

2021 Annual Report Statewide Habitat Plan Accomplishments

Annual Report 2021

Statewide Habitat Plan



Wyoming Game and Fish Department
May 2022

*Conserving Wildlife
Serving People*

Aquatic Habitat
Terrestrial Habitat
Habitat and Access Branch
Lands Administration
Statewide Communications
Habitat Protection Program

Message from the Director

Quality habitat is a cornerstone of wildlife management. That's why the Wyoming Game and Fish Department continues to invest heartily to sustain wild and healthy populations of aquatic and terrestrial wildlife. Nowadays, it's even more important to make the most of each drop of Wyoming's water. Sound habitat planning is one way we can do that, and it helps us build resilience on the landscape. So, when water is scarce and times are tough, ecosystems — whether that's the sagebrush country, mountainscapes, streams or wetlands — can withstand the highs and the lows of water availability. Our work at Game and Fish is long term, not reactionary.

Game and Fish allocated over \$2.5 million in funds for habitat projects and leveraged that for over \$8 million more from the Wyoming Wildlife Natural Resources Trust fund, federal government funds, state funds, private landowners and our local conservation partners. That's about \$3.16 coming from external partners for every Game and Fish dollar allocated. With 800 species in the department's charge, we use each dollar in the most impactful and effective way. That's how we executed 226 projects in 2021.

The way these funds are spent is determined by the Statewide Habitat Plan, a five-year plan guiding our work until 2025, at which time the plan will be updated. Since 2001, the SHP has remained the cornerstone of habitat management in the state. Projects found in this report were subject to intense scrutiny and planning in order to make a difference for wildlife. The plan directs our efforts to focus on projects that invest in the future of Wyoming.

Game and Fish and our partners united to work for a sustained future. Over the last year, the SHP guided the completion of the Wood River diversion fish ladder, replacement of a culvert barrier on Horse Creek near Jackson, and rehabilitation of Munn Ditch near Pinedale. These three projects reconnect over 197 miles of stream that will benefit our native cutthroat and many other species.

Battling invasives is a priority of Game and Fish and I'm especially proud of the work to control and prevent the spread of invasive plants, like cheatgrass, treating a notable 100,278 acres. We will keep this work going; bettering wildlife habitat is part of our long game and these efforts take years to produce measurable results.

In this year's annual report we profiled one of our crucial project partners, Rocky Mountain Elk Foundation for their work and for the work of the many local chapters across Wyoming. RMEF is a common partner for habitat restoration, conservation easements, land acquisition and public access across the state. In addition to financial support, RMEF volunteers often contribute to on-the-ground project implementation. Thank you, RMEF, for your ongoing commitment to habitats!

Enjoy reading about the projects making a difference for Wyoming's future. Together we are making a difference for our state.

Brian Nesvik, Director, Wyoming Game and Fish Department



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Statewide Habitat Plan Annual Report

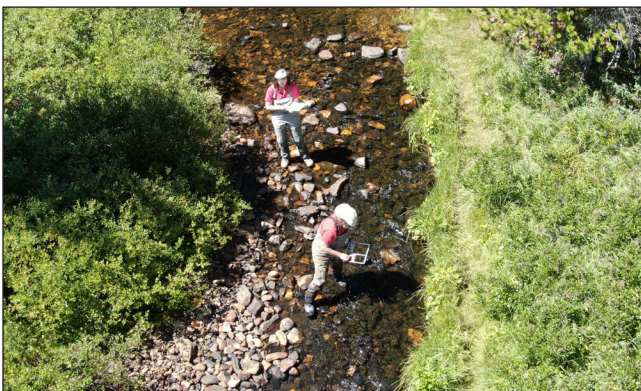
Mission

The Statewide Habitat Plan (SHP) defines how the Wyoming Game and Fish Department (WGFD) will meet its mission of *Conserving Wildlife - Serving People* by working with external partners to conserve and improve habitat statewide and manage Wyoming Game and Fish Commission (WGFC) owned lands. Within the WGFD, the SHP provides a road map defining how the Director's Office and all divisions will work together to accomplish habitat protection and enhancement goals. Progress to achieve these goals is tracked by the WGFD Habitat Technical Advisory Group (HTAG). A synopsis of goal progress can be found in Appendix A, SHP Implementation.

Strategy II of the SHP directs the WGFD to communicate habitat efforts and project results by developing an annual report highlighting habitat projects. This strategy will be implemented by sharing this habitat plan with the Governor's Office, State and Federal agencies, private landowners, conservation districts, conservation groups and the public. The SHP Annual Report documents habitat projects executed by WGFD programs to meet SHP goals:

- 1) Conserve and protect crucial aquatic and terrestrial wildlife habitats;**
- 2) Restore aquatic and terrestrial wildlife habitats; and**
- 3) Conserve, enhance, and protect fish and wildlife migrations.**

For additional information, please contact any of the personnel listed at the end of this document. This report can be viewed on the WGFD website at: <https://wgfd.wyo.gov/Habitat/Habitat-Plans/Strategic-Habitat-Plan-Annual-Reports>.



Habitat Program Expenditures

The WGFD and partners have contributed to fund projects focused on SHP goals. The figures below (rounded to the nearest \$1,000) represent the estimated totals expended on these goals during 2021. Additional information can be found in Appendix B, Habitat Program Expenditures.

WGFD Funds Expended on SHP Goals: **\$ 2,533,000**

Non-WGFD Funds Expended on SHP Goals: **\$ 8,005,000**

Grand Total for SHP Goals: **\$ 10,538,000**

Thank You, Partners!

The following lists major funding partners and approximate amounts (rounded to the nearest dollar) the WGFD spent in 2021. This is not a complete list, and may not reflect all partner contributions. We apologize for any partners who may have been inadvertently omitted.

