



National Fish and Wildlife Foundation

Business Plan for Rocky Mountain Rangelands

~Wildlife and Working Lands of the Mountain West~

August 2019

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About NFWF

The National Fish and Wildlife Foundation protects and restores our nation's wildlife and habitats. Chartered by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private contributions. NFWF works with government, nonprofit and corporate partners to find solutions for the most complex conservation challenges. Over the last three decades, NFWF has funded more than 4,500 organizations and committed more than \$5.3 billion to conservation projects. Learn more at www.nfwf.org.

Note on Business Plan Presented to NFWF's Board of Directors

This version of the business plan does not include appendices due to board book space constraints. Additional materials will accompany the public version of this plan.

Cover photo credit:

Top: Noppadal Paothong, Bottom Left: Trout unlimited Bottom Right Noppal Paothong

Background

NFWF has been active in the Intermountain West landscape for more than 30 years. This business plan describes NFWF’s science based outcome-focused approach to grant-making for the Rocky mountain rangelands, and builds on knowledge gained from previous migration-focused business plans under Great Migrations and Crucial Corridors. Most recently, NFWF has administered Sagebrush Landscapes, Gunnison Sage-Grouse, Lahontan Cutthroat Trout, Upper Colorado Native Fishes, and Big Game Migrations and Winter Range programs. In addition, NFWF also has invested in conservation projects in this landscape through the Pulling Together Initiative and the Bring Back the Natives program. This landscape-scale Business Plan will provide the goals and strategies that will help guide the investments of the programs and maximize our species and habitat conservation impact. This Business Plan has been informed by our organizational history with those programs, as well as by extensive discussions with program grantees and external experts on wildlife of the region.

Maintaining ecological function and habitat for species of greatest conservation need within this working landscape is frequently cited as a priority among state, federal and non-government natural resource agencies and organizations. Recognizing the growing threats, the absence of dedicated funding, and a strong interest in conservation efforts by key stakeholders, NFWF is leveraging its resources to strategically invest at a landscape scale, focusing on the highest quality and largest remaining wildlife habitat in the region. To do this, we will bring new tools, expertise and expanded financial resources to ranching communities, NGOs and public land managers who together steward these lands. The intent of this Business Plan is to complement and expand upon, not duplicate, ongoing efforts, all while meeting or exceeding the identified outcomes for priority species and habitat.

Conservation Need

The Intermountain West includes the broad valleys and mountain ranges that cover a large area of the western United States, a significant portion of which are in sagebrush. Sagebrush shrublands historically comprised over 150 million acres of the West but are estimated to have shrunk by almost 44% (SGI 2019). Nested within this landscape are mesic and irrigated meadows. Mesic meadows are typically smaller sites that are located within undisturbed rangeland sites and are not farmed or irrigated. They are particularly important for wildlife in the late summer and fall when they provide lush vegetation and insect life not available elsewhere in the landscape. In contrast, irrigated meadows have been highly modified by humans for agriculture. This water use has affected where key wildlife habitat and wetlands are located, which now provide critically important habitat for wetland birds and native fish.

For the purposes of this business plan, we refer to this suite of landcover types described above as “rangelands.” According to the U.S. Department of Agriculture, “Rangelands encompass a wide variety of landscapes, including some grasslands, shrublands, wetlands, tundra, and deserts. Indigenous to every continent except Antarctica, grasslands’ vast expanse is dominated by grasses and non-woody plants. Rangelands, primarily covered by natural vegetation, provide grazing and forage for livestock and wildlife.” (USDA 2018).

Historically, the region—and sagebrush in particular—has largely been viewed as an endless and low value habitat sometime referred to as “the big empty”. Within the past 20 years, however, sagebrush

habitats and the concept of working cooperatively with agricultural communities to sustain this landscape has come to the national forefront.

The landscape supports a unique assemblage of wildlife adapted to this climate and often require large open spaces to sustain their populations. These include a suite of species uniquely adapted to the sagebrush ecosystem, including its most prominent species, the greater sage-grouse. Other species, such as mule deer and pronghorn, move long distances to take advantage of scarce resources in different seasons, leading to several of the longest known ungulate migrations in North America. Irrigated agricultural lands provide habitat to suites of waterfowl, waterbirds and shorebirds during both migration and the breeding season. The relative arid nature of the region has also led to endemic fish that are found only in small river systems and nowhere else. Despite large, unfragmented tracts of rangelands, not all associated species are thriving. It is home to the last stronghold of three of the five lekking bird species in North America including the greater and federally listed threatened Gunnison sage-grouse. Both species have suffered significant range contractions over the last several decades. Some of the last long distance migrations of mule deer, pronghorn and elk are at risk of extinction due to fragmentation, habitat alteration and other threats.

Land ownership varies as the habitat transitions from the wet meadow valleys, to sagebrush slopes and higher elevation forested mountains. The mountain ranges are largely in public ownership, with the valleys a patchwork of private and public ownership, with the most watered and productive lands in private ownership. The Bureau of Land Management (BLM) is the primary public land management agency for the lower elevations and the U.S. Forest Service (USFS) in the mountain ranges. Smaller public ownerships of the National Park Service are generally at higher elevations (Yellowstone National Park being the largest) as well as several smaller, but very important wetland-dominated National Wildlife Refuges and state wildlife areas. While private lands are a relatively small component of the landscape, their connection with ranching on both public and private lands and the prevalence of water and productive soils make it imperative to engage with the ranching sector in conservation practices.

Private lands serve as the home base for ranching operations that often have leased grazing allotments on federal lands. Ensuring the conservation practices that will be implemented through this plan are beneficial to both private land owners and federal land management agencies is paramount to the success of this program. In some places, past range management decisions have led to degraded habitat where conditions can be improved or restored through active management. Fortunately, there is a growing understanding and body of scientific research that realizes the importance of these conservation practices for both wildlife habitat and the agricultural livelihoods in the region.

