams will engage with local land managers and owners to plan for effective wildlife movement using cooperative agreements, land trades, and land acquisitions. Restoration teams will work with private contractors to manage on-the-ground projects to recover degraded lands. The assessment and monitoring team will track landscape and ecological indicators across the entire bioregion to plan and report on the program's implementation.

The politics of this legislation are complicated by the different scales it represents. Proponents of the Act argue that top-down action is required to conserve this landscape for sustained use and enjoyment by future generations. Opponents believe that lands in the West are best managed locally. The value of the Northern Rockies is widely celebrated, however, and this program offers a plan for collaborative stewardship.

TABLE OF CONTENTS

Executive Summary

I. Introduction 1

II. Program Design 2

- A. Interagency Coordination
- B. Implementation Teams
- C. Independent Panel of Scientists

III. Program Design: Corridor Planning 4

- A. Overview
- B. Corridor Planning Mechanisms and Activities
- C. Staffing, Budget, Calendar
- D. Performance Management
- E. Case Study #1: Sapphire Mountains / Continental Divide Biological Connecting Corridor

IV. Program Design: Restoration 9

- A. Overview
- B. Staffing, Budget, Calendar
- C. Performance Management
- D. Case Study #2: Betty Baptiste Project

V. Assessment and Monitoring 12

- A. Overview
- B. Staffing, Budget, Calendar
- C. Reporting Process

VI. Political Context 14

- A. Stakeholders
- B. Legislative History

VII. Conclusion 16

Appendices

- A. Staffing Plan
- B. Budgets
- C. Master Calendar
- D. Summary of Land Designations

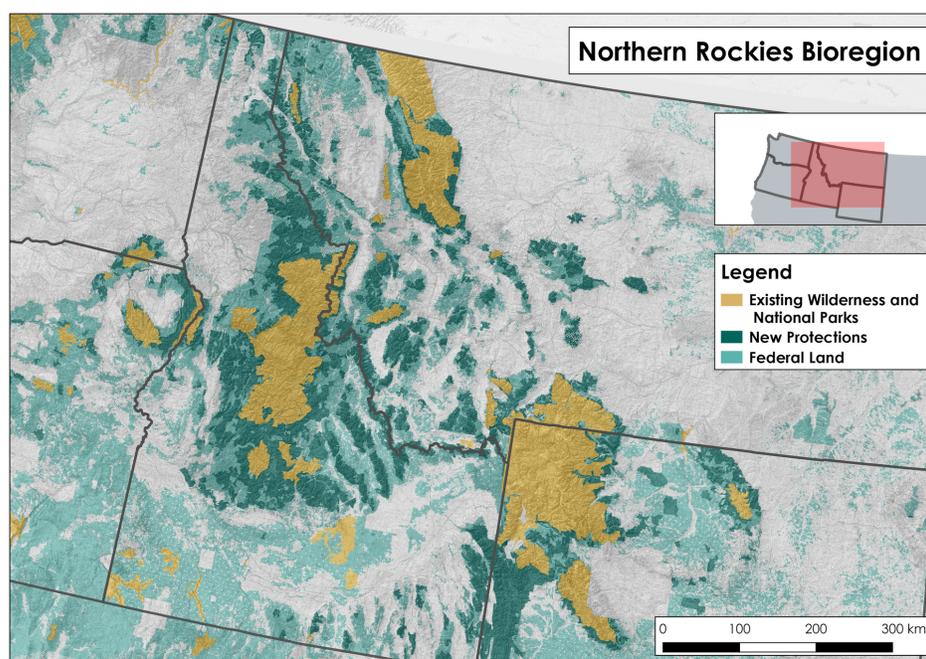
I. INTRODUCTION

The Northern Rockies Bioregion extends over five states in the northwestern United States: Wyoming, Idaho, Montana, Washington and Oregon. The ecological and cultural value of the region makes it a sanctuary for wildlife and some of the most popular wildlands in the country for recreation and outdoor activity. Though it contains some of the last remaining wilderness in the continental United States, the legacy of extractive industry and human development poses a serious threat to aspects of ecosystem health. Threats include water pollution, land degradation, and the fragmentation and decline of wildlife populations. The bioregion contains some of the highest ratios of federally-owned land to privately-owned land in the country, and these public lands are managed by the U.S. Department of Agriculture's Forest Service (USDA-FS) and the U.S. Department of Interior's Bureau of Land Management (BLM), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS). While around nine million acres of federal land in the bioregion are already designated as wilderness under the Wilderness Act of 1964, the federal government provides leases on other public lands for activities like timber harvesting, mineral extraction, and oil and gas development. Such extractive industries generate economic activity but also degrade the quality of waters, erode soils, and fragment wildlife habitats.

The Northern Rockies Ecosystem Protection Act would limit the scope of extractive activities throughout the region by strengthening federal protections on remaining roadless areas and facilitating public-private cooperative agreements and land trades to promote habitat connectivity (Figure 1). These protections include:

- 23 million acres of new wilderness areas, as designated by the Wilderness Act of 1964.
- 1,800 miles of new wild and scenic rivers, as designated by the Wild and Scenic Rivers Act of 1968.
- 2.9 million acres of biological connecting corridors, with some areas that fall under the protections of the Wilderness Act of 1964 and others which will be managed according to the Multiple-Use Sustained-Yield Act of 1960 with restrictions on some extractive activity and road densities.
- One million acres of wildland restoration and recovery areas.

Figure 1. Map of the extent of federal land and wilderness protections, both before and after the passage of the Act, but excluding biological connecting corridors (Alliance for the Wild Rockies, n.d.; Save America's Forests, 2016; Streater, 2019). Map Data Source: US Geological Survey, US Census Bureau; USDA Forest Service; Wilderness Connect. Map: Beryl Sinclair.



II. PROGRAM DESIGN

The program proposed here gives a broad plan of action for implementing the goals of the Northern Rockies Ecosystem Protection Act for the first three years after passage of the legislation. As most of the federal land in the Northern Rockies Bioregion is owned and managed by the USDA-FS, including all of the existing wilderness areas, this will be the agency to administer the program. The USDA-FS will coordinate efforts with other federal, state, and local agencies, while also convening an interagency team with private sector representatives and conservation groups to regularly review and monitor the progress of the program’s goals.

The bulk of the program’s activities and budget is structured around the planning and implementation of biological connecting corridors and restoration and recovery areas as these designations require significant resources to plan and manage. Another component of the program will be to evaluate the overall ecological integrity of all areas designated for additional protections in the Act to holistically measure the long-term success of the legislation. Implementation teams will be responsible for the on-the-ground management of these three programmatic areas and will be based out of USDA-FS Administrative Regions 1 and 4 (Appendix A).

Therefore, the program outlined in this report consists of three sub-programs covered in the following sections: Corridor Planning, Restoration, and Assessment and Monitoring. This program design spans the first three years of the implementation of the Act, at the end of which a progress report will be submitted to Congress (Figure 2).

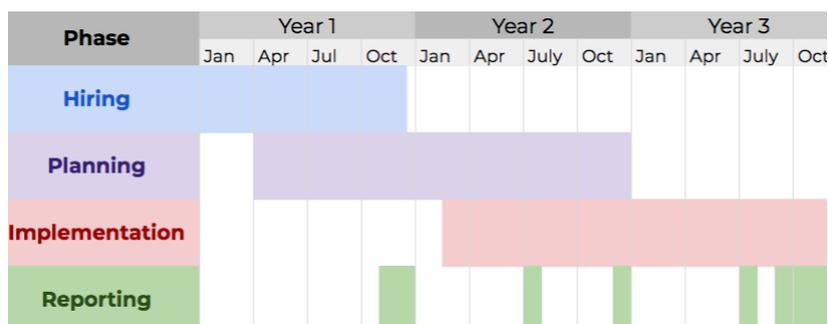


Figure 2. This calendar covers the first three years of the program’s development and implementation. A progress report is due to Congress at the end of the third year.

Interagency Coordination

Interagency coordination is key to the success of the goals of the legislation. The Secretary of Agriculture and the Secretary of the Interior, per legislative mandate, will create a collaborative working group known as the Bioregion Interagency Team. This team will “monitor, evaluate and make recommendations” to achieve the goals of the Northern Rockies Ecosystem Protection Act and manage the implementation of the program design (S. 827, 2019; H.R. 1321, 2019).

By design, this team balances the interests of public and private stakeholders, consisting of 13 staff members from each of the two sectors. The 13 public sector staff include representatives from the USDA-FS, USFWS, BLM, NPS, and state forestry and natural resources agencies. As the lead agency to administer the program, the USDA-FS will create a new position, the Northern Rockies Bioregion Executive Director, who manages programs throughout the entire bioregion and the reporting cycle. The Executive Director will then hire a Northern Rockies Bioregion Deputy Director, Monitoring Manager, Budget Analyst, and Administrator into the USDA-FS. These employees are referred to as the Director's

Office in this report. Other federal representatives on the interagency team are drawn from existing staff and include the Deputy Director of Operations from the USFWS, the Assistant Director of Resources and Planning from the BLM, the Deputy Director of Operations from the NPS, and five staff members from individual state forestry and national resource departments.

The thirteen private sector representatives consist of eight representatives from relevant industries, distributed across oil and gas, mining, timber, and tourism/recreation, while the other five representatives are from conservation organizations and other non-profits. The private stakeholders are not employees of this program – their efforts on behalf of the Interagency Team are supported by their sponsoring organizations or employers. The organizational structure of the Interagency Team is summarized in Figure 3.

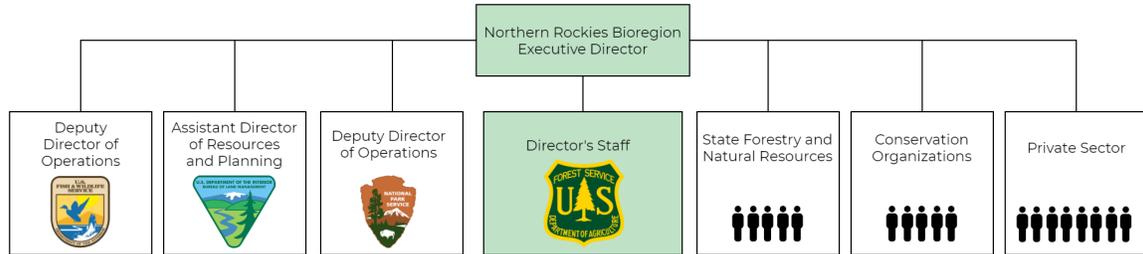


Figure 3. The organizational structure of the Bioregion Interagency Team. Agency logos indicate existing federal roles, green boxes indicate new federal positions, and person symbols indicate public and private stakeholders representing the diversity of interests in the region.