Funding Partner	Approximate 2021 Amount	Approximate 2021 In-Kind Donation
Albany County Weed & Pest	\$1,400	
Bird Conservancy of the Rockies	\$6,850	
Bowhunters of Wyoming	\$2,375	
Bureau of Land Management	\$1,341,474	\$16,174
Bureau of Reclamation	\$21,850	
Carbon County Weed & Pest	\$7,257	\$21,975
Ducks Unlimited	\$210,199	\$42,000
Federal USDA Farm Bill Program (NRCS and FSA)	\$120,265	
Fremont County Fire Protection	\$103,952	
Fremont County Weed and Pest	\$14,937	\$11,254
Goshen County Weed and Pest	\$2,300	
Greater Yellowstone Coalition	\$5,000	
Jackson Hole One Fly	\$24,001	
Jonah Interagency Office	\$170,287	
Muley Fanatic Foundation	\$24,000	
National Fish and Wildlife Foundation	\$818,413	
National Resources Conservation Service	\$716,912	
National Wild Turkey Federation	\$5,000	
North American Waterfowl Conservation Act	\$100,000	
Pinedale Anticline Project Office	\$127,715	
Popo Agie Conservation District	\$1,500	
Private Donor	\$243,715	
Private Landowners	\$91,055	\$194,856

Funding Partner	Approximate 2021 Amount	Approximate 2021 In-Kind Donation
Rocky Mountain Elk Foundation	\$89,001	
Saratoga-Encampment-Rawlins Conservation District	\$1,960	\$6,269
Sheridan County Weed & Pest	\$16,004	
Sublette County Conservation District	\$6,338	\$1,000
The Nature Conservancy	\$12,500	
Trout Unlimited	\$27,352	\$12,500
Uinta County Weed & Pest		\$3,471
US Fish and Wildlife Service - Fish Passage	\$26,063	
US Fish and Wildlife Service - Private Lands Program	\$108,191	
US Fish and Wildlife Service WNTI	\$10,880	
US Forest Service	\$196,866	\$2,000
Water for Wildlife Foundation	\$26,700	
Wyoming Community Foundation	\$3,000	
Wyoming Department of Agriculture Water Quality	\$3,000	
Wyoming Department of Transportation	\$252,426	\$2,000
Wyoming DEQ 205J	\$4,999	
Wyoming DEQ 319	\$153,257	
Wyoming Governor's Big Game License Coalition	\$230,945	
Wyoming Landscape Conservation Initiative	\$247,606	
Wyoming Office of State Lands and Investments	\$107,834	\$5,000
Wyoming Water Development Commission	\$67,088	
Wyoming Wild Sheep Foundation	\$7,703	
Wyoming Wildlife and Natural Resources Trust Board	\$1,898,183	
Total	\$7,686,085	\$318,499
Grand Total	\$8,004,584	

2021 Partner Profile

Rocky Mountain Elk Foundation

WGFD would like to recognize RMEF for their work and for the work of the many local chapters across Wyoming. RMEF is a common partner for habitat restoration, conservation easements, land acquisition and public access across the state. In addition to financial support, RMEF volunteers often contribute to on-the-ground project implementation. RMEF embraces their mission by assisting WGFD with ensuring the future of elk, other wildlife, their habitat and our hunting heritage.

RMEF was instrumental in WGFD's acquisition of Raymond Mountain PAA in 2021. This PAA creates a permanent public roadway and parking area. The addition of the PAA provides public access from Highway 30, north of Cokeville, to Groo Canyon trail, opening access to the Raymond Mountain Wilderness Study Area and other state and federal lands. RMEF's role in the Raymond Mountain PAA acquisition provides access to 32,900 acres of previously difficult to access public land in the Sublette Mountain Range in western Wyoming.

The Director's Office

Habitat Protection Program

The Habitat Protection Program (HPP) coordinates project proposal and land/resource management plan reviews and recommends appropriate wildlife stipulations and mitigation strategies to protect important fish and wildlife habitat and to facilitate the implementation of Wyoming's Greater Sage-grouse Executive Order 2019-3 and Wyoming's Mule Deer and Antelope Migration Corridor Executive Order 2020-1. The HPP has six, full time employees consisting of one supervisor, four staff biologists, and an office support specialist located in Cheyenne, Lander, Pinedale, and Sheridan.

During the Calendar Year 2021, the HPP completed 553 Wildlife Environmental Reviews (WERs) for federal, state, local government, and private sector proponents. The majority of the reviews were completed for state and private sector project proponents (42.31% and 37.61% respectively). The HPP completed 183 WERs for Sage-grouse Executive Order compliance and 23 WERs for Mule Deer and Antelope Migration Corridor Executive Order compliance. The project types most frequently reviewed by HPP were related to roadwork/fences, mining, municipal planning and development, and oil and gas. Additional tables and figures detailing the number of WERs sent to various recipients can be found in Appendix C, Habitat Protection Program WER Tables.

Total WERs		
	Number of WERs	Percentage of Total
Federal WERs	49	8.86%
State WERs	234	42.31%
Local Government WERs	62	11.21%
Private Sector WERs	208	37.61%

Fish Division

Aquatic Habitat Program

The aquatic habitat program works to protect, restore, and enhance Wyoming's water, watersheds, and waterways. The program consists of 12 permanent full time employees: 6 regional aquatic habitat biologists, a statewide fish passage coordinator, a statewide fish passage biologist, a Wyoming Landscape Conservation Initiative coordinator, an aquatic habitat program manager and assistant manager, and a water management instream flow biologist. An aquatic habitat project biologist under an annual contract worked for the section in Lander. Seasonal biologist technicians assisted the section out of the Lander, Cheyenne, and Casper offices.

In 2021, there were 38 on-going aquatic habitat projects involving significant funding. Tracked annually, this metric has ranged from 34 to 42 the last 5 years. The 83 miles of habitat work logged on Wyoming's rivers and creeks in 2021 is above the 5-year average (see Appendix F for information about how miles are summarized). As usual, these miles come from a strong mix of assessments, implementation, and monitoring. All three of these activities are vital for identifying and understanding aquatic habitat issues, implementing lasting solutions, and learning whether work achieved objectives. Noteworthy, 2021 was marked by a relatively high number of detailed stream assessments (45) where measurements are taken to understand functional impairments and develop projects. A high number of beaver were moved, many associated with work in the Cody Region to improve riparian areas on Grass,

Enos and Muddy creeks. Similarly, more BDAs than ever were installed (44), reflecting the popularity of this riparian restoration approach. The nearly 21 miles of follow-up monitoring of stream restoration and fish passage projects reflects our commitment to monitoring. Finally, WGFD developed a strong sense of stream water temperatures across the state with recording loggers established at 36 sites.