Threats to the landscape

In this vast region, much of the land remains intact in a working landscape dominated by ranching, but it is increasingly under threat from fragmentation and invasive species (Knick et. al, 2011; Chambers et. al, 2016, Reeves et. al 2018). While seemingly endless, the Intermountain West is changing every day. Wildfires and the resulting invasive species have converted large areas from perennial shrub cover to annual grasslands, with huge impacts to sage-dependent species. From 2014 to 2018, catastrophic wildfire burned over 9 million acres of sagebrush habitat in the Intermountain West (Kern 2019).

The region is one of the fastest growing of the country in terms of human population, with Idaho, Nevada, Utah and Colorado all in the top 10 fastest growing states from 2017-2018 (U.S. Census Bureau 2018). With an increased population comes increased impacts from energy development, residential housing and recreation. Many species in the region require large and connected areas of habitat to thrive. Even low levels of fragmentation and habitat loss can have a magnified negative impact on wildlife.

The potential loss of ranching and generations of management capacity would increase the pace of fragmentation and habitat loss and therefore poses a major threat to this region. Ranching maintains large undisturbed tracts of habitat for native species in a compatible land use that prevents land conversion, subdivision and fragmentation. Finally, the ranching community has the potential to provide skilled land managers with capacity and equipment to positively support habitat and species outcomes.

Changes in agricultural practices may also pose significant threats to wildlife habitat. Conversion of gravity or “flood” irrigation systems to more efficient drip and sprinkler systems has been a boon to water conservation efforts but comes with some unintended habitat impacts. In 1984 across seventeen western states there were 24 million acres in gravity feed systems, while in 2013 those acres have been reduced to almost half, at 13 million acres (USDA 2019). This conversion in many instances has direct unintended consequences by reducing the acres of flooded wildlife habitat. In addition, economic efficiencies may lead to localized impacts by expanding the intensive row-crop agricultural footprint and associated hydrological alterations.

Grouse and other sagebrush obligates

There are over 350 sagebrush obligate species of all taxa (Wisdom et. al 2005) including sage thrasher, sagebrush sparrow, Brewer’s sparrow and pygmy rabbit which are all largely or completely reliant on sagebrush habitats for their existence. The fate of the iconic sage-grouse is tied to the health of sagebrush habitats. While stable in most places, greater sage-grouse occupy only about 60% of their historical range and populations continue to be threatened by habitat conversion from fire, invasive species such as conifers and cheatgrass, fragmentation and development. Sage-grouse have been shown to vacate lek sites in habitat with greater than 4% conifer encroachment (Baruch-Mordo et. al. 2013). In portions of the Great Basin, conifers have expanded over 600% of their native range due to fire suppression and a general lack of management. Estimates show that without intervention, 75% of the sagebrush currently expressing conifer encroachment will convert to dense woodlands in the next 30-50 years (USDA Science to Solutions 2019), leading to greater sagebrush habitat degradation and fragmentation. In 2014 the Gunnison sage-grouse was listed as threatened under the Endangered Species Act while in 2015 the decision was made to not list the greater sage-grouse, in large part due to the types of voluntary conservation efforts that will be perpetuated by this business plan.

Ungulate migrations

Due to the region’s generally harsh and highly variable seasonal conditions, large ungulates, including elk, mule deer and pronghorn, undertake long distance and/or large elevational migrations to complete their full life cycle. These migrations often take the animals from productive high elevation summer habitats across vast areas to winter ranges in drier sagebrush-dominated areas that are sometimes over 100 miles away. To complete these movements, animals must be able to move safely through the landscape and find important seasonal and stopover habitat and critical winter range. Migration can take as much as 20% of the year and plays a role in sustaining large herbivore populations by promoting abundance through access to high quality forage and predator avoidance (Avgar et al. 2014, Middleton et al. 2018). Therefore, potential migration barriers including roads, fencing, subdivisions and habitat fragmentation need to be carefully considered or mitigated for when needed.

In the western U.S., mule deer populations have experienced a gradual decline in portions of their range (Bergman et al. 2015, Bishop et al. 2009). Although the drivers of the decline are highly complex and are not fully understood, deteriorating habitat conditions are likely a contributing factor (Monteith et al. 2014), which can be exacerbated by high traffic roads that restrict movement to valuable resources and can be a significant source of mortality (Sawyer et al. 2012, WAFWA 2013). In 2018, over one million of State Farm Insurance claims were reported to involve deer, with Montana and Wyoming ranking as the 2nd and 9th states where drivers are most likely to be involved in a deer collision (State Farm 2018). The average animal vehicle collision causes \$3,000 in vehicle damage, amounting in the U.S to over a billion

dollars a year (Kidd 2019). Mule deer, particularly populations in the northern latitudes of their range, are highly migratory so roadways can have detrimental population-level effects.

Highway crossing structure needs are largely determined by high collision rates with deer more so than any other large mammals. However, successful use of crossing structures has been documented in a multitude of wildlife species from small reptiles to large carnivores, indicating mule deer movement requirements allow them to serve as an umbrella species. Studies from Colorado, Montana and Wyoming show crossing success rates through or over structures ranging from 60-95%, with success rates increasing over time as the science of crossing structures are better understood (Gagnon et al. 2011, Kintsch et al. 2019).