Implementation Teams

Implementation teams are responsible for managing the on-the-ground programmatic activities mandated by the legislation. These teams will report to existing USDA-FS regional foresters who report on the program’s success to the Northern Rockies Bioregion Executive Director (Appendix A). These two teams are based in USDA-FS Administrative Regions 1 and 4 as they contain nearly all of the restoration areas and biological connecting corridors in the Act (Figure 4). Each implementation team is headed by a new Director of Bioregion Programs. Approximately three-quarters of the overall program’s budget and resources are allocated to the team in Region 1 and one-quarter to Region 4, based on the locations of the restoration areas and designated wildlife corridors (Appendix D).

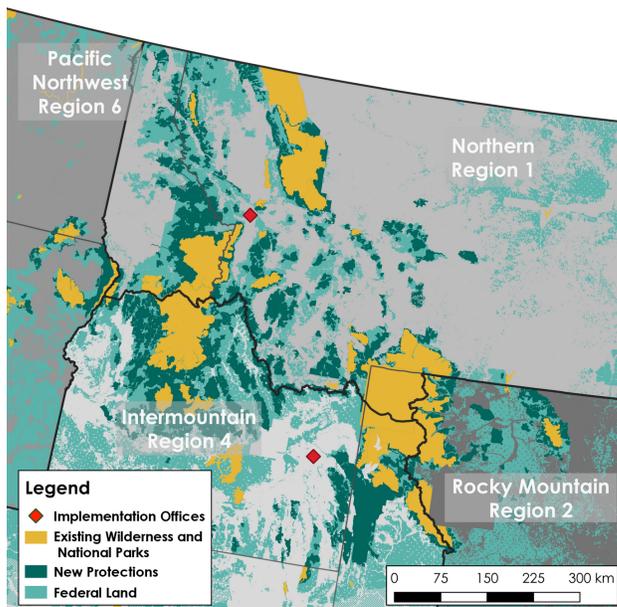


Figure 4. The USDA Forest Service administrative regions with implementation offices in Missoula, MT (Region 1) and Idaho Falls, ID (Region 4) (Save America’s Forests, 2016). Map Data Source: US Geological Survey, US Census Bureau, USDA Forest Service. Map: Beryl Sinclair

Independent Panel of Scientists

The final component of the staffing of this Act is an independent panel of scientists appointed by the National Academy of Sciences in consultation with the Society for Conservation Biology. The panel of scientists, made up of ten representatives from different disciplines such as ecology, botany, wildlife biology, geology, soil science, and environmental chemistry, reports on the implementation of the Act for the first three years. The panel also recommends additional actions, especially regarding protection of roadless areas and funding requirements to meet the goals of the Act. The independent panel of scientists, in collaboration with the other programmatic teams, are key to the successful implementation of the long-term goals of the legislation.

III. PROGRAM DESIGN: CORRIDOR PLANNING

Overview

Although the region as a whole has extensive wildlands, areas within the Northern Rockies Bioregion have been degraded as a result of a long history of natural resource extraction and other forms of human disturbance (Cushman, 2015). Extractive activities require the creation of roads, which create barriers to wildlife movement and degrade adjacent habitats (Fahrig, 2003). Fragmentation can isolate segments of wildlife populations, leading to declines via inbreeding and physiological stress, and can degrade habitat by facilitating the invasion of exotic species (Tyser and Worley, 1992). This process has led to significant reduction in various wildlife populations, reflected especially by a reduction in populations of large carnivores such as grey wolves and grizzly bears (Cushman and Landguth, 2012).

The Act designates 2.9 million acres as biological connecting corridors divided into eighteen distinct areas (Figure 5; Appendix D). Corridors are defined as uninterrupted, narrow natural landscapes and habitats that encourage wildlife movement to prevent population isolation (Rosenberg et al., 1997). Corridors can be evaluated using a Least-Cost Path Analysis, which delineates a path for wildlife with the lowest resistance (i.e., the most probable pathway wildlife would take) to manage the genetic diversity of a population (Parks et al., 2013). Federal land in the corridors would be managed under the Multiple-Use Sustained-Yield Act of 1960 or the Wilderness Act of 1964, depending on the present condition of the land. While some extractive leases may be granted on a case-by-case basis within these corridors, new extractive endeavors, such as timber harvesting, mining, and oil exploration, development and road construction or reconstruction would be prohibited in these special corridor management areas as detailed in Section 203 of the legislation. The Act also specifies that the federal land management agency responsible for administering the proposed biological connecting corridors take immediate action to decrease road density to no more than 0.25 miles of road per square mile of land, with the ultimate aim of achieving zero miles of road per square mile, although this will exempt existing major roads and highways.

Each biological connecting corridor will be primarily managed by the USDA Forest Service (USDA-FS) with assistance from the local offices of the Bureau of Land Management (BLM). These agencies will evaluate land ownership and stakeholder needs within the corridors in their jurisdictions to create cooperative agreements to best facilitate wildlife movement and ecological integrity.

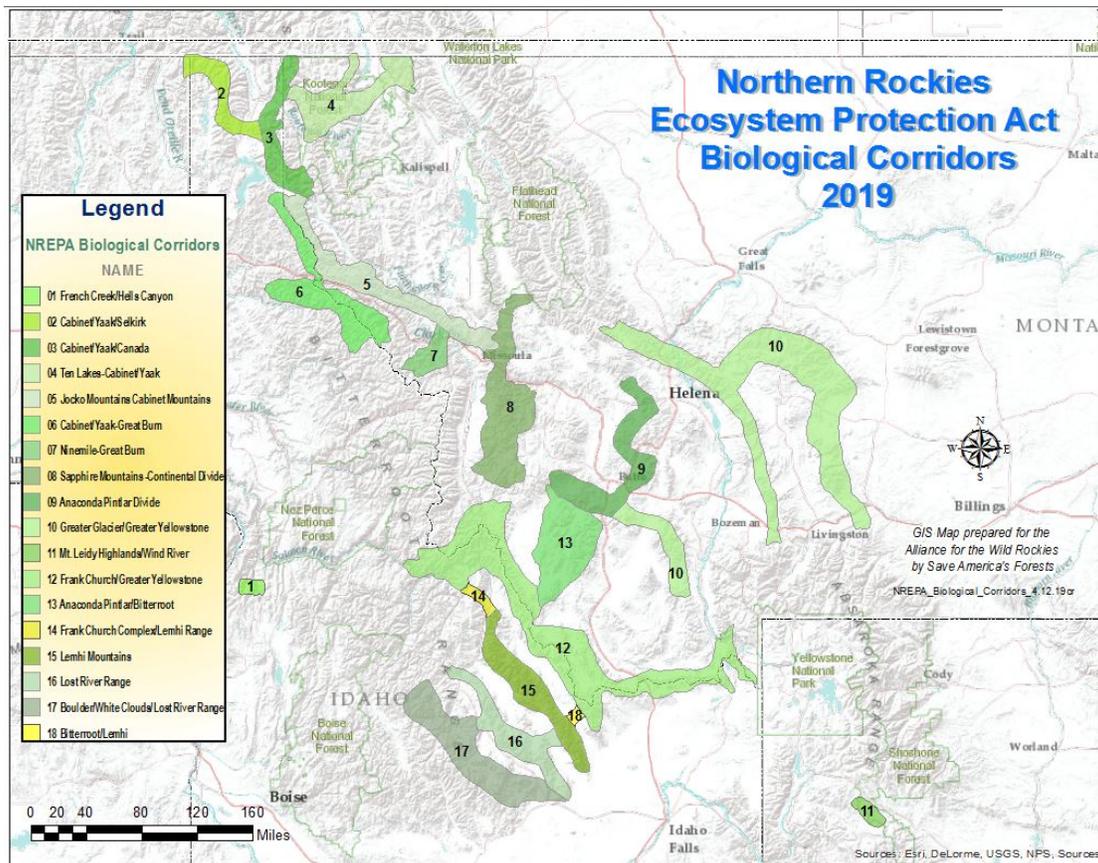


Figure 5. The biological connecting corridors designated by the Northern Rockies Ecosystem Protection Act, totaling 2.9 million acres. Source: Save America's Forests (2019) (reproduced with permission).

Corridor Planning Mechanisms and Activities

The USDA-FS and BLM will negotiate purchases or exchanges of land to increase the connectivity of corridors with respect to wildlife movement. This may lead to land deals such as:

- *Land Trades* where private landowners are given the option of exchanging their land for federal land of equally assessed value.
- *Land Acquisitions* where private landowners have the option of selling their land to the federal government.

The federal government will also enter into cooperative agreements with public and private landowners, including sovereign tribes, to jointly establish corridor management activities with land remaining legally owned by the landowner. This could involve the removal of barriers to wildlife movement such as roads or fences.

Extractive leases within corridor designations will be subject to re-evaluation, and monitoring will be performed to manage the impacts of any new development. Future commercial activities on federal land will be determined on a case-by-case basis. If a parcel of land acquired through a trade or acquisition is determined to be of a low quality for wildlife movement, restoration would be needed. This land would then go through the restoration processes described in Section IV of this report.

Staffing, Budget, and Calendar

New corridor planning staff will be needed in both the USDA-FS and the BLM. The corridor planning organizational structure will be replicated across USDA-FS Administrative Regions 1 and 4, with thirteen new hires planned for Region 1 and six new hires for Region 4 (Figure 6; Appendix B). Each team will be headed by a biological connecting corridor supervisor who oversees new hires to negotiate agreements and perform outreach to landowners. In Region 1, six new land acquisition specialists and one lawyer will be hired to handle the exchanges and purchases from private landowners. An ecological assessment coordinator will be hired to work with an engineering team to assess and plan the recovery of degraded land and the removal of human structures. A communications team of two will handle the public-facing aspects of the corridor planning program. Region 4 has a smaller area to manage than Region 1, so only six new staff will be hired to the region's new Northern Rockies Bioregion Department. This region's Supervisor will be supported by one lawyer, one engineer, one public affairs specialist, one ecological assessment coordinator, and one land adjustment coordinator. The number of hires was determined based on existing staff in each regional USDA-FS office by determining the ratio of each area of expertise to the amount of land managed.

Additionally, two corridor planning liaisons will be hired in the BLM, one each in the Idaho State Office and the Montana/Dakotas State Office to provide interagency coordination with the USDA-FS and local stakeholders. The same hiring pattern was applied to the hires within BLM as the USDA-FS by looking at existing staff and their ratios.