Wyoming Landscape Conservation Initiative

The Wyoming Landscape Conservation Initiative (WLCI) was established in 2007 and is a long-term science based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale in south-west Wyoming, while facilitating responsible development through local collaborations and partnerships. This report contains summaries from eight projects: six involved modifying fences to wildlife friendly fencing standards, one involved treating Russian olive and tamarisk, and one installed BDAs. Nearly 32 miles of fences were converted and an additional 1.5 miles of nonessential fences were removed, 58 acres were treated, and 7 BDAs were installed.

Since fall 2020, 17 grants have been completed (six in 2020, and eleven in 2021). Currently, WLCI anticipates 1.8 million dollars for projects in 2022. The WLCI also has adopted the WWNRT application and application deadlines of March 1 and September 1.

Fish Passage

The WGFD fish passage program consists of two full time personnel and one seasonal technician and works with several internal and external teams to address fish passage needs across the state. A diverse workload includes passage inventories, entrainment sampling, fish movement evaluations, design review, grant writing, permitting, construction oversight, and coordination with various engineering consultants. On average, 4-6 projects are underway each year working to remove barriers and reconnect miles of stream.

Highlights for 2021 included completion of the Wood River diversion fish ladder, replacement of a culvert barrier on Horse Creek near Jackson, and rehabilitation of Munn Ditch near Pinedale. These three projects reconnect over 83 miles of stream that will benefit our native cutthroat and many other species. Several ditches were sampled in the Bear River drainage for entrainment, rubber culvert baffles were installed for the first time in WY, and the development of a fish passage prioritization tool were other significant activities conducted in 2021.

Services Division

Habitat and Access

The Habitat and Access Branch is responsible for managing WGFD lands. Our mission is to manage Commission lands to be the benchmark for wildlife habitat while providing public access. The Habitat and Access Branch in 2021 consisted of a branch chief located in Cheyenne, four regional supervisors located in Lander, Cody, Pinedale, and Laramie, one statewide crew supervisor located in Cheyenne, four coordinators located in Sheridan, Casper, Jackson, twelve biologists located in Pinedale, Dubois, Lander, Yoder, Cody, Lovell, Laramie, and Saratoga, and numerous seasonal employees stationed across the state.

The Habitat and Access Branch manages 44 WHMAs, 200 PAAs, and 22 feedgrounds consisting of approximately 500,000 acres. In addition, a statewide crew completes habitat development projects

across the state. The WHMAs are managed for specific wildlife habitat purposes and are included within the SHP. The Habitat and Access Branch incorporates specific objectives and strategies from the SHP into regional work schedules.

The branch manages and maintains approximately 500,000 acres, 95 wetlands, 140 miles of ditches/drains, 5,100 acres of irrigated meadows, 2,400 acres of farmland, 250 acres of food plots and more than 1,000 miles of fence for wildlife habitat purposes. To assist hunters and fisherman, another 1,100 miles of road, 395 parking areas, 67 boat ramps, 28 docks, 200 outhouses, and more than 10,000 signs are maintained.

During 2021, Habitat and Access acquired and developed a new public access area, Raymond Mountain. The branch also worked on other habitat development projects, including MDI, aeration, harrowing, mowing, meadow improvements, wetland developments, stream restoration, food plots, wildlife friendly fence conversions, noxious weed spraying and riparian projects. Grants provided an additional \$565,000 in on-the-ground expenditures.

Lands Administration Branch

The mission of the Lands Administration Branch is to administer WGFC property rights and work with other agencies, NGO's, and the public to acquire and manage property rights for the benefit of wildlife conservation and public access. The Lands Administration Branch currently administers approximately 500,000 acres of property rights including WHMAs, PAAs, conservation easements, and administrative facilities. The Lands Administration Branch consists of a Lands Branch Chief located in Cheyenne, and two Lands Coordinators located in Cheyenne and Lander. The State is divided into two Lands Administration Regions with each Lands Coordinator handling four regions.

Lands Branch personnel worked on numerous projects involving habitat conservation and conservation easements. A significant portion of the Lands Coordinators' time is spent monitoring conservation easements held by the WGFD to ensure the terms of the easements are not violated, and processing lease payments for the use of both public and private properties. Branch personnel also spent a significant amount of time communicating with WGFD personnel, state and federal agencies, and various NGOs, including RMEF and TNC, among others.

The 2021 Wyoming Legislature increased the Conservation Stamp fee, and required that at least 85 percent of the increased revenues be used to purchase access easements or other agreements to provide public access to private property and federal and state land parcels that are inaccessible or difficult to access for hunting and fishing purposes. Since that law was implemented in July 2021, the Lands Branch has identified and prioritized locations statewide to pursue easements or access agreements and started the negotiation process with several landowners. The Lands Branch looks forward to working with private, state, and federal landowners to improve access for hunting and fishing into the future.

Wildlife Division

Statewide Terrestrial Habitat Program

The Statewide Terrestrial Habitat Program works to actively enhance Wyoming's vast array of terrestrial habitats. This Wildlife Division work unit consists of a Terrestrial Habitat Program Manager and Office Manager stationed in Cheyenne, a Big Game Migration Coordinator located in Pinedale and a Migratory Game Bird and Wetland Biologist located in Lander. In addition, the Terrestrial Habitat Program works closely with regional personnel to administer grants, contracts, agreements, and expen-

ditures for all terrestrial habitat projects statewide.

During calendar year 2021, Terrestrial Habitat Program personnel were heavily involved with on-the-ground implementation, oversight or verification of expenditures on 94 projects concerning WGFD trust funds and funds granted to or from the WGFD from sources such as: WWNRT, various conservation organizations, local, county, state, and federal agencies, conservation districts, weed and pest districts, private landowners, and others. These sources provided approximately \$6.9 million towards on-the-ground expenditures for terrestrial projects.