Pronghorn are a sagebrush-dependent species that experienced a significant range contraction in the early 20th century due to habitat loss and overharvest (Yoakum 2004). Through favorable legislation and management intervention, pronghorn have recovered throughout much of its range. However, some herds have recently experienced declining population trends, particularly in Wyoming where nearly 50% of all pronghorn in North America reside (Reinking et al. 2019). High metabolic demands requires them to spend most of their time foraging, even during harsh winter months (WAFWA 2013). Human barriers such as roads and fences have restricted pronghorn movements within or between seasonal ranges resulting in direct mortality or more commonly observed indirect effects such as decreased access to available forage, decreased breeding opportunity/fitness and genetic isolation (Harrington and Conover 2006, Hoffman et al. 2010, Seidler et al. 2015, Jakes et al. 2018).

Pronghorn are recommended as a prospective species for the Business Plan. In order to prioritize their conservation needs and set appropriate, population-level goals, additional investments are needed to: 1) better understand adult female survival and recruitment and 2) realize population-level benefits of barrier removal/modification.

Wetland birds & native fish

Water is a finite resource and the West is dependent on annual snowpack to provide water for fish and wildlife habitat, residential areas, agricultural irrigation and recreation. As human population increases in the arid West so does the demand on water. Many species are dependent on the small areas of the landscape that are irrigated or seasonally inundated. These habitats and associated water are constantly threatened with conversion to other uses. Prospective focal species, such as greater sandhill crane, white-faced ibis and cinnamon teal have significant portions of their global populations in the region. Similar stressors are occurring on native fish populations. Water demands may decrease flow and dissolved oxygen levels leading to fish kills, and irrigation infrastructure can disrupt native hydrology and habitat requirements by eliminating passage or inversely opening up systems to non-native species. These threats can be prevented or addressed with proper management of riparian and water resources.

Ample observational data show that cinnamon teal, white-faced ibis and greater sandhill crane use irrigated meadows, yet little is known about their seasonal habitat use for energetic needs and reproduction. These wetlands species have been selected as prospective species to help NFWF better determine the importance of these habitats and the impacts of associated management practices.

Lahontan cutthroat trout (LCT) has been listed as threatened under the Endangered Species Act since 1975. The species is confined to the Lahontan Basin, with the stream form found only in northern Nevada and southern Oregon. Stream-form LCT are reported to inhabit less than 10% of their historic habitat; many live in small, isolated streams. Key threats to the species include habitat fragmentation and degradation leading to additional isolation, competition, hybridization, and predation by non-native trout, decreased stream flows and unsuitably warm stream temperatures.

Arctic grayling is a salmonid fish with a widespread Holarctic distribution, but is known historically in only two states: Michigan, where it no longer exists, and a few places in Southwest Montana. The arctic grayling in Montana is at risk and faces some of the same challenges as LCT and also shares the landscape with ranching and the terrestrial focal species.

Several prospective focal native fish species are found in the region. In the Upper Colorado Basin the flannelmouth sucker and Colorado River Cutthroat trout are conservation priorities as is the Bonneville cutthroat trout on the eastern margins of the Great Basin. All three species are found in tributary streams in this plan's focal areas and coexist with working lands. Strategies include reconnecting tributary streams, increasing fish passage, ensuring instream flows at critical times, reducing mortality with irrigation infrastructure, and targeting habitat improvements important for recovering populations.

Current Conservation Context

This Business Plan builds on existing interests and expertise within NFWF and the larger Intermountain West conservation community, while remaining flexible to support innovation, strategic investments and new approaches. NFWF plays an important role in this landscape by providing a proven ability to match private funding with federal resources, along with a unique landscape perspective that is not limited by land ownership or state boundaries, and the ability to catalyze collaboration among partners.

Rancher and local community-led landscape scale partnerships are flourishing across the region and offer promising new approaches that support the conservation and improvements of rangelands, with dual emphasis on cattle production and species and habitat. Many government agencies and non-profit conservation groups are focused on rangelands and working closely with ranching communities. These entities employ resource professionals who provide ranchers technical assistance to access wildlife and habitat incentive programs. Increasingly, rancher-led associations recognize the need to promote a conservation ethic to conserve wildlife habitat and productive agricultural communities.

State game and fish agencies and funding sources provide a tremendous opportunity for NFWF in the arena of matching funds and complementing existing conservation priorities as identified in State Wildlife Action Plans. Maintaining solid relationships with state agencies will be a critical component of moving NFWF's shared priorities over the course of this business plan.

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) provides resources for the implementation of conservation practices and the long term protection of working agricultural lands, both of which have significant benefits to priority wildlife and habitat. Through NRCS's Working Lands for Wildlife Program (WLFW) a significant catalyst of conservation efforts on public and private lands in the region has been the Sage-grouse Initiative which has led to over 3 million acres of conservation practices implemented on private land throughout the West since 2010.

Additional efforts focused on aquatic habitat and wetland-dependent species include the Intermountain West Joint Venture's Working Wetlands & Water in the West Initiative to support agricultural producers and other partners with conservation on working lands and the Western Native Trout Initiative, to secure the diverse suite of native trout found in the region.

In 2018 the Secretary of the Interior issued order 3362 that provides resources to the states to increase research of ungulate migration and habitat, and provides resources to restore, enhance and protect those places.

Conservation Outcomes

The vision of the Rocky Mountain Rangelands Business Plan is to work in focal landscapes in the region to restore and conserve wildlife species associated with sagebrush, irrigated meadows and aquatic systems while conserving the phenomenon of large mammal migration. To achieve this vision the plan identifies both species and habitat outcomes it will achieve over the next 10 years. Combined habitat outcomes will restore, enhance or improve management on over 1 million acres by 2029.