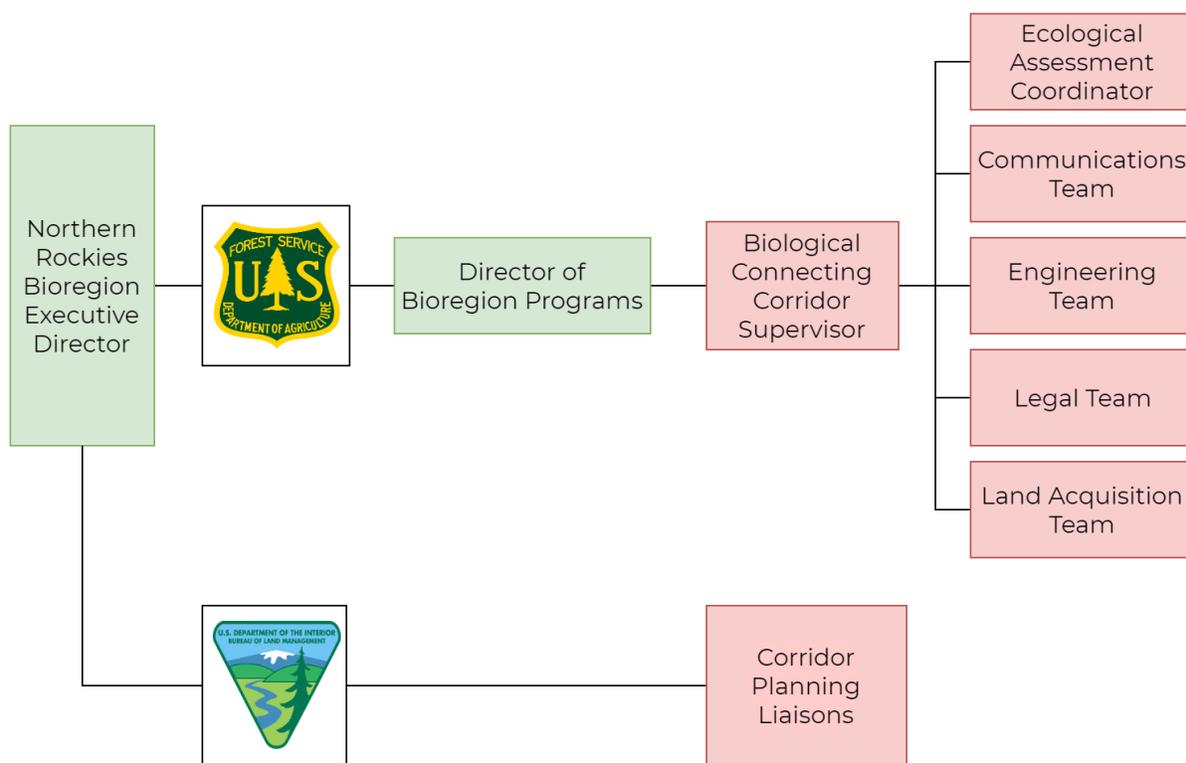


Figure 6. The organizational structure for the corridor planning program in the USDA Forest Service. This structure will be created in both Administrative Regions 1 and 4. Green shading indicates executive and interagency roles, and red shading indicates the new hires for the corridor planning teams.

The total annual budget for managing the biological connecting corridor program is estimated at \$64 million dollars per year, including approximately \$2 million for annual personnel costs and administrative overhead and \$62 million in expenditures related to land acquisitions and trades over years two and three of the program (Appendix B, Table B-3). Program staff will be hired at the beginning of the first year to start planning and outreach by the second quarter. Land trades and acquisitions will be mainly implemented during the second and third year leading up to the comprehensive report due to Congress. The results of this assessment could lead to recommendations of further funding allocations for the corridor program, which could include both additional land acquisitions and projects such as the construction of overpasses or underpasses to facilitate wildlife movement across highways.

Performance Management

Specific measures for evaluating the successful implementation of the corridor planning program involve monitoring land trades and acquisitions, commercial activities, and barriers to species movement. These relevant metrics are the:

- number of acres purchased and/or traded.
- money and effort spent on each landowner agreement.
- value of extractive industry leases.
- amount of timber harvested.
- extent of barriers such as roads, fences, *etc.* removed.

Planning and managing connecting corridors will incorporate an important social component on top of the ecological evaluation performed by each Ecological Assessment Coordinator. Other teams will manage aspects of stakeholder engagement (*i.e.*, the human dimensions) to maintain relationships with private landowners, corporations, local communities, tribal leaders, and state and local agencies. Feedback for improving the management of the connecting corridors will have to consider a balance between the ecological goals mandated by the bill and the sometimes conflicting socio-economic realities of the region.

Case Study: Sapphire Mountains-Continental Divide Connecting Corridor

The Sapphire Mountains/Continental Divide Corridor established by the bill highlights the complexity involved in coordinating the needs of landowners in federal, state, and local agencies, sovereign tribal nations, and the private sector while improving improve wildlife movement. This biological connecting corridor is 120,000 acres in total and managed by both the USDA Forest Service (Region 1 Missoula Office) and Bureau of Land Management (Missoula Field Office). It includes several national forests including Bitterroot National Forest, Beaverhead-Deerlodge National Forest, and Lolo National Forest. The corridor is designed to encourage wildlife movement between the Salmon-Selway Ecosystem to the southwest and the Northern Continental Divide Ecosystem to the northeast. This corridor is an integral link between the northwest corridors and southeast corridors of the entire bioregion (Figure 7).

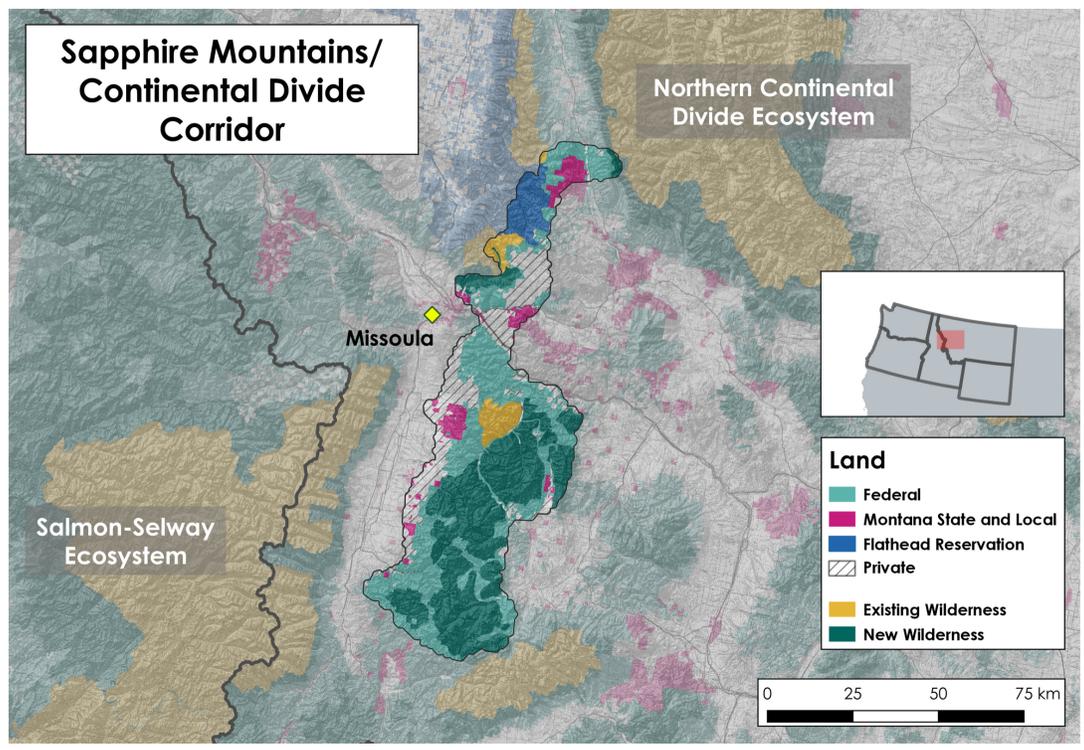


Figure 7. The proposed biological connecting corridor in western Montana, totaling 120,000 acres with land ownership as of November 2019 (Save America's Forests, 2019). Map Source Data: Montana Cadastral; Montana Fish, Wildlife & Parks; US Geological Survey, US Census Bureau; USDA Forest Service; Wilderness Connect. Map: Beryl Sinclair.

Interstate 90 runs east-west through the corridor and represents a challenge for corridor connectivity as the Act exempts major highways from further regulation. The implementation team managing this corridor will have to evaluate the cost and effectiveness of potential underpasses or overpasses to facilitate wildlife movement across this road. The corridor also includes the city of Missoula, Montana with a population of roughly 70,000 in the city center.

Figure 7 shows the complex mosaic of land ownership in the corridor. The federal government will need to initiate trades or acquisitions with private landowners, develop agreements such as conservation easements, and evaluate overall corridor connectivity to encourage wildlife movement. The Nature Conservancy, a conservation non-profit, has already brokered easements with private landowners on a significant portion of private land in the corridor, so the corridor planning team will need to coordinate with the organization to work with existing stewardship plans (The Nature Conservancy, 2018). Other stakeholders include the Confederated Salish and Kootenai Tribes of the Flathead Nation, Montana Fish, Wildlife and Parks, the City of Missoula, and local residents and community groups. The corridor team will have to go through a robust planning and community engagement process to develop cooperative agreements that balance different interests with measures to ensure ecological success.

IV. PROGRAM DESIGN: RESTORATION

Overview

After the enactment of the bill, approximately one million acres of land will be designated as wildland restoration and recovery areas. These lands have been degraded from prior land uses to such an extent that they cannot be considered as wilderness. Targeted efforts in these areas would therefore restore the former ‘wilderness character’. Examples of actions to restore land damaged by extractive activities include replanting vegetation, reducing or eliminating invasive species, facilitating native species diversity, stabilizing soils for erosion prevention, recontouring slopes, removing man made barriers, and restoring water quality (H.R. 1321, 2019).

These active interventions highlight the program’s commitment to undoing the impacts from industrial timber harvest, mining, and oil and natural gas extraction. An alternative would be to follow an exclusively passive approach, but active restoration techniques will be prioritized to accelerate the process of landscape restoration (Steven-Rumann et al., 2017). In each restoration area, context-dependent research and assessment will be performed to determine the most appropriate recovery plan. Active restoration under the Northern Rockies Ecosystem Protection Act will also create employment opportunities, ultimately contributing to both ecological and economic gains in the region.