In 2021 increased emphasis was placed on beaver restoration and wetland development with 26 beavers translocated and 570 wetland acres developed or restored. Invasive annual grasses continued to represent a significant portion of regional workloads with over 100,000 acres treated statewide for the first time in the program’s history. WGFD personnel and partners converted over 100 miles of fence to wildlife friendly specifications in 2021. Lastly, increased emphasis and work resulted in improved wildlife passage in 2021 and future plans to add to Wyoming’s growing list of migration structures intended to reduce wildlife vehicle collisions in the future.

Wildlife Migration

The Wildlife Migration Program was created in 2019 with the establishment of a Statewide Big Game Migration Coordinator position. This created an opportunity to increase the effectiveness of the WGFD’s ongoing migration work including wildlife crossings, fence modifications, vegetation improvements and other conservation practices in migratory habitat, as well as assist with the implementation of the Governor’s Mule Deer and Antelope Migration Corridor Protection Executive Order. Additionally, a significant number of GPS collar research projects have been underway across the state to better understand migratory habitat selection and help prioritize the locations of conservation work. While the majority of work in this program is focused on Goal 3 activities, many of the projects have multiple objectives and benefits to a wide variety of terrestrial and aquatic wildlife.

Habitat Program Accomplishments

Miles of stream and riparian habitat and acres of riparian and upland habitat directly impacted by habitat work in 2021 are tallied below. Additional information can be found in Appendices D and E.

Stream and Riparian Activity	Stream Miles	5 Year Average
BDA's installed	2.7	13.6
Beaver restoration	2.7	2.8
Detailed stream assessments	7.1	5.4
Fish passage stream miles connected	94.5	61.5
Instream flow filing segments	0	5.4
Post-stream project channel/riparian monitoring	20.7	12.2
Riparian protection and management	0.5	1.1
Stream restorations or bank enhancements	3.5	3.5
Survey or design for passage or stream restoration	1.7	5
Watershed stream assessments	64.1	51.7
Total	197.5	162.2

Riparian and Upland Activity	Acres	5 Year Average
Aspen Rapid Habitat Assessment	4,652	4,698
Aspen, cottonwood, willow browse monitoring	0	3,200
Conservation easements in process and acquired	149	136
Fee title acquisition	0	0
Herbicide vegetation to thin sagebrush	0	434
Herbicide weed treatments	100,278	63,033
Livestock grazing management plans or wildlife habitat stewardship plans	167,140	106,481
Mechanical shrub treatment	692	1,226
Mechanical tree removal	3,040	4,782
Mowing, chopping, and Lawson aerator treatments	1,061	3,032
Noxious weed control	164,610	57,924
Post management prescription monitoring	94,840	42,183
Post-vegetation treatment monitoring	119,011	101,595
Pre-vegetation treatment monitoring	17,172	33,634
Prescribed burns	690	1,128
Rangeland Rapid Habitat Assessments	59	69
Riparian habitat protection, enhancement, and management	0	283
Riparian Rapid Habitat Assessments	625	746
Special Rapid Habitat Assessments	4,780	3,713
Trees or shrubs planted	10,074	4,821
Upland exclosure developed	0	2
Upland grass, forb, and food plot seeding	0	407
Upland habitat assessment (e.g. GIS)	1,557	45,272
Wetland development or major renovation	570	581
WGFC managed lands farming contract	1,135	1,240
WGFC managed lands food plot	290	257
WGFC managed lands forage reserve	0	11,923
WGFC managed lands grazed	26,934	71,239
WGFC managed lands irrigated	1,015	3,463
WGFC managed lands meadow mowed/farmed	1,219	1,313
WGFC managed lands noxious weed control	4,200	3,662
WGFC managed lands prescribed burns	103	82
Total	725,896	625,474

Migration Activity	Number	5 Year Average
Fish entrainment assessments	8	4
Fish movement monitoring	1	5
Fish barriers inventoried	7	51
Fish passage structures monitored	58	18
Fish passage structures installed	15	10
Fish passage structures maintained	4	12
Fish passage upstream miles connected	94.5	52
Wildlife crossing assessment	0	1
Wildlife crossing monitoring	10	8
Wildlife crossing structures installed and enhanced	8	11

Highway 487 Mule Deer Collision Reduction (Goal 3) - Justin Binfet and Willow Bish

Landowners, WYDOT, and WGFD identified highway crossing points used by mule deer along Highway 487. These areas were targeted for shrub treatment within the highway ROW with the goal of reducing concealment cover for mule deer, thereby reducing vehicle collisions. In summer 2021, approximately 180 acres of shrubs (primarily sagebrush and greasewood) along 10 miles of Highway 487 were chemically sprayed. In fall 2021, sprayed areas were mowed. These areas will be re-treated in 2022 to address re-sprouts and seedlings. Two herbicides will be used in spring 2022, 4-D mixed with Escort XP to impact both sagebrush and greasewood. Mowing will likely occur in 2022, but it will likely be much less, as only shrubs that have re-grown to a large enough stature to conceal deer will be mechanically re-treated. WYDOT deer mortality data will be used to assess the success of the treatment. These data were collected prior to the treatments and data collection is on-going. Funding partners include WGBGLC, WWNRT, and WGFD MDI.



Figure 1. *Shrub treatment along Highway 487 to reduce mule deer concealment cover and prevent deer-vehicle collisions.*

Bates Hole/Hat Six Mule Deer Initiative RHA (Goal 2) - Willow Bish



Figure 2. *Bates Creek RHA area.*

Casper Region personnel completed three aspen, nine rangeland, and two riparian RHAs in the Bates Hole Mule Deer Herd Unit in 2021. Drought conditions resulted in low herbaceous productivity in 2021. The RHA data collected within this herd over a five-year period will inform future objective reviews.