10-Year Business Plan Species Goals	
Sagebrush sparrow <i>Artemisiospiza nevadensis</i>	Improve breeding density above baseline (0.85 birds/ha) at all project sites within the Owyhee-Great Basin – Green & Bear watersheds
	Improve population trend over regional baseline (-0.67% annually) in the Owyhee Great Basin and Green and Bear River watersheds
Sage thrasher <i>Oreoscoptes montanus</i>	Improve breeding density above baseline (0.54 birds/ha) at all project sites within all focal areas
	Improve population trend over regional baseline (-1.39%) in all focal areas
Greater sage-grouse <i>Centrocercus urophasianus</i>	Increase population of greater sage-grouse by 10% in at least 1 Priority area of conservation (PAC) in each focal area
Gunnison sage-grouse <i>Centrocercus minimus</i>	Increase reproductive success of adult females nesting in or adjacent to restored mesic meadows by 50% within the Western Slope focal area
Mule deer <i>Odocoileus hemionus</i>	Support the development of population goals and analytical capacity to detect improvements in population growth in three population units that have demonstrated declining population trends
	Reduce the number of reported mule deer-vehicle collisions (DVC) at 10 sites by 80% when compared to pre-construction averages
	Achieve a mule deer movement success rate of 80% at 10 priority sites
Arctic grayling <i>Thymallus arcticus</i>	Triple the number of spawning individuals within an Arctic grayling population (300-450)
Lahontan cutthroat trout <i>Oncorhynchus clarkii henshawi</i>	Population goal to be determined by June 2020 and informed by NFWF-funded data collection that is currently underway

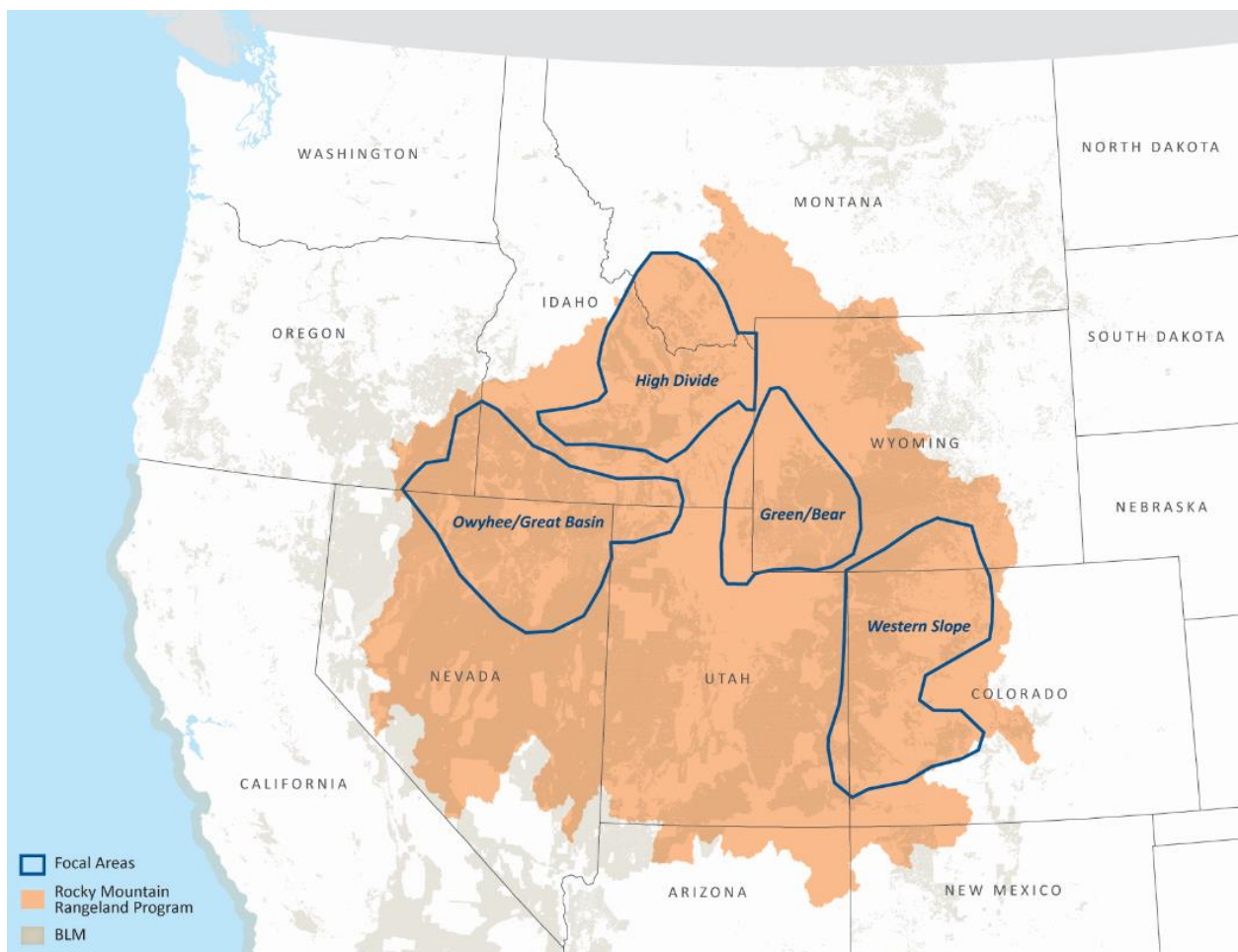
The following prospective focal species require additional information and/or investment before NFWF can include them as focal species with measurable conservation goals in the business plan.

Prospective Species: Planned Actions	
Pronghorn	Invest in developing landscape connectivity metrics to measure species specific outcomes to barrier removal (assess by 2021)
Bonneville & Colorado River cutthroat trout, Flannelmouth sucker	Secure adequate funding to identify spatially explicit priorities, determine baselines, develop business plan goals and follow through on these goals
Cinnamon teal, Greater sandhill crane, White-faced Ibis	Investigate species response to improved management and infrastructure on irrigated meadows (assess by 2025)

Geographic Focus

The Intermountain West is a vast area, stretching from the Colorado Rockies to the Sierra Nevada and includes much of the states of Colorado, Utah, Wyoming, Montana, Idaho, Nevada and Oregon. In order to be most effective in our conservation investments, NFWF will focus grants in areas that will have the highest impact on the conservation outcomes identified in the Business Plan. Specific focal areas, including the High Divide, Green/Bear Watershed, Western Slope and Owyhee Great Basin are shown below in Figure 1. These focal areas were identified based on the highest combination of high quality sagebrush habitat, known migration routes, extensive irrigated meadow complexes and the presence of priority native fish populations. In addition, NFWF considered geographic diversity, public and private partnership opportunities and the capacity of local implementation partners in selecting these areas.