Recovering landscapes at the intensity and scale of the Northern Rockies Ecosystem Protection Act will be costly. The restoration program makes up roughly 80% of the total three-year program budget. Choosing which criteria of restoration success to use must be established at the beginning of the process so that success can be appropriately evaluated (Ruiz-Jaen et al., 2005). Thus, to better organize the implementation of landscape restoration across the bioregion, the program divides recovery into three main activities: soil management, wildland species composition, and environmental remediation (*i.e.*, the removal of toxic materials and manmade structures). Projects that will require erosion control and toxic chemical removal are significantly more expensive than those that will mainly necessitate the replanting of riparian buffers. In terms of wildland species composition, projects involving the removal of invasive species will be more expensive than those that will only require reintroducing native species. These activities provide an effective basis for organizing on-the-ground work. On a thematic level, these activities also identify the areas of degradation brought about by human activities like unsustainable timber harvest (tree clearing reducing species abundance and diversity), natural gas extraction (fracking wastes causing toxic pollution in waterways), and other infrastructure developments (roads facilitating erosion through their effect on geomorphic processes).

Staffing, Budget, and Calendar

On-the-ground restoration work will be conducted primarily by private contractors (Figure 8). These private actors are heavy-equipment operators, invasive species specialists, and foresters who will perform the mechanical tasks needed to begin the restoration process. Engaging private companies also contributes to the wider integration of the local private sector into developing a green economy. Contracting under this program design will follow the rules of the WILD Act (Wildlife Innovation and Longevity Driver Act), legislation that requires a contract to delineate the area impacted, disclose what management techniques are used, and estimate the cost and time of the project (S. 862, 2017).

Contract specialists hired within each region report to their relevant restoration supervisor. Together, the contract specialists and restoration supervisors determine the number and scope of contracts granted in each region. The contract specialists and restoration supervisors report to their relevant director of bioregion programs, who ultimately reports to the regional foresters directly connected to the interagency team (Figure 8).

Hiring for new positions will take place in the first year following the passage of the Act. Assembling restoration and recovery plans will also start in the first year to prepare for implementation and contracting to start in the second year. Restoration activities are then expected to continue into the third year prior to the entire program being evaluated by Congress. Total personnel costs and administrative overheads for new USDA-FS staff are estimated at about \$0.7 million annually. The cost of private contracts are estimated at around \$500 per acre for one million acres, totaling an average annual cost of \$225 million over the first two years of implementation (Appendix B, Table B-4; Rizzo, 2001; Joyner, 2011).

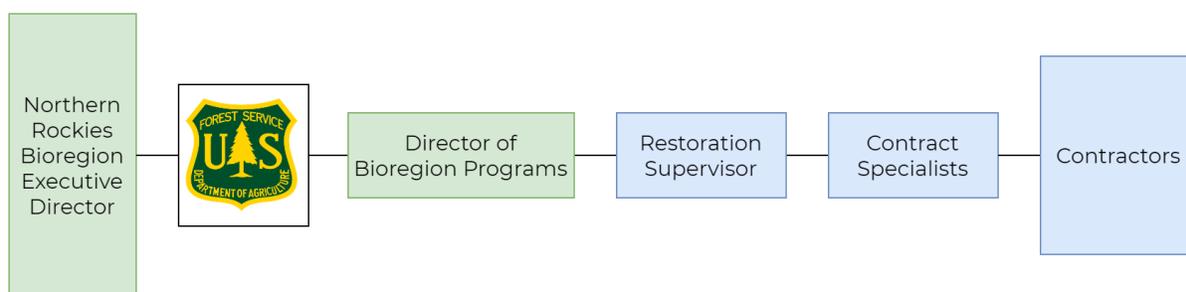


Figure 8. The organizational structure for the wildland restoration and recovery program in both USDA Forest Service Administrative Regions 1 and 4. Green shading indicates executive and interagency roles, and blue shading shows the new hires of the restoration team.

Performance Management

The strategies for restoring a degraded landscape are based in science. Therefore, the foundation of the restoration program assessment rests on satisfying certain ecological indicators and are discussed in greater depth in the Assessment & Monitoring section of this report (Section VI). Since restoration projects are carried out by contractors, these teams will also be evaluated based on the success of the project. Private contractors will be retained both for implementing restoration activities and for collecting data necessary for the overarching monitoring work performed by the federal agencies. Moreover, while the program design is explicitly divided by designation, data collected for restoration, corridors, and wilderness areas and wild and scenic rivers will be shared. Recovery work on lands acquired through the corridor planning program further illustrates the potential for overlap among the program activities.

In addition to the ecological impact assessments, staff evaluations are also part of the restoration performance management. These evaluations will follow USDA-FS standards. Lastly, budget review for the wildland restoration and recovery program will be done at the level of the interagency team.

Case Study: Betty Baptiste Project

The Betty Baptiste Project is a restoration project in Flathead National Forest, Montana. While this project is within the Northern Rockies Bioregion, the project lies outside of the legislative boundaries of the Act. The project area covers 20,000 acres, and nearly 2,000 of those acres will be treated using pre-commercial thinning, shelterwood logging, seed-tree regeneration, and prescribed burning (U.S. Department of Agriculture, 2018; Scott, 2018). These techniques aim at restructuring and diversifying forest stands. The wildland restoration and recovery areas of the Northern Rockies Ecosystem Protection Act will employ similar strategies over a much larger scale to restore approximately one million acres of degraded land. The Betty Baptiste Project serves as an illustration of the kinds of restoration approaches that occur in an area with common ecological conditions. Moreover, the Betty Baptiste project's environmental impact assessment reflects comparable targets and indicators for restoration success.

The Betty Baptiste project is divided into three sections that highlight different land uses: vegetation management, transportation management, and recreation management. This range of land management issues is common throughout the Northern Rockies. Despite potential conflicts of interest among local stakeholders, the goal of the Betty Baptiste Project is to balance ecological restoration with timber productivity, recreational opportunities, and transportation networks (U.S. Department of Agriculture, 2018). To provide a variety of wood products to the local economy, the project prioritizes harvesting dead or near-death trees. In addition, restoration activities will improve existing recreational areas through trail renovations, scenic area upgrades, and parking area expansions. Drainage improvements to manage soil stability and camouflaging temporary roads to minimize use are examples of actions that mitigate the negative impacts of motorized transport on wildlife and geomorphology. Finally, the Betty Baptiste Project's public comment history mirrors the Act's emphasis on collaboration with local actors to ensure inclusive and knowledge-based decision making. Indeed, local input for the Betty Baptiste Project resulted in important plan modifications.



Figure 9. View northeastward across Hungry Horse Reservoir in Montana near the Betty Baptiste Project area.
Source: Wikimedia Commons.

V. ASSESSMENT AND MONITORING

The Northern Rockies Ecosystem Protection Act defines success as “protect[ing] ecological integrity and continuity... in order to restore the wilderness character of the land” (H.R. 1321, 2019). Responding to these goals, the program designed in this report includes an interagency staffing structure and budget plan to carry out activities related to corridor planning, wildland restoration, wilderness and wild and scenic river designations, and monitoring. In order to determine whether projects are implemented appropriately, resources are used efficiently, and intended goals are achieved, monitoring and assessment of critical ecological and performance metrics will be necessary.

The Director’s Office of the interagency team will supervise the overall assessment and monitoring process using information reported through geographic information systems (GIS) used to monitor satellite data, produce maps, and manage data to detect changes in the Northern Rockies Bioregion. The monitoring teams created in Regions 1 and 4 will collect data and report on ecological indicators to determine whether the major goals of protecting native species and water quality, connecting genes and habitats, and renewing the intrinsic value of productive land have been achieved. Specifically, the monitoring teams will give the Director’s Office status reports analyzing the restoration of vegetative cover, water quality, and wildlife habitats throughout the region (Figure 10).

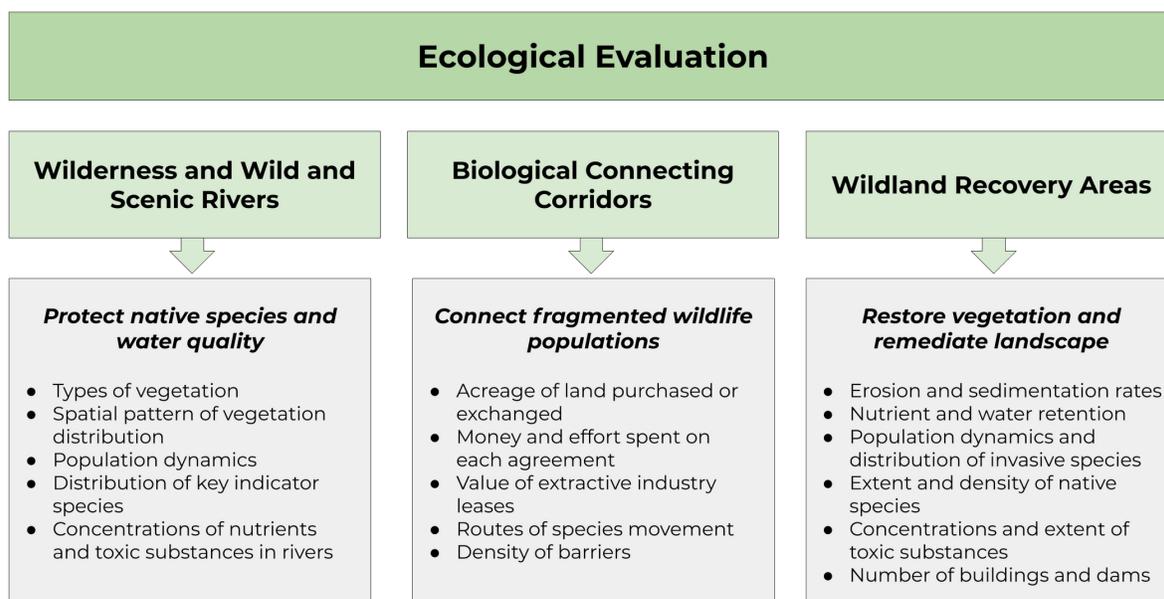


Figure 10. This chart shows an example set of Northern Rockies Bioregion ecological indicators.