Bates Hole Riparian Restoration (Goal 2) - Willow Bish and John McCoy

In 2021, we completed approximately 250 acres of juniper removal along Bates and Chalk Creek, constructed 10 BDAs in Chalk Creek, and inventoried and treated 24 miles of salt cedar on Bolton Creek with our Weed and Pest partners. These habitat projects occur in Crucial Winter Yearlong range, as well as sage-grouse core. Specifically, the projects target riparian habitats which contribute significant resources to mule deer year-round. In Bates Hole, riparian area issues primarily include juniper encroachment, competition from weeds, lack of desirable woody species recruitment, erosion/ incision, lack of water retention and storage, and excessive herbivory. The treatments address many of these issues and build upon over a decade of work by WGFD within Bates Hole as well as compliment on-going efforts

by the BLM and other partners. Funding partners include the Sage-Grouse Local Working Group, WWNRT, and WGFD MDI.

Bolton Creek BDA Installation and Monitoring (Goal 2) - Willow Bish and John McCoy

Bolton Creek is a seasonally intermittent, incised, heavily degraded watershed which has been identified as a large contributor of sediment to the North Platte River. For the last decade, restoration has focused on beaver transplants, channel plugs, BDAs, riparian plantings, and invasive species removal. Efforts in 2021 included installing ten BDAs upstream of the historic Fetterman BDA restoration site. Untreated fence posts were driven vertically into the channel providing a framework to weave willows throughout. The structures will collect sediment, reconnect the channel with the floodplain, reduce fine sediment inputs to the North Platte River, raise the water table allowing for expansion of riparian vegetation, and encourage beaver re-colonization. A longitudinal profile and cross-section survey, greenline transect, and lateral riparian transects were collected to document shifts in channel dimension and riparian community. Other activities in the watershed included repairing six historic BDAs and conducting greenline transect and lateral riparian transects within the downstream Easter site. Funding was provided by WWNRT.



Figure 3. *The crew finishing the last post on a Bolton Creek BDA installation.*

Chalk Mountain Phase II (Goal 3) - Heather O'Brien

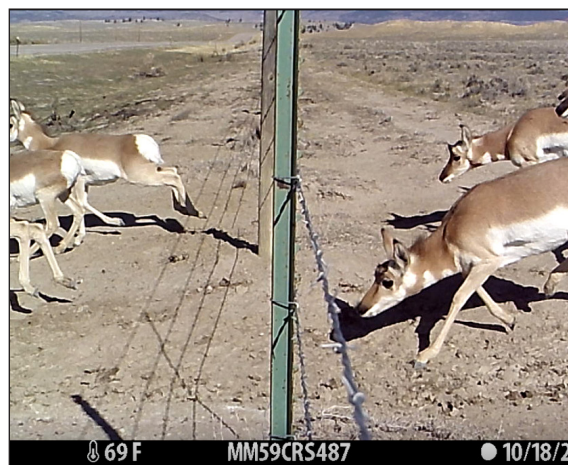


Figure 4. *Still from a video of 40 pronghorn successfully crossing under wildlife-friendly ROW fence in 40 seconds.*

This project was a continuation of the Chalk Mountain Pronghorn Fence Project, which converted 12 miles of pasture fences to wildlife friendly standards prior to 2021. In this second phase, two three-mile segments of ROW fence along State Highway 487 were converted to wildlife friendly standards in August and September 2021. Funds were utilized to convert an additional two miles of adjacent pasture fence. All fences identified for conversion to wildlife friendly standards were selected based on pronghorn movement and use data. The construction phase was completed in 2021; post-treatment GPS collar data is expected to illustrate improved movements of pronghorn via more frequent highway crossings and more variable timing of movements. Following successful documentation of improved movement and distribution, future projects may be proposed for adjacent pastures and ROW fences to further restore movement

corridors for the herd. Funding partners include WYDOT, WGBGLC, WWNRT, and WGFD Trust Fund.

Converse County Park Mahogany Rejuvenation (Goal 2) - Willow Bish

The objective of this project is to mechanically treat true mountain mahogany stands using mosaic mowing to reduce total cover of mahogany from >50% canopy cover to <30%. This is accomplished by

mosaic mowing approximately 50% of the area within the treatment sites. True mountain mahogany is a re-sprouter, but requires a disturbance to activate this mechanism. Due to the loss of historic disturbance regimes, such as fire, many of these stands are very decadent and lack the productivity needed to sustain big game populations. With the inherent costs, risks, and liabilities of conducting a prescribed fire, alternative treatment methodologies are warranted. The use of chemical treatment options, which are much less expensive, were previously trialed but did not meet the objectives of the project. Mechanical mowing was used to rejuvenate mahogany stands by stimulating new, palatable and nutritious leader growth. Using mechanical methods creates a very predictable response. Because topography limits the use of heavy equipment, hand crews with brush saws conducted the mowing. Approximately 100 acres were treated in 2021 on Converse County Park, south of Glenrock, with a total of 1,000 acres treated to date. In 2021, this project also included about 50 acres of mechanically mowed mountain big sagebrush treatments in snow accumulation areas for the benefit of forbs. Converse County Park treatments will continue through 2022. Funding partners include RMEF and WGFD Trust Fund.



Figure 5. *True mountain mahogany mowing.*

Duncan Ranch State Land Habitat Improvement (Goal 2) - Willow Bish



Figure 6. *True mountain mahogany mowing treatment on Duncan Ranch to promote re-sprouting.*

In 2021, the final portion of phase one of the Duncan Ranch project was completed. Approximately 100 acres of true mountain mahogany were cut by hand to stimulate new, palatable regrowth. In previous treatments, true mountain mahogany leader growth had 1,700% higher dry weight biomass two years post-treatment than control sites. Other project components completed in previous years included juniper removal, conifer treatments in aspen stands, forb seeding, and mountain big sagebrush mowing. WWNRT provided funding for this project.

North Platte River Erosion Assessment Phase 2 (Goal 2) - John McCoy

Excessive sediment causes the North Platte River to have a wide and shallow channel, increased lateral erosion, and unfavorable spawning conditions. Eroding riverbanks have been identified as a source of this sediment. A 12 mile reach from Government Bridge to Sechrist boat ramp was floated in late spring to sediment source banks. The BANCs method was used to assess 23 eroding banks revealing an estimated 50,700 tons of sediment entering the river annually. Combined with earlier erosion measurements, a total of 113,700 tons (8,100 dump truck loads) of annual sediment source have been identified between Gray Reef Dam and the Sechrist boat ramp. The next step is to focus restoration effort on key eroding banks.