There are clearly areas that lie outside of the focal areas identified in this plan that contain opportunities for achieving the conservation outcomes of the Business Plan. NFWF will preferentially fund projects for sagebrush landscapes, irrigated meadows and native fish that fall within the focal areas, and will evaluate projects that occur outside of those areas on case-by-case basis. Because priorities for these migration-oriented projects, particularly around transportation corridors, are set at the statewide level, NFWF will take state priorities as a guide for investments under this plan.



– **Figure 1.** Rocky Mountain Rangelands Focal Areas include: High Divide, Green/Bear River Watershed, Western Slope, and Owyhee Great Basin

Implementation Strategies

The following strategies as depicted in the logic model (Figure 2) provide a diversity of conservation practices that best support the goals and outcomes for the identified priority species and sagebrush and irrigated meadow habitats set forth by this Plan. Human capacity is often needed to help expand conservation in rural communities and across land ownerships. As such, NFWF will support conservation districts, nonprofits, local and state governments, and private sector partners to provide technical assistance necessary to achieve NFWF's habitat restoration, species conservation, and management goals. Across all strategies NFWF will support field positions, development of targeted outreach strategies such as community-based coordination, and partnerships among technical assistance providers to improve efficiency and reduce administrative bottlenecks.

Strategy 1: Improved management and restoration of sagebrush rangelands to benefit of sagebrush obligate and other associated species.

1.1 Improved management - In the vast expanse of sagebrush habitat, management via practice modification and changed behaviors through practices such as prescribed grazing and the associated infrastructure often provide prolific results. Management agreements often incentivize such modifications and provide technical and financial assistance to do so. Studies have shown that once behaviors are changed and positive results are shown, landowners tend to maintain those practices post incentive (Ramsdell et al. 2015). Behavior changes may include activities such as delaying the timing of harvesting hay or other crops to coincide with birds nesting dates, deploying range riders or using water and mineral distribution to move livestock. Projects with formal management agreements will be given preference and may come by way of multiple programs including, but not limited to, the U.S. Fish and Wildlife Service's (USFWS) Partners for Fish and Wildlife – Wildlife Habitat Extension Agreements, NRCS's Environmental Quality Incentive Program (EQIP) or other Farm Bill Programs, USFWS's Candidate Conservation Agreements with Assurances (CCAA).

Prescribed grazing of livestock can be an ecologically compatible and economically viable land use in the region and as such can be managed to meet both wildlife habitat and production goals (Varva 2005). The implementation of prescribed grazing techniques is extremely site specific and scale dependent and should factor in landowner needs, species needs, and a suite of abiotic factors including soil types and weather patterns. Projects will promote habitat heterogeneity at ecologically significant scales. Management prescriptions may adjust stocking rates and the timing and intensity of grazing to meet specific habitat outcomes.

Improvement of infrastructure facilitates land, livestock and habitat management and may include fence removal, reconfiguration, marking and installation as well as water development. For example, one study showed that fence markers can reduce sage-grouse mortality up to 83% (Stevens et al. 2012). Because this mortality is often visible by those working and living in this landscape, these practices are as important for outreach efforts and conversation starters as they are in preventing wildlife mortality.

1.2 Control of woody vegetation: Numerous studies produced over the last decade have shown the benefits of removing encroaching conifer to nesting sagebrush obligate song birds, sage-grouse, groundwater retention as well as forb, grass and shrub production (SGI 2017). Several low impact methodologies are being deployed to address the issue at scale including lop and scatter which

involves trained crews cutting trees by hand via chainsaw and scattering the brush so as not to create predator denning sites. The other is mechanical mastication which uses a piece of heavy machinery to splinter the tree into mulch, vastly decreasing the amount of time needed for the tree to decompose. Both practices have shown positive results for multiple sagebrush obligate species.

1.3 Control of annual invasive grasses: Cheatgrass, medusahead and ventenata are all non-native invasive grass species that may pose significant threats to sagebrush ecosystems and associated species. Once established, these annual grasses will often outcompete native vegetation post disturbance, making the landscape less productive and more vulnerable to increased fire intervals. Although there is no one solution, success has been shown and investments will be made in integrated pest management approaches using some combination of the following methods: grazing management, chemical treatments, seeding perennial grasses, and early detection and rapid response to both the invasives themselves and fires. Decision support tools have been developed that identify a site's resistance and resilience to fire and restoration activities and help ensure the proper practices occur on the proper sites into the future (Chambers et. al 2017).

1.4 Restoration of mesic meadows: Mesic areas make up less than 2% of the landscape, yet are critically important to wildlife. These stream sides, springs, seeps and small meadows maintain moisture longer throughout the growing season than the surrounding landscape. Eighty-five percent of sage-grouse leks are found within 6 miles of these mesic areas (SGI 2014). Restoration and enhancements of these sites are critical and can be achieved through the implementation of practices such as the installation of "Zeedyk structures" or rock constructions that serve to slow the flow of water, heal erosion and restore natural hydrology to drainages that have been altered or degraded as a result of no management. Beaver mimicry is also appropriate in some systems where beaver are absent or are re-colonizing. Both practices help to slow water flow, increase the water table and provide increased habitat and forage production. More than 80% of mesic-wet meadows in this region are found on private lands; therefore, it will be critical for NFWF to work with private landowners to successfully implement these activities.