Staffing, Budget, and Calendar

New employees will be hired for the assessment and monitoring teams in Regions 1 and 4 (Figure 11). To monitor the long term progress of the Act, monitoring supervisors will be employed in both regions to oversee data collection and GIS monitoring. Geospatial specialists will be hired to analyze remote-sensing data, and contracts will be issued for ground-truthing to supplement satellite imagery. The contractors will collect field data to assess the progress of wildland recovery, wildlife use of corridors, and the effectiveness of wilderness designations. In addition, a GIS specialist for the Northern Rockies Bioregion will be added to the United States Fish and Wildlife Service (USFWS) to support the evaluation of programs focused on wildlife movement.

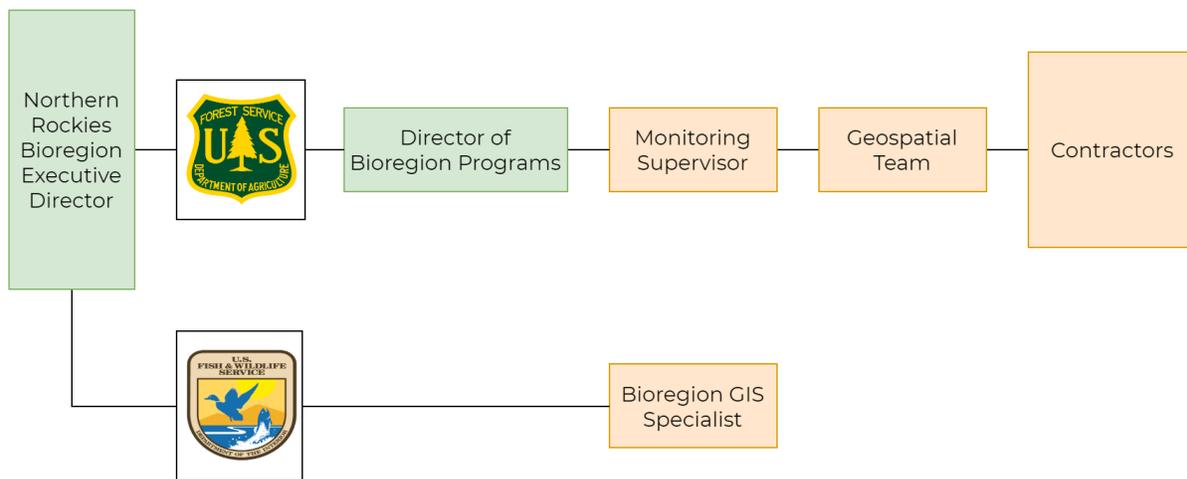


Figure 11. The organizational structure for the assessment and monitoring program in both USDA Forest Service Administrative Regions 1 and 4. Green shading indicates executive and interagency roles, and yellow shading shows the new hires of the assessment and monitoring teams.

The total annual personnel cost and administrative overhead for the monitoring team is approximately \$0.8 million. In addition to the activities of full-time federal staff, private contractors will be hired who specialize in field data collection and on-site ecological assessments. These contracts are estimated to cost \$580,000 in each year. Altogether, assessment and monitoring will have a fixed annual cost of \$1.35 million, which is less than 1% of the program’s total three-year budget (Appendix B, Table B-5).

Reporting Process

Within three years after the enactment of the legislation, the Secretaries of the Interior and Agriculture must submit an implementation report to the Committee on Energy and Natural Resources of the Senate and the Committee on Natural Resources of the House of Representatives. The report will be prepared by the independent panel of scientists described in Section II of this report using data sources from the monitoring team. It will outline the implementation of the bill during the preceding three years as well as identify additional projects, activities, and funding necessary to achieve the goals of the Act moving forward.

In order to regularly analyze information needed for the final implementation report, every six months, status reports will be submitted from implementation team to bioregional departments, and the interagency team will meet to assess the status of the implementation. Finally, based on the reports from the implementation teams as well as the recommendations from the whole interagency team, the Bioregion Director’s Office will work with the panel of scientists to make modifications and develop future plans for the program (Figure 12). To assess whether the newly hired staff under the implementation team are meeting expectations, the monitoring supervisor, geospatial team, GIS specialists, and contractors will all be evaluated according to current USDA Forest Service performance management standards and procedures.

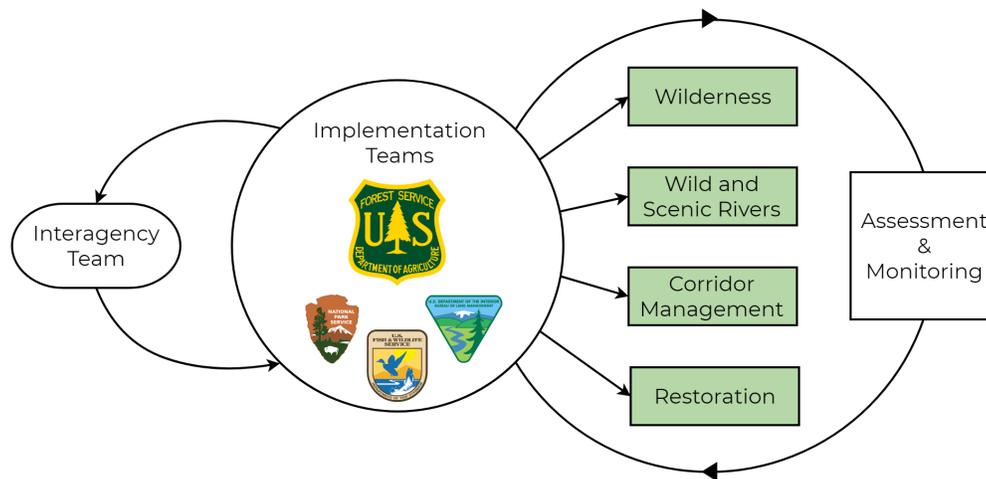


Figure 12. The overall structure of the program. The USDA Forest Service will administer the program in coordination with the Bureau of Land Management, National Park Service, and Fish and Wildlife Service. The program will plan, implement, manage, and evaluate the success of the goals and new land designations of the Act with regular review by an interagency team.

VI. POLITICAL CONTEXT

Stakeholders

Arguments against the Northern Rockies Ecosystem Protection Act are primarily concerned with local rights, particularly those of management of land and water resources. Some stakeholders are concerned that more stringent protection of the lands will weaken the local economy by limiting economic activity, such as motorized recreation and resource extraction (Pinedale Online, 2009). Extractive activities in timber, oil and gas, and minerals would be limited by the designations of the bill, concerning some local municipalities due to potential loss of revenue. For example, under the Act, 1.3 million acres in Sublette County in Wyoming will gain additional protections at the cost of losing 40% of timber land (Pinedale Online, 2009). Ranchers who oppose the legislation fear it will lead to the repopulation of predators like wolves and grizzly bears which will harm their cattle (Bergstrom et al, 2009). This staunch local opposition has resulted in resistance from politicians representing the region. Senator Max Baucus, a Democrat from Montana, attempted to prevent the Act from moving from committee during his tenure in the Senate from 1978 to 2014 due to his ties to extractive industry in the area and the opposition of his constituents (O’Brien, 2016).

Arguments for the legislation come from conservation and recreation groups as well as outdoor enthusiasts in the region and across the United States. Save America’s Forests, Alliance for the Wild Rockies, the Sierra Club, Friends of the Clearwater, and the Wildlands Network have all endorsed the legislation (“NREPA,” 2019; Manchenn, 2019). Those who support the Act have argued the economic losses in extractive industries will be countered by increased tourism, increased opportunities for education and research, and decreased public costs currently spent subsidizing extraction. In fact, the legislation is predicted to save \$245 million in subsidies for logging and road construction associated with extractive activities (Manchenn, 2019). Support for the legislation also comes from activism for ecological restoration and habitat connectivity in some of these last remaining wildlands in the continental U.S (H.R. 1321, 2019).

VII. CONCLUSION

The Northern Rockies Ecosystem Protection Act will connect habitats and restore degraded land and water. These actions will have a profound impact on both the regional ecosystem and economy. Given the varied levels of local political support, the program will need to engage community members to meet the social and economic as well as environmental sustainability goals. The program set out in this report brings together stakeholders from a variety of backgrounds to advance the successful implementation of the new protections. By designating new wilderness areas and wild and scenic rivers, the legislation will further protect native species and water quality. The creation of biological connecting corridors will reverse the effects of fragmentation of genes and habitats to support sustainable wildlife populations. Finally, wildland recovery areas will renew the intrinsic value of productive lands while spurring economic activity.

With an initial price tag of approximately \$650 million over three years, this program would aim to increase tourism, education, research, and economic gains derived from ecosystem management. The Northern Rockies Ecosystem Protection Act is a comprehensive piece of legislation that mandates the protection of some of the last remaining contiguous wildlands in the continental United States. Successful implementation of this legislation could result in large swaths of continuous, protected wildlands where wildlife flourishes and communities benefit from increased ecosystem services.



Figure 14. Autumn view of Grand Teton National Park in northwestern Wyoming. Source: Pixabay.