North Platte Restoration Monitoring (Goal 2) - Del Lobb and John McCoy

The North Platte River provides an important resource to both residents and visitors of the City of Casper including scenic beauty, fishing and boating opportunities, educational opportunities, and water supply. Several years ago, the City of Casper began an effort to preserve and enhance many of these values, teaming up with the Wyoming Business Council, WWNRT, WGFD, WGBGLC, Natrona County Weed and Pest, and Central Wyoming Regional Water System Joint Powers Board to complete restoration on 2.5 miles of river throughout 7 restoration sites.

Restoration was completed at Morad Park in 2015 and at Wyoming Boulevard and Water Treatment sites in 2016. In 2017, a monitoring plan was developed to ensure goals were achieved including: 1) improvement and stability of stream channel characteristics, 2) enhancement of fisheries, and 3) restoration of native riparian vegetation. Monitoring is to occur over five years, beginning one year after completion, starting in 2016 and 2017 respectively. Morad Park monitoring did not occur in 2020 in order to finish all 3 sites in the final year.

Stream channel dimensions, a BANCs assessment, structural assessments, and photopoints were collected throughout the Morad Park and Wyoming Boulevard/Water Treatment reaches in the 2021 field season (see Figures 7 and 8). Data will be compiled and analyzed in a final monitoring report in 2022. Finally, the City of Casper completed stream restoration construction on the First Street reach near Jonah Bank.



Figure 7. 2017 Wyoming Boulevard photopoint looking upstream.



Figure 8. 2021 Wyoming Boulevard photopoint looking upstream.

Sanchez Creek Riparian Restoration (Goal 2) - Willow Bish and John McCoy

In 2021, the statewide Habitat and Access Crew, along with various Casper WGFD personnel, constructed 4,870 feet of steel jack fencing along Sanchez Creek. This is the second installment of fencing along this reach. This project will be completed in 2022 with a third steel jack enclosure, conifer removal from areas with deeper soils, and Zeedyk structure construction to help heal erosion and restore headcuts.

Stockade Beaver Creek Conifer Removal (Goal 2) - Todd Caltrider

Stockade Beaver Creek is a large drainage in Weston County that runs north to south from the Black Hills to the prairie near the Wyoming/South Dakota state line. This area serves as a major migration route for mule deer traveling between winter range and summer range at the highest elevations of the Black Hills in Wyoming and South Dakota. Transition/Winter habitat for mule deer is currently threat-

ened by conifer encroachment into mesic meadows and mountain shrub communities. In addition to conifer encroachment, a large percentage of the true mountain mahogany in the valley is mature and decadent. In an effort to improve nutritional condition for mule deer in the Stockade Beaver Creek drainage, WGFD initiated work with private landowners and Wyoming State Forestry to set back succession and create early seral habitats. To accomplish this, WGFD has worked with landowners and Wyoming State Forestry to thin areas that are becoming dominated by both juniper and ponderosa pine to promote more herbaceous and browse habitat for mule deer. In addition to conifer removal, WGFD is mowing stands of decadent and mature true mountain mahogany to increase leader growth and production. Phase I was completed in 2018, where 492 acres of conifer removal/thinning and mahogany mastication occurred on a mixture of private and state of Wyoming trust land. Phase II started spring 2019, and to date a total of 765 acres of conifer removal/thinning has been completed (see Figure 9). Work on remaining acres will occur during the winters of 2021-2022. Funding was provided by the WGBGLC and WWNRT.



Figure 9. *Before and after conifer removal.*

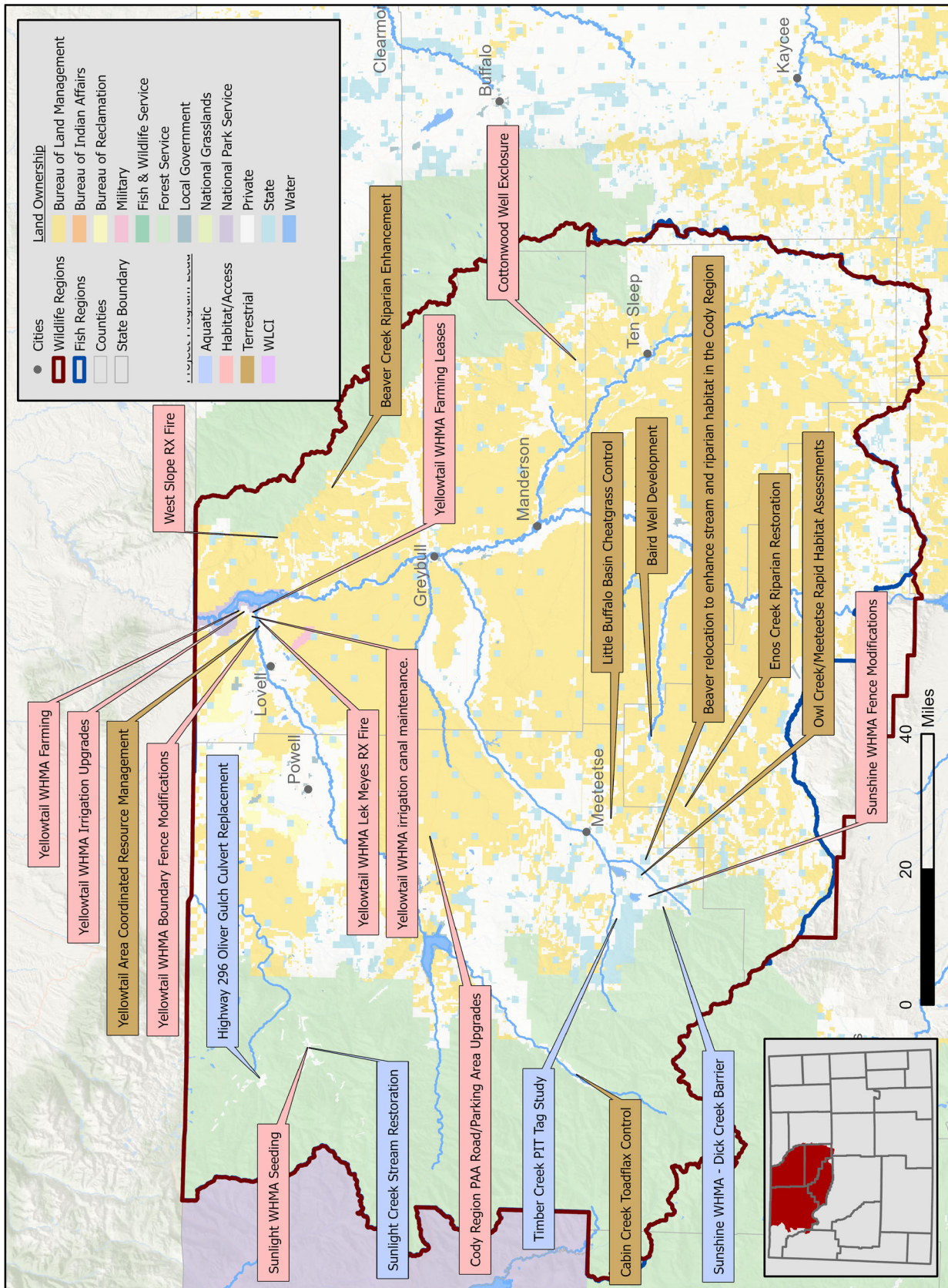
Thunder Basin Habitat Improvement (Goal 2) - Willow Bish