Strategy 2: Secure important ungulate migrations across the landscape with specific focus on transportation conflicts, winter range and stopover sites.

The science behind designing highway crossings to minimize animal vehicle collisions and increase landscape permeability has grown exponentially in recent decades. Installation of under- and over-pass structures as well as innovative warning signals are reducing collisions as much as 90% in some instances. These projects, while proven effective, have multiple components and are often resource intensive to deliver. NFWF will collaborate with state game and fish agencies and transportation departments to work on state-identified priorities within the overall boundaries of this plan to assist in the implementation of these crossings utilizing the following strategies.

2.1 Fencing: Fencing can be a significant obstruction to ungulates, resulting in direct mortality from entanglements, indirect mortality or reduced fitness from reduced landscape permeability. NFWF will invest in conversion or removal of fences as a low-tech way to make significant impacts on ungulate herds throughout their lifecycle. Fencing can also be an important tool and deployed as a deterrent or to funnel animals to safe passage or more desirable habitats.

2.2 Habitat enhancement: Habitat enhancement covers a broad spectrum of activities including annual invasive weed treatments, conifer or brush removal, prescribed fire, or the restoration of native

high quality forage with the intent to influence ungulate seasonal movements. Projects focused in critical winter ranges, seasonal stop-overs and/or migrations bottlenecks will be given preference.

2.3 Land conservation: Conservation easements can be used to protect critical ungulate migration bottlenecks and stopover habitat from fragmentation and sub-division. This practice may also be implemented adjacent to transportation crossing projects to ensure that the habitat associated with the project is maintained in desirable condition into the future.

Strategy 3: Restore habitat and expand occupancy of wetland birds and native fish

3.1 Address fish passage barriers: Depending on whether the desired project goal is the reconnection of aquatic systems or the isolation of populations, both removal and installation of barriers to fish passage can be important management tools. Barrier installation may prevent detrimental non-native species from entering a native fishery, or native fish from entering an irrigation system. Conversely, barrier removal may increase habitat and genetic flow and ultimately population levels.

3.2 Reduce the impacts of non-native fish: To protect native fish species when reconnecting populations, it may be necessary in some instances to remove or control non-native fish.

3.3 Increase survival of Arctic grayling: Within Centennial Valley the population of Arctic grayling is thought to be limited by the amount of available oxygen in Upper Red Rock Lake. NFWF will pursue the means to maintain some degree of open water or otherwise aerate the lake when oxygen levels are low to increase overwintering survival.

3.4 Riparian and stream restoration: Stream restoration may include, but not be limited to, practices such as bank stabilization installation of coarse woody debris and rock structures to alter hydrology to improve or enhance conditions for native fish species.

3.5 Ensure that fish have sufficient amounts of water: Water availability and seasonal flows are often limiting factors for native fish. Securing instream water rights may be a critical need for certain populations of fish to be sustained. This could include voluntary leasing or acquisition of water rights as allowed under the various state laws. In addition, source-switch—whereby water is extracted from the main channel instead of smaller streams—can be used to maintain important habitats that might otherwise be dewatered.

3.6 Improve the quality and function of irrigated meadows for wetland bird breeding and migration stopover habitat through improve flood irrigation infrastructure: Flood irrigation for agriculture, while resulting in altered hydrology, has created large areas of important waterbird and waterfowl habitat (IWJV 2013). In recent years there has been a trend towards converting these flooded areas to sprinklers and more water efficient irrigation methods. While water efficiency is an important ecological consideration, the widespread implementation of those practices could lead to a drastic decline in flooded habitat. Therefore, NFWF will consider supporting enhancement of flood irrigation systems that allow for better spatial and temporal application of water and take into consideration return flow to local rivers and streams. Projects that benefit both birds and focal fish species will be given highest priority.

Strategy 4: Monitoring and evaluation needs

- 4.1 Develop metrics for landscape permeability and realized population benefits due barrier removal for pronghorn
- 4.2 Track ungulate migration utilization of road crossings, winter range and stopover habitat improvements
- 4.3 Monitor avian focal species response to the implementation of conservation practices
- 4.4 Monitor the life cycle importance and habitat use of irrigated meadows by cinnamon teal, greater sandhill crane and white-faced Ibis to target and develop species goals
- 4.5 Research spatial prioritization to target and develop measurable goals for flannelmouth sucker, Colorado River cutthroat trout and Bonneville cutthroat trout