APPENDIX A. Staffing Plan

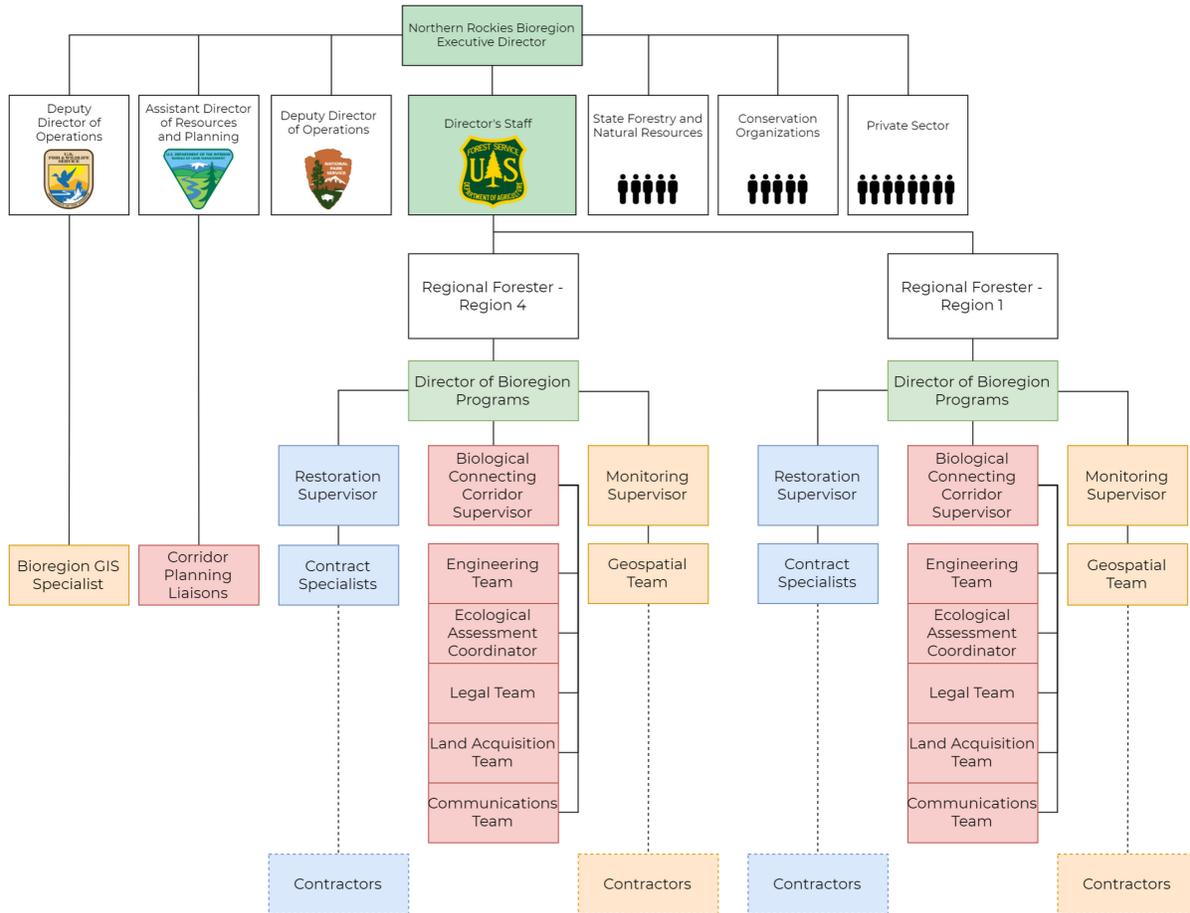


Figure A-1. The overall staffing plan for the new hires required to implement the Northern Rockies Ecosystem Protection Act. An interagency team made up of equal representation from the public and private sectors will be chaired by a newly hired Northern Rockies Bioregion Executive Director. Two implementation teams will be formed in USDA Forest Service Administrative Regions 1 and 4 and will report into the existing regional foresters. These teams will be responsible for coordinating on-the-ground activities, planning, and data collection. The implementation teams will coordinate with new hires in regionally located Bureau of Land Management field offices and US Fish and Wildlife Service field offices who will have roles specifically focused around implementing the goals of the Act.

APPENDIX B. Budgets

Table B-1. The summary budget for the three-year program implementation. Personnel costs are fixed for each team over the first three years, so depending on hiring timelines, the year one staffing budget is likely to vary. Base salaries were determined based on comparable positions within the federal government general pay scale (GS) system. GS scales were found on either FederalPay.org (2019) or Glassdoor (n.d.). Fringe benefits include health insurance, approximately 30% of base salaries, and federal retirement plans, the Thrift Savings Plan and Basic Benefit Plan, each approximately 1% of base salaries (Parker, 2019; Gallion, n.d.). Rent and utilities were excluded from overheads as the implementation teams will work out of existing USDA Forest Service offices in the Northern Region 1 headquarters in Missoula, Montana and the Intermountain Region 4 in Idaho Falls, Idaho.

Summary Budget		Year One	Year Two	Year Three
Personnel Costs				
	Interagency Coordination	\$1,000,000	\$1,000,000	\$1,000,000
	Corridor Planning	\$2,000,000	\$2,000,000	\$2,000,000
	Restoration Activities	\$800,000	\$800,000	\$800,000
	Assessment and Monitoring	\$700,000	\$700,000	\$700,000
	subtotal	\$4,500,000	\$4,500,000	\$4,500,000
Expenses				
	subtotal	\$200,000	\$200,000	\$200,000
Land Acquisitions				
	Corridor Planning	\$0	\$62,100,000	\$62,100,000
Contracted Services				
	Restoration Activities	\$0	\$255,800,000	\$255,800,000
	Assessment and Monitoring	\$600,000	\$600,000	\$600,000
	subtotal	\$600,000	\$318,500,000	\$318,500,000
	GRAND TOTAL	\$5,300,000	\$323,200,000	\$323,200,000

Table B-2. The personnel costs of the Northern Rockies Bioregion Executive Director’s Office and the administrative overhead for the semi-annual weeklong convenings of the interagency team.

Interagency Coordination		Year One	Year Two	Year Three
Personnel Costs				
Salaries - USDA-FS	Executive Director - ES 1	\$182,232	\$182,232	\$182,232
	Deputy Director - GS 15	\$138,572	\$138,572	\$138,572
	Monitoring Manager - GS 14	\$114,789	\$114,789	\$114,789
	Budget Analyst - GS 9	\$51,440	\$51,440	\$51,440
	Administrator - GS 6	\$47,264	\$47,264	\$47,264
Salaries - USDA-FS Region 1	Region 1 Director - GS 13	\$100,000	\$100,000	\$100,000
Salaries - USDA-FS Region 4	Region 4 Director - GS 13	\$100,000	\$100,000	\$100,000
	subtotal	\$734,297	\$734,297	\$734,297
Fringe benefits	At 32%	\$234,975	\$234,975	\$234,975
	Total Personnel	\$969,272	\$969,272	\$969,272
Expenses				
Travel and meetings	Hotel, travel, meals, conference coordination	\$140,000	\$140,000	\$140,000
	Total Expenses	\$140,000	\$140,000	\$140,000
	GRAND TOTAL	\$1,109,272	\$1,109,272	\$1,109,272

Table B-3. The personnel costs and expenses budgeted for the corridor planning team, located in the USDA Forest Services offices in Administrative Regions 1 and 4 and Bureau of Land Management offices for Idaho State and Montana/Dakotas. It also details a rough order of magnitude for the cost of land acquisitions in the bioregion, based off information published in the Fiscal Year 2020 Forest Service Budget Justification (U.S. Department of Agriculture, 2019). The average amount that the USDA Forest Service has spent on land acquisition in the past three years was calculated and this amount was allocated as the budget for land acquisition and exchanges for corridor planning in the Northern Rockies Bioregion, assuming that the USDA Forest Service will prioritize land acquisitions in this region. The number of staff needed within Regions 1 and 4 was determined by looking at the ratio of existing staff in the Region 1 to the acreage of the land they oversee. That ratio was applied to the number of hires needed for the total number of biological connecting corridors established by the bill in each USDA-FS office.

Corridor Planning		Year One	Year Two	Year Three
Personnel Costs				
Salaries - USDA-FS Region 1	(1) Biological Connecting Corridor Supervisor - GS 12	\$96,978.00	\$96,978.00	\$96,978.00
	(1) Ecological Assessment Coordinator - GS 11	\$71,574.00	\$71,574.00	\$71,574.00
	(6) Land Acquisition Specialist - GS 9	\$354,924.00	\$354,924.00	\$354,924.00
	(1) Legal Specialist - GS 11	\$71,574.00	\$71,574.00	\$71,574.00
	(2) Engineering Specialist - GS 10	\$130,284.00	\$130,284.00	\$130,284.00
	(2) Communications Specialist - GS 9	\$118,308.00	\$118,308.00	\$118,308.00
Salaries - BLM	(2) BLM Corridor Planning Liaison - GS 9	\$118,308.00	\$118,308.00	\$118,308.00
Salaries - USDA-FS Region 4	(1) Biological Connecting Corridor Supervisor - GS 12	\$96,978.00	\$96,978.00	\$96,978.00
	(1) Ecological Assessment Coordinator - GS 11	\$71,574.00	\$71,574.00	\$71,574.00
	(1) Land Adjustment Coordinator - GS 10	\$65,142.00	\$65,142.00	\$65,142.00
	(1) Attorney - GS 11	\$71,574.00	\$71,574.00	\$71,574.00
	(1) Engineer - GS 11	\$71,574.00	\$71,574.00	\$71,574.00
	(1) Public Affairs Specialist - GS 10	\$65,142.00	\$65,142.00	\$65,142.00
Salaries - BLM	(2) BLM Corridor Planning Liaison - GS 9	\$118,308.00	\$118,308.00	\$118,308.00
	subtotal	\$1,522,242	\$1,522,242	\$1,522,242
Fringe benefits	At 32%	\$487,117	\$487,117	\$487,117
	Total Personnel	\$2,009,359	\$2,009,359	\$2,009,359
Expenses				
Travel and meetings	Travel and meals	\$2,500	\$2,500	\$2,500
Materials and supplies	Printing and office supplies	\$2,500	\$2,500	\$2,500
	Total Expenses	\$5,000	\$5,000	\$5,000
Land Acquisitions				
Land acquisitions	Land purchases	\$0	\$62,110,000	\$62,110,000
	Total Land Acquisitions	\$0	\$62,110,000	\$62,110,000
	GRAND TOTAL	\$2,014,359	\$64,124,359	\$64,124,359

Table B-4. The personnel costs and expenses budgeted for the restoration team, located in the USDA Forest Services offices in Administrative Regions 1 and 4. It also offers a rough order of magnitude for the cost of on-the-ground restoration contracts to be awarded to private contractors starting in the second year of the program. Based on community restoration projects in the bioregion and in other forest ecosystems elsewhere in the country, a fairly conservative first estimate for restoration work is a cost of \$500 per acre, giving a total cost of approximately \$512 million for the 1,023,000 acres of land designated for restoration (Rizzo, 2001; Joyner, 2011). This amounts to a little over \$520 million in total for two years. The contractors are managed by contract specialists, and both are part of wider USDA Forest Implementation Teams in Regions 1 and 4. Since Region 1 has more restoration acreage, the team there will have three contract specialists while Region 4 will only have one.