In 2021, 12 miles of fencing were retro-fit to wildlife friendly fencing, and 3.5 miles of fencing were marked for sage-grouse in the central grasslands. Also, 4,675 acres were preventatively sprayed for cheatgrass post wildfire in the Cellers Fire, which is in the Thunder Basin Sage-Grouse Core Area, and about 10,000 sagebrush plants were planted in the area in the fall. Funding partners include NFWF, Sage-Grouse Local Working Groups, WWNRT, and WGFD Invasive Annual Grass Fund



Figure 10. *Doe antelope at sheep fence which was retrofitted to wildlife friendly specifications.*

Cody Region



Baird Well Development (Goal 2) - Jerry Altermatt



Figure 11. *Installation of solar array pump at existing Baird well site.*

The Baird Well is an older well that was historically pumped by a windmill which has long been inoperable. The well is located on BLM land in the Gooseberry drainage south of Meeteetse. The BLM grazing permittee, partnering with WGFD and Water for Wildlife, installed a solar powered pump in the well to provide water to an existing tank in the pasture throughout the frost-free season. The water development is located within winter/yearlong habitat for antelope and yearlong habitat for deer. Both antelope and deer are commonly seen on the grazing allotment. The addition of a water source will expand usable habitat for deer and antelope in the area where there is currently no permanent accessible water sources. Funding was provided by private landowners and WFW.

Beaver Creek Riparian Enhancement 2021 (Goal 2) - Sam Stephens

During winter 2020/21 and spring 2021, 120 acres of conifer encroached riparian habitat was treated on Beaver Creek Ranch, near the headwaters of North Beaver Creek. Also, 21 acres of heavily encroached riparian habitat was treated on Bear Creek Ranch. All treatments included mechanical removal of conifers from riparian habitat by contracted hand crews (see Figure 12). Funding partners include RMEF, WWNRT, and WGFD Trust Fund.



Figure 12. *Beaver Creek restoration area pre- and post-treatment.*

Beaver Translocations for Stream and Riparian Restoration (Goal 2) - Jerry Altermatt

Between April 27 and September 28, 2021, a total of 14 beavers were trapped and relocated within the Cody Region. Beavers were trapped using Hancock and Comstock traps by the aquatic and terrestrial habitat biologists from six different locations where they were causing problems on private lands. Beavers were relocated to Grass Creek, Enos Creek, and Muddy Creek (tributary of Clarks Fork) for the

purpose of stream/riparian restoration. Beavers were held in a trailer-mounted holding facility until the time of release, with holding time ranging from 1 to 14 days. All beavers were weighed to determine an approximate age. Sex was determined on five beavers by expressing anal glands. One pair of beavers were fixed with VHF tail tag transmitters after being anesthetized.

Grass Creek: One family of two adults, one yearling and two kits and two possibly unrelated adults were released at two locations on Grass Creek in spring 2021. A new complex of five dams was discovered on October 22, 2022 within 0.16 miles of the family release site. A new complex of nine dams was discovered on October 27, 2022 approximately one mile upstream of the release site of the two possibly unrelated adults. This complex is less than 1.2 mile downstream from a colony that established from a 2019 translocation, so it is unknown which beavers were responsible for the construction of these new dams. Since 2019, a total of 15 beavers have been translocated to Grass Creek resulting in a total of 32 dams in 5 complexes.

Enos Creek: Three unrelated females and one related kit were released in Enos Creek in fall 2021. No new dams were observed in Enos Creek as of late October 2021. It is suspected that lack of deep pools may be responsible for the low success of establishment in Enos Creek. Approximately 50 beaver dam analogs are scheduled to be installed in Enos Creek in fall 2022 with the objective of providing deep pool habitat. More beaver translocations will follow these installations.

Muddy Creek: One family of two adults and one yearling were released into Muddy Creek on September 28, 2021. Both adults were fitted with VHF tail tag transmitters. The beavers were mule-packed into the release site by Shoshone National Forest packers. The locations of these two beavers were determined approximately bi-weekly through early-December. Both beavers were alive in early-December, and one dam and four food caches had been constructed within 0.25 miles downstream of the release site.