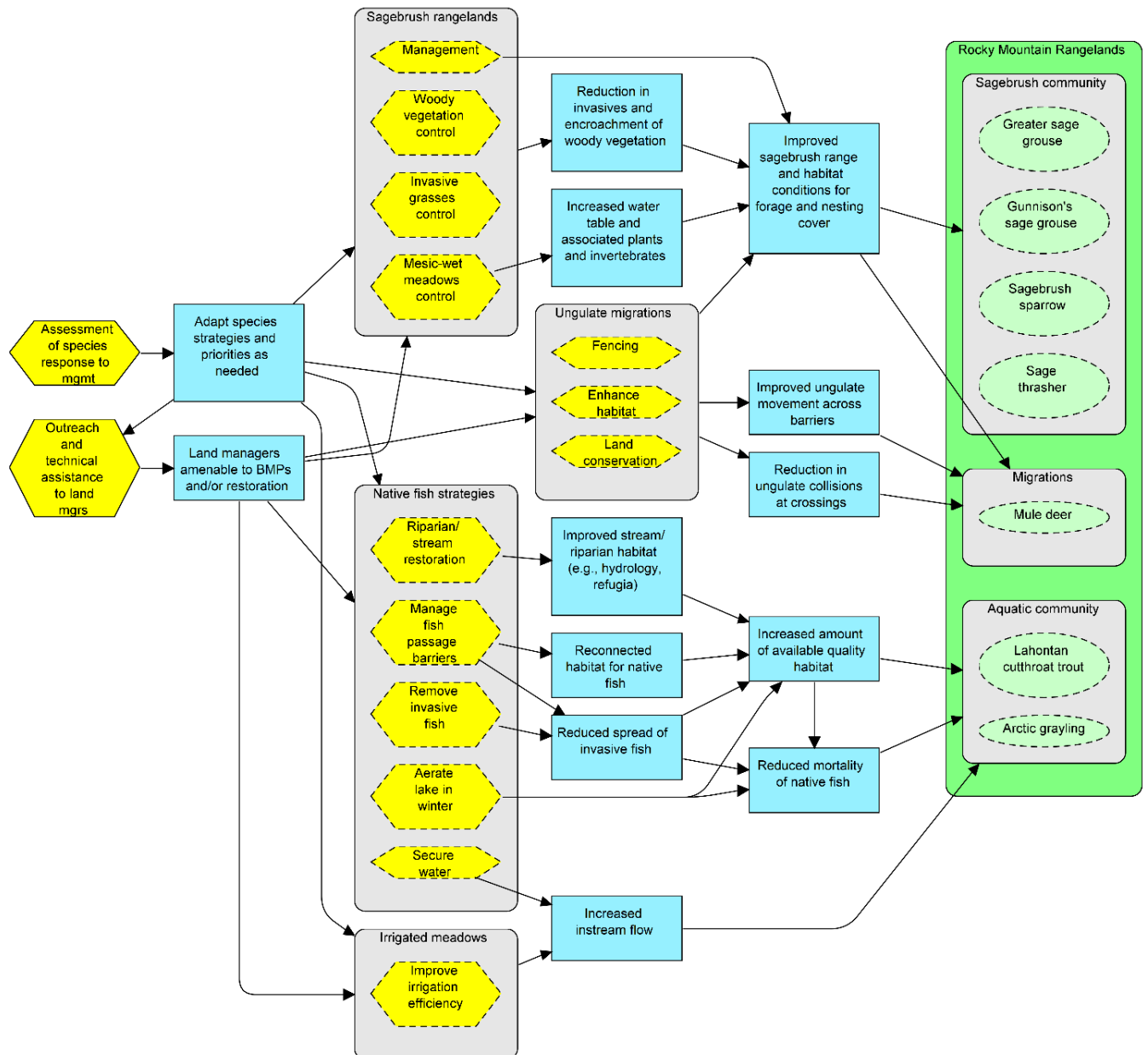


Figure 2. Logic model depicting how business plan strategies (yellow hexagons) are anticipated to lead to intermediate results (blue boxes) and ultimately to the business plan species goals (green ovals).

Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could have a negative effect on a program’s desired outcome. We assessed seven risk event categories to determine the extent to which they could impede progress towards our stated business plan strategies and goals during the next 10 years. Below (table 2), we identify the greatest potential risks to success and describe strategies that we will implement to minimize or avoid those risks, where applicable.

Table 1: Risk Assessment

RISK CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Regulatory Risks	Moderate	a) Potential Endangered Species Act regulation could decrease landowner participation rates should a listing occur. b) shifting agency priorities could place regulatory emphasis on different public lands resource concerns then identified in this plan	a) Strategies being invested in are voluntary in nature and may assist in precluding the need to list and participation in similar efforts has not decreased in other regions where listing occurred. b) The species selected in this plan are often thought of as indicators for healthy overall rangelands and the practices implemented to conserve them are largely resilient to shifting priorities.
Financial Risks	Moderate	The plan relies highly on federal funds.	Diversification of funds will be pursued with private foundations as well as various industries including mining, energy and agribusiness.
Environmental Risks	Moderate	a) Climatic factors including prolonged drought, resulting catastrophic wildfires and harsh winters may have direct impacts on ungulate and grouse populations as well as negative effects on the success of some of restoration efforts (e.g., range seeding). b) Chronic wasting disease is expanding and may pose a threat to ungulate populations.	a) Projects will utilize science tools to target restoration efforts in areas that are more drought and fire resilient. Practices being implemented in wet meadow and irrigated landscapes will promote drought resilience through water efficiency. b) Coordination with state game and fish agencies will ensure that work will not occur to expand populations infected with CWD.
Scientific Risks	Moderate	More science is needed on the importance of irrigated meadows to breeding waterbirds as well as return flows to surrounding river systems.	Similar efforts in other regions have had positive impacts on birds as well as return flows. Effectiveness monitoring is included in this plan to confirm the presumed benefits.
Social Risks	Low	Limited landowner engagement due to unforeseen social stressors may be a localized issue.	Previous collaborative efforts in the region have set this plan up for success and the voluntary nature of the program minimized much of the risk.
Economic Risks	Moderate	External economic pressures (e.g., water, land, crop and commodity prices) all play a role in the future of land use in the region.	Plan includes resources for both land and water protection.
Institutional Risks	Low	Public and private land managers alike are constrained by tight budgets and the corresponding lack of capacity as well as lack of continuity as people move from position to position.	This plan will invest in capacity in organizations committed to maintaining a presence in small rural communities.

Monitoring & Evaluating Performance

Performance of the Rocky Mountain Rangelands Program will be assessed at project and program scales. At the project scale, individual grants will be required to track relevant metrics from Table 2 below for demonstrating progress on project activities and outcomes and to report out on them in their interim and final programmatic reports. At the program scale, broader habitat and species outcomes will be monitored through targeted grants, existing external data sources, and/or aggregated data from relevant grant projects, as appropriate. In addition, NFWF may conduct an internal assessment or commission a third-party evaluation at a future stage of the program to determine program outcomes and adaptively manage. In some cases these course corrections may warrant increased investment; however, it is also possible that NFWF would reduce or eliminate support if periodic evaluation indicates that further investments are unlikely to achieve intended outcomes.