Restoration		Year One	Year Two	Year Three
Personnel Costs				
Salaries - USDA-FS Region 1	(1) Restoration Supervisor - GS 12	\$96,978	\$96,978	\$96,978
	(3) Contract Specialist - GS 12	\$290,934	\$290,934	\$290,934
Salaries - USDA-FS Region 4	(1) Restoration Supervisor - GS 12	\$96,978	\$96,978	\$96,978
	(1) Contract Specialist - GS 12	\$96,978	\$96,978	\$96,978
	subtotal	\$581,868	\$581,868	\$581,868
Fringe benefits	At 32%	\$186,198	\$186,198	\$186,198
	Total Personnel	\$768,066	\$768,066	\$768,066
Expenses				
Travel and meetings	Travel and meals	\$1,500	\$1,500	\$1,500
Materials and supplies	Printing and office supplies	\$1,500	\$1,500	\$1,500
	Total Expenses	\$3,000	\$3,000	\$3,000
Contracted Services				
Private contracts	Restoration activities	\$0	\$255,750,000	\$255,750,000
	Total Contracts	\$0	\$255,750,000	\$255,750,000
	GRAND TOTAL	\$771,066	\$256,521,066	\$256,521,066

Table B-5. The personnel costs and expenses budgeted for the assessment and monitoring team, located in the USDA Forest Services offices in Administrative Regions 1 and 4 and the regional US Fish and Wildlife Service office. It also offers an estimate for the cost of on-the-ground field data collection contracts to be awarded to private contractors starting as soon as possible in the first year of the program to allow for baseline data collection and evaluation to begin. According to a forest inventory project completed from 2012-2016, thirteen individuals were needed to assess over 150,000 acres over five years (Gallion, n.d.). This suggests that about 4,000 acres can be evaluated per person per year, meaning that 80-90 individuals would be required to evaluate 1,000,000 acres over three years.

Assessment and Monitoring		Year One	Year Two	Year Three
Personnel Costs				
Salaries - USDA-FS Region 1	(1) Monitoring Supervisor - GS 12	\$96,978	\$96,978	\$96,978
	(4) Geospatial Specialist - GS 9	\$248,756	\$248,756	\$248,756
Salaries - USDA-FS Region 4	(1) Monitoring Supervisor - GS 12	\$96,978	\$96,978	\$96,978
	(1) Geospatial Specialist - GS 9	\$62,189	\$62,189	\$62,189
Salaries - USFWS	(1) GIS Specialist - GS 9	\$62,189	\$62,189	\$62,189
	subtotal	\$567,090	\$567,090	\$567,090
Fringe benefits	At 32%	\$181,469	\$181,469	\$181,469
	Total Personnel	\$748,559	\$748,559	\$748,559
Expenses				
Travel and meetings	Travel and meals	\$1,500	\$1,500	\$1,500
Materials and supplies	Printing, office supplies, IT, servers, storage	\$30,000	\$30,000	\$30,000
	Total Expenses	\$31,500	\$31,500	\$31,500
Contracted Services				
Private contracts	Field assessments	\$580,000	\$580,000	\$580,000
	Total Contracts	\$580,000	\$580,000	\$580,000
	GRAND TOTAL	\$1,360,059	\$1,360,059	\$1,360,059

APPENDIX C. Master Calendar

Table C-1. A detailed implementation schedule for the first year of the program design. This year is broken into four phrases, the formation of the interagency team, the formation of the interagency team, the hiring of the implementation team staff, and the end of year reporting process.

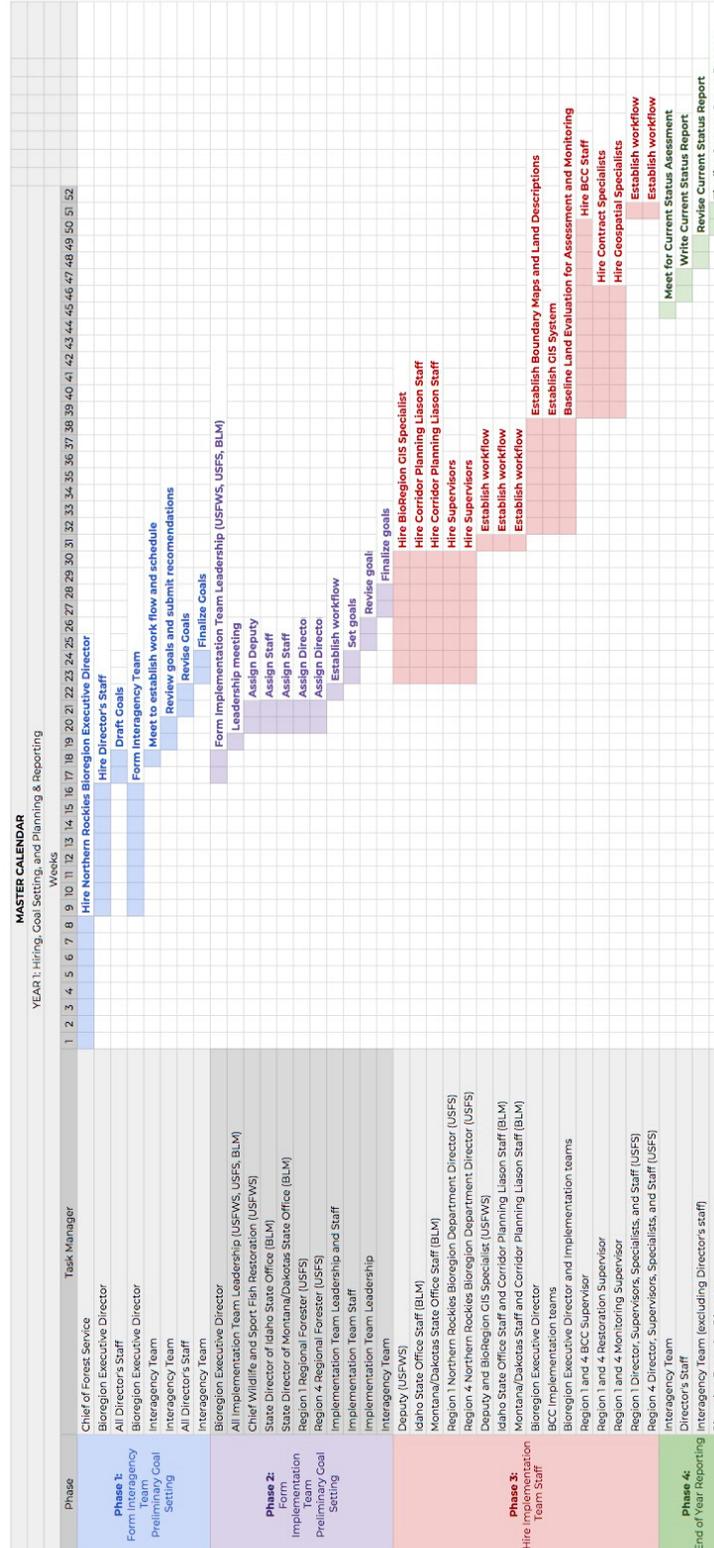


Table C-2. A rough plan for Year 2 of the corridor planning program.

		Weeks																																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Phase 1		Corridor Management Proposals																																																			
Phase 2		Corridor Management																																																			
Phase 3																										Mid-year status report								End of year status report																			

Table C-3. A rough plan for Year 2 of the restoration program.

		Weeks																																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Phase 1		Restoration and Recovery Draft Plans																																																			
Phase 2								Contractors Assigned				Restoration and Recovery Plan Implementation																																									
Phase 3																										Mid-year status report								End of year status report																			

Table C-4. A rough plan for Year 2 of the monitoring and assessment program.

		Weeks																																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Phase 1		Contractors Assigned																																																			
Phase 2		Monitoring and Evaluation																																																			
Phase 3																										Mid-year status report								End of year status report																			

Table C-5. A rough plan for Year 3 for the entire implementation program leading up to the assessment report due to Congress.

		Weeks																																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Phase 1		Biological Connecting Corridor Management Restoration and Recovery Monitoring and Assessment																																																			
Phase 2																										Mid-year status report								Draft, revise, finalize final assessment report for Congress																			

APPENDIX D. Summary of Land Designations

Table D-1. These restoration areas are located exclusively on USDA Forest Service land in the Northern Rockies Bioregion in Administrative Regions 1 and 4.

Administrative Region	National Forest	Name of Recovery Area	Acreage
Region 1	Flathead National Forest	Skyland Area	10,000
Region 1	Flathead National Forest	Flathead National Forest	205,000
Region 1	Lolo National Forest	Lolo Creek Area	59,000
Region 1	Kootenai National Forest	Cabinet/Yaak Area	100,000
Region 1	Panhandle National Forest	Lightning Creek Area	31,000
Region 1	Panhandle National Forest	Coeur d'Alene River Area	372,000
Region 1	Nez Perce or Bitterroot National Forest	Magruder Corridor Area	12,000
Total acreage in Region 1			789,000
Region 4	Caribou-Targhee National Forest	Yellowstone West Area	164,000
Region 4	Bridger-Teton National Forest	Mt. Leidy Area	70,000
Total acreage in Region 4			234,000
Total wildland restoration acreage in Northern Rockies Bioregion			1,064,000

Table D-2. These biological connecting corridors span four USDA Forest Service Administrative Regions, Regions 1, 2, 4, and 6. Roughly one-quarter of the acreage is located in Region 1 and three-quarters in Region 4 with just two corridors extending to Regions 2 and 6, respectively. Due to their relatively small size, the planning and management of corridors in Regions 2 and 6 will be absorbed by administrative structures in Regions 1 or 4. Corridor planning and activity will be controlled by Regions 1 and 4 with resources weighted based on acreage. USDA Forest Service staff will coordinate program implementation with Bureau of Land Management field offices when joint management is required.