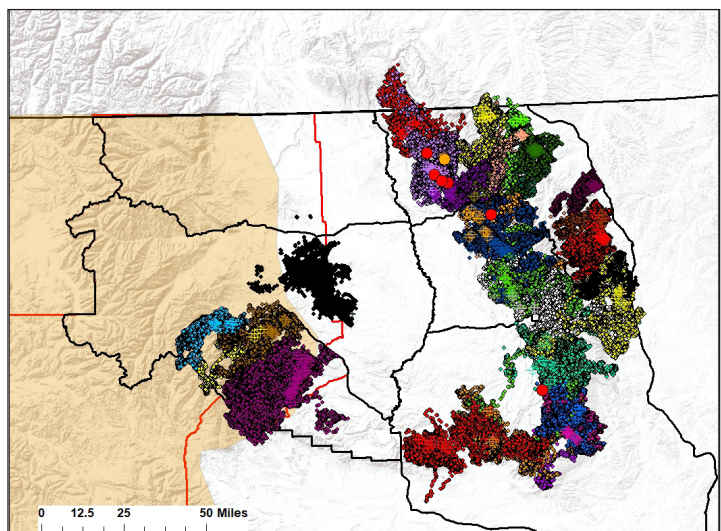
Bighorn Mountains Elk Movement Study (Goal 3) - Eric Maichak

From 2012 to 2015, seven hunter-harvested elk from the northwest Bighorn Mountains were found to be seropositive for exposure to brucellosis. This project was initiated in 2016 to understand the movement and ecology of elk and brucellosis into and around the Bighorn Mountains. Since February 2016, total elk captured, tested for brucellosis, and monitored for movement is 276. From November 1, 2020 to October 31, 2021, 62 elk (including 22 captured in February 2021) had iridium satellite radio collars that collected GPS data. Of these 62 elk, none traveled

Figure 14. *Bighorn Mountain elk collar locations.*



Figure 13. *Beavers being packed into Muddy Creek.*



from the Wyoming brucellosis Designated Surveillance Area (DSA) into the Bighorn Mountains or vice versa. Six of these elk died, including from hunter harvest (2), disease (1), natural causes (1), and unknown (1). Data were used for preliminary delineation of elk migration routes, home ranges, response to shed antler hunter GPS tracks, land use, and use of livestock mineral feeders (CWD study). Funding was provided by RMEF.

Cabin Creek Toadflax Control (Goal 2) - Jerry Altermatt



Figure 15. *Spraying Dalmation toadflax on the South Fork Shoshone River.*

Between September and December, 2021 dalmation toadflax infestations were treated on the Shoshone National Forest between Cabin Creek and Legg Creek on the South Fork Shoshone River. Park County Weed and Pest District backpack crews and private horse spraying contractors spent approximately 120 man hours spot spraying toadflax with imazapic herbicide on a total of 279 acres. The toadflax infestations were mostly associated with conifer removal projects in 2018 and 2019 and conifer slash pile burning in 2020. The area is Crucial Winter Range for bighorn sheep, elk and mule deer. Funding was provided by USFS.

Noxious Weed Control (Goal 1) - Brad Sorensen, Craig Swanson, and Eric Shorma

Approximately 2,000 acres of invasive plants are treated annually by Cody Region Personnel and local Weed and Pest Districts on WGFC- managed properties. These invasives are treated using chemical, mechanical, and biological methods to stress the plants. Controlling these noxious plants will enhance habitat while allowing native plants to thrive.



Figure 16. *Treating noxious weeds on the Yellow-tail WHMA.*

PAA Maintenance and Upgrades (Goal 1) - Brad Sorensen, Craig Swanson, Eric Shorma, and Todd Grosskopf

PAA's serve as critical recreational areas for the general public and sportsmen alike. Yearly maintenance and upgrades are necessary to preserve these habitats. Yearly upgrades include: treating noxious weeds, adding gravel and blading roads, installing new cattle guards, replacing dilapidated fences, and replacing signs. Various PAA's within the Cody Region received road upgrades in 2021. Approximately 1,200 cubic yards of gravel was hauled, spread, and bladed on eight different access areas.

WHMA Annual Maintenance (Goal 1) - Brad Sorensen, Craig Swanson, and Eric Shorma

Annual maintenance and improvements continued on the five WHMAs in the Cody Region in 2021. The Sunlight, Yellowtail, and Medicine Lodge WHMAs received annual fence maintenance on a total of 70 miles to reduce trespass livestock. The Sunshine and Renner WHMAs received annual fence maintenance on a total of 45 miles of stock fence by lessee. 1,486 acres of irrigation water rights were spread on the Yellowtail, Renner, Medicine Lodge, and Sunlight WHMAs. Annual parking lot and road maintenance was performed and over 57,000 acres of WGFC managed property rights were monitored.



Figure 17. Pivots irrigating Sunlight WHMA.

Renner WHMA Cottonwood Well Exclosure (Goal 1) - Brad Sorensen and Todd Grosskopf

The Cottonwood Well exclosure on Renner WHMA was dilapidated and needing rebuilt. Years of trespass livestock and vandalism led to the removal and rebuild of this exclosure. An all steel pole top fence with cable was installed to reduce the constant vandalism and to protect the well that feeds Renner Reservoir. A 3,300 foot all steel exclosure was built around the cottonwood well. This exclosure will protect the delicate artisan well head.



Figure 18. Installing new exclosure fence.

Paintrock and Southwest Bighorn Mule Deer Research (Goal 3) - Sam Stephens and Bart Kroger

CWD prevalence has reached 16-18% in mule deer in the Southeast Bighorn Basin. Effective management of this disease requires adequate baseline data to design prescriptive management strategies and monitor management impacts. Our on-going research aims to collect this baseline data for two mule deer herd units (Paintrock and Southwest Bighorns) in the Bighorn Basin by GPS collaring 100 adult female mule deer for a three-year period. This would enable managers to monitor population-level vital rates and seasonal range use. Additionally these data will help managers better define herd-unit boundaries and determine the level of interchange between neighboring herd units and the relationship to CWD transmission. Lastly, maintaining a robust sample of marked individuals will help determine harvest rates of adult females for each herd unit.

In December 2021, fifteen (n=15) adult female mule deer were captured and outfitted with GPS collars in the Paintrock (n=5) and Southwest Bighorns (n=10) herd units to map seasonal range use, monitor

movements, survival, and determine cause-specific mortality of marked individuals.

Devil's Canyon Bighorn Sheep Movement (Goal 3) - Sam Stephens