Table 2: Metrics for assessing progress towards species and habitat outcomes.

Category	Strategies/ Outcomes	Metrics	Baseline (2019)	Goal (2029)	Data Source
Sagebrush landscapes	Improved management	Habitat Management - Acres under improved management (private land)	0	300,000 acres	Grantee
	Improved management	Habitat Management - Acres under improved management (public lands)	0	300,000 acres	Grantee
	Control of woody invasives	Habitat Restoration - Removal of invasives	0	180,000 acres	Grantee
	Control of annual grasses	Habitat Management – Acres managed to treat annual invasive plants	0	180,000 acres	Grantee
	Land Restoration	Acres restored on private land	0	17,500 acres	Grantee
	Land Restoration	Acres restored on public land	0	17,500 acres	Grantee
	Restoration of mesic meadows	Acres of habitat with restored hydrology (private land)	0	2,500 acres	Grantee
	Restoration of mesic meadows	Acres of habitat with restored hydrology (public lands)	0	2,500 acres	Grantee
Greater sage-grouse	Increase greater sage-grouse through sagebrush landscape strategies	% increase in population	0	Increase population of greater sage-grouse by 10% in at least 1 Priority Area for Conservation (PAC) in each focal areas	State Agencies
Gunnison sage-grouse	Increase Gunnison sage-grouse through sagebrush landscape	Nest success rate	0	Increase reproductive success of adult females nesting in or adjacent to restored mesic meadows by 50% within Western Slope focal area	State Agencies/ universities/ BLM/ TNC

	strategies				
Sagebrush sparrow	Increase sagebrush sparrow through sagebrush landscape strategies	Density (# individuals/ha)	2.1 birds/acre	Improve breeding density at all project sites within Owyhee-Great Basin – Green & Bear watersheds*	Grantees
		% Annual change in Breeding Bird Survey (BBS) data	-0.67%	Improved population trend over regional baseline in project areas where species initially present**	BBS Data
Sage thrasher	Increase sage thrasher through sagebrush landscape strategies	Density (# individuals/ha)	1.3 birds/acre	Improve breeding density at project sites within all focal areas*	Grantees
		% Annual change in Breeding Bird Survey (BBS) data	-1.39%	Improved population trend over regional baseline in project areas where species initially present**	BBS Data
Migrations and corridors	Fencing	Miles of fencing improved	0	300 miles improved	Grantee
	Fencing	Miles of fencing removed	0	200 miles removed	Grantee
	Transportation corridor crossings	# road crossing improvements	0	Invest in 10 sites over 10 years	Grantee
	Land conservation	Acres protected under long-term easement	0	25,000 acres in perpetual conservation easement	Grantee
Mule deer	Population increase	Population growth rate	TBD	Dependent on state agency development of population, abundance, and growth rate models that can detect changes in herd units with declining trends	State agency population models in development
	Mortality reduction	# of reported mule deer-vehicle collisions	Site specific	80% reduction in reported collisions at each site	State agencies
	Movement success	Mule deer passage success rate	Site specific	80% passage success rate at 10 priority sites	State agencies
Pronghorn	Landscape permeability	Metric that measures pronghorn response to barrier removal is under development	0	Under development	TBD
Native fish conservation	Lahontan cutthroat trout outcome	To be developed by June 2020	TBD	To be developed by June 2020	TBD
	Arctic grayling species outcome	# breeding individuals	100-150	Triple the number of spawning individuals in a Montana grayling population (300-450)	State agency
Irrigated meadows	Improve flood irrigation infrastructure	To be developed by June 2025	0	To be developed by 2025	Grantee

*These baselines were derived from region wide Integrated Bird Monitoring by Bird Conservation Region (IMBCR) data and will be refined with more spatially explicit data specific to Rocky Mountain Rangelands focal areas

** These baselines were developed using data from the Breeding Bird Survey (BBS)

Budget

The following budget shows the estimated costs to implement the business plan activities. NFWF must raise funds to meet these costs, therefore, this budget reflects NFWF’s anticipated engagement over the ten year period of the business plan. It is not an annual or cumulative commitment by NFWF to invest.

Budget Category	Years 1-5	Years 6-10	Total
1. Sagebrush Landscapes			
1.1 Habitat Management	\$4M	\$4M	\$8M
1.2 Woody Invasive Species	\$3M	\$3M	\$6M
1.3 Invasive Annual Grasses	\$3M	\$3M	\$6M
1.4 Mesic Site Improvement	\$3M	\$4M	\$7M
2. Migrations and Corridors			
2.1 Fencing	\$3M	\$3M	\$6M
2.2 Habitat Improvements	\$3M	\$3M	\$6M
2.3 Land Conservation	\$2.5M	\$3.5	\$6M
3. Native Fish and Wetland Bird Conservation			
3.1. Fish Passage	\$500K	\$500K	\$1M
3.2 Management of Invasive Fish Species	\$500K	\$500K	\$1M
3.3 Arctic Grayling	\$500K	\$500K	\$1M
3.4 Riparian Habitat Improvement	\$1M	\$1M	\$2M
3.5 Increase Water Availability	\$500K	\$500K	\$1M
3.6 Improved Management of Irrigated Meadows	\$1.5M	\$1.5M	\$3M
4. Monitoring and Evaluation			
Priority Actions for Focal and Prospective Species	\$1M	\$1M	\$2M
TOTALS			\$56M

NFWF is fully aware that the demand for conservation dollars will greatly exceed the amount of funding that can be delivered through this business plan. It is also understood that funding will not be secured or delivered equally across the focal areas or strategies on an annual basis.

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