USDA-FS Region(s)	BLM Field Office(s)	National Forest(s)	Corridor Name	Acreage
Region 1	Missoula	Bitterroot / Beaverhead-Deerlodge / Lolo	Sapphire Mountains / Continental Divide	120,000
Region 1	--	Lolo	Jocko Mountains / Cabinet Mountains	129,000
Region 1	--	Lolo	Nine Mile / Great Burn	73,000
Region 1	Dillon / Butte	Beaverhead-Deerlodge	Anaconda-Pintler Divide	260,000
Region 1	Dillon	Beaverhead-Deerlodge	Anaconda-Pintler / Bitterroot Mountains	147,000
Region 1	--	Kootenai	Ten Lakes / Cabinet / Yaak	310,000
Region 1	--	Panhandle / Lolo / Kootenai	Cabinet / Yaak / Great Burn Complex	205,000
Region 1	--	Panhandle / Kootenai National Forests	Cabinet / Yaak / Canada Corridor	41,000
Region 1	Lewistown	Custer Gallatin / Helena-Lewis and Clark	Greater Glacier / Greater Yellowstone	542,000
Region 1 / Region 4	Dillon / Salmon	Beaverhead-Deerlodge / Bitterroot / <u>Carribou-Targhee</u> / Salmon-Challis	Frank Church / Greater Yellowstone	642,000
Region 1 / Region 4	Cottonwood	Nez Perce / Payette	French Creek / Hells Canyon	3,000
Region 4 / Region 2	Lewistown	Bridger-Teton / Shoshone	Mt. Leidy Highlands / Wind River Range	69,000
Region 1 / Region 6	--	Panhandle / Kootenai / Colville	Cabinet / Yaak / Selkirk	96,000
Region 4	Upper Snake / Challis	<u>Carribou-Targhee</u> / Salmon-Challis	Lemhi Mountains	88,000
Region 4	Upper Snake / Challis	<u>Carribou-Targhee</u> / Salmon-Challis	Boulder / White Clouds / Lost River Range	88,000
Region 4	Upper Snake / Challis	Salmon-Challis	Lost River Range	64,000
Region 4	Challis	Salmon-Challis	Frank Church Complex / Lemhi Range	3,000
Region 4	Challis	Salmon-Challis	Bitterroot / Lemhi	20,000
Total biological connecting corridor acreage in legislation				2,900,000

References

- Alliance for the Wild Rockies. (n.d.). NREPA. Retrieved December 4, 2019, from Alliance for the Wild Rockies website: <https://allianceforthewildrockies.org/nrepa/#what-will-it-do>
- Alliance for the Wild Rockies. (2019, February 26). Rep. Maloney makes another push for 5-state wilderness area. Retrieved May 29, 2019, from Alliance for the Wild Rockies website: <https://allianceforthewildrockies.org/rep-maloney-makes-another-push-for-5-state-wilderness-area/>
- Bergstrom, B. J., Vignieri, S., Sheffield, S. R., Sechrest, W., & Carlson, A. A (2009). The Northern Rocky Mountain Gray Wolf Is Not Yet Recovered. *BioScience*, 59(11), 991–999. <https://doi.org/10.1525/bio.2009.59.11.11>
- Cushman, S. (2015, October 14). Wildlife dispersal ability and landscape connectivity in the northern Rocky Mountains. Retrieved September 8, 2019, from U.S. Department of Agriculture, Forest Service website: <https://www.fs.usda.gov/rmrs/science-spotlights/wildlife-dispersal-ability-and-landscape-connectivity-northern-rocky-mountains>
- Cushman, S. A., & Landguth, E. L. (2012). Multi-taxa population connectivity in the Northern Rocky Mountains. *Ecological Modelling*, 231, 101–112. <https://doi.org/10.1016/j.ecolmodel.2012.02.011>
- Fahrig, L. (2003). Effects of Habitat Fragmentation on Biodiversity. *Annual Review of Ecology, Evolution, and Systematics*, 34(1), 487–515. <https://doi.org/10.1146/annurev.ecolsys.34.011802.132419>
- Gallion, J. (2017). Indiana DNR State Forest Properties Report of Continuous Forest Inventory (CFI) Summary of years 2012-2016. Indiana Department of Natural Resources, Division of Forestry.
- Horning, J. (n.d.). Bridging the Continental Divide. Retrieved November 16, 2019, from WildEarth Guardians website: <https://wildearthguardians.org/historical-archive/bridging-continental-divide/>
- H.R. 1321: Northern Rockies Ecosystem Protection Act. (2019, November 16). Retrieved November 16, 2019, from GovTrack.us website: <https://www.govtrack.us/congress/bills/116/hr1321>
- Joyner, C. (2011). People Restoring America’s Forests: A Report on the Collaborative Forest Landscape Restoration Program. CFLRP Steering Committee and U.S. Department of Agriculture, Forest Service.
- Maloney, C. B. H.R. 1321 Northern Rockies Ecosystem Protection Act: 116th Congress 1st Session. (2019).
- Mannchen, B. (2019, April 8). Sierra Club Supports “The Wildest Bill on Capitol Hill.” Retrieved November 16, 2019, from Sierra Club Houston Group website: <https://www.sierraclub.org/texas/houston/blog/2019/04/sierra-club-supports-wildest-bill-capitol-hill>
- Missoula, Montana (MT). (2019, November 16). Retrieved November 16, 2019, from City-Data.com website: <http://www.citydata.com/city/Missoula-Montana.html>

- Montana General Schedule (GS) Pay Scale for 2019. (n.d.). Retrieved November 16, 2019, from FederalPay.org website:
<https://www.federalpay.org/gs/2019/montana>
- Northern Sapphires Conservation Project. (2016, September 16). Retrieved November 16, 2019, from Five Valleys Land Trust website:
<http://www.fvlt.org/blog/northern-sapphires-conservation-project>
- NREPA would lock up land, eliminate multiple use, sustainable communities Pinedale, Wyoming. (2009, April 25). Retrieved September 14, 2019, from Pinedale Online website: <http://www.pinedaleonline.com/news/2009/04/NREPAwouldlockupland.htm>
- O'Brien, E. (2016, June 15). Sweeping Wilderness Bill Divides Environmental Community. Retrieved from <https://www.mtpr.org/post/sweeping-wilderness-bill-divides-environmental-community>
- Parker, T. (2019, September 24). What Is the Federal Employees Retirement System (FERS) and How Does It Work? Retrieved November 16, 2019, from Investopedia website: <https://www.investopedia.com/articles/personal-finance/062513/what-federal-employees-retirement-system-fers-and-how-does-it-work.asp>
- Parks, S. A., Mckelvey, K. S., & Schwartz, M. K. (2013). Effects of Weighting Schemes on the Identification of Wildlife Corridors Generated with Least-Cost Methods: Weighting Least-Cost Corridors. *Conservation Biology*, 27(1), 145–154. <https://doi.org/10.1111/j.1523-1739.2012.01929.x>
- Proctor, M. F., Paetkau, D., McLellan, B. N., Stenhouse, G. B., Kendall, K. C., Mace, R. D., ... Strobeck, C. (2012). Population Fragmentation and Inter Ecosystem Movements of Grizzly Bears in Western Canada and the Northern United States. *Wildlife Monographs*, 180, 1–46. Retrieved from JSTOR.
- Rizzo A. (2001). Introduction and General Description (p. 4). *Partners for Fish and Wildlife Program. Rock Creek Confluence Property*. (n.d.). Retrieved November 16, 2019, from Five Valleys Land Trust website:
<http://www.fvlt.org/projects/rock-creek-confluence-property>
- Rosenberg, D. K., Noon, B. R., & Meslow, E. C. (1997). Biological Corridors: Form, Function, and Efficacy. *BioScience*, 47(10), 677–687.
<https://doi.org/10.2307/1313208>
- Shays, C. H.R. 1105 Northern Rockies Ecosystem Protection Act: 108th Congress 1st Session.
- Save America's Forests. (2016). Northern Rockies Ecosystem Protection Act 2016. Retrieved from http://www.saveamericasforests.org/NREPA/S.3022-2016-maps/JPGs/NREPA_4_28_16.JPG
- Save America's Forests. (2019). Northern Rockies Ecosystem Protection Act Biological Corridors 2019. Retrieved from http://www.saveamericasforests.org/NREPA/2019-NREPA%20Maps/NREPA_Biological_Corridors_4_12_19.JPG

- Stevens-Rumann, C. S., Morgan, P. E., Strand, E. K., & Abendroth, D. (2017). Quaking aspen in the Northern Rockies: Considerations for retention and restoration (No. 3). Retrieved from <http://nrfirescience.org/resource/15368>
- Streater, S. (2019, February 26). Rep. Maloney makes another push for 5-state wilderness area. Retrieved December 4, 2019, from Greenwire website: <https://www.eenews.net/greenwire/stories/1060122455>
- Shays, C. H.R. 1105 Northern Rockies Ecosystem Protection Act: 108th Congress 1st Session.
- The Nature Conservancy. (2018). Montana: Annual Report 2018. Retrieved from The Nature Conservancy website: https://www.nature.org/content/dam/tnc/nature/en/documents/MT_AR_FY18_spreads.pdf
- Timber Harvest & Recreation. (2009). Retrieved September 16, 2019, from Pinedale Online website: <http://www.pinedaleonline.com/news/2009/04/TimberHarvestRecreat.htm>
- Tyser, R. W., & Worley, C. A. (1992). Alien Flora in Grasslands Adjacent to Road and Trail Corridors in Glacier National Park, Montana (U.S.A.). *Conservation Biology*, 6(2), 253–262. Retrieved from JSTOR.
- U.S. Department of Agriculture. (2018). Betty Baptiste Project Environmental Assessment. Hungry Horse/Glacier View and Spotted Bear Ranger Districts, Flathead National Forest: U.S. Department of Agriculture, Forest Service.
- U.S. Department of Agriculture. (2019). FY 2020 Budget Justification: 2020 USDA Explanatory Notes—Forest Service. Washington, D.C.: U.S. Department of Agriculture.
- US Forest Service Salaries. (2019, November 16). Retrieved November 16, 2019, from Glassdoor website: <https://www.glassdoor.com/Salary/US-Forest-Service-Salaries-E366754.htm>
- Walker, R. E., & Craighead, F. L. (1997, July 13). Analyzing Wildlife Movement Corridors in Montana Using GIS.
- Whitehouse, S. S. 827 Northern Rockies Ecosystem Protection Act: 116th Congress 1st Session. (2019).

Data Sources

- Montana Fish, Wildlife & Parks GIS Data. (n.d.). FWP Lands Parcels—Polygons [Data set]. Retrieved from https://gis.mtfwp.opendata.arcgis.com/datasets/464a0cec1d674d5292e27691d1691a04_0
- Montana State Library. (n.d.). Montana Cadastral [Data set]. Retrieved from <http://svc.mt.gov/msl/mtcadastral/>
- U.S. Census Bureau. (n.d.). TIGER/Line Geodatabases [Data set]. Retrieved from <https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-geodatabase-file.html>
- U.S. Department of Agriculture, Forest Service. (2019). Timber Harvest [Data set]. Retrieved from https://data.fs.usda.gov/geodata/edw/edw_resources/meta/S_USA.Activity_TimberHarvest.xml
- U.S. Department of Agriculture, Forest Service. (n.d.). Administrative Forest [Data set]. Retrieved from https://data.fs.usda.gov/geodata/edw/edw_resources/meta/S_USA.AdministrativeForest.xml
- U.S. Geological Survey (USGS) Gap Analysis Project (GAP). (2018). Protected Areas Database of the United States (PAD-US): U.S. Geological Survey data release (Version 2.0) [Data set]. <https://doi.org/10.5066/p955kple>
- Wilderness Connect. (n.d.). Geographic Wilderness Data (GIS/GPS) [Data set]. Retrieved from <https://www.wilderness.net/GIS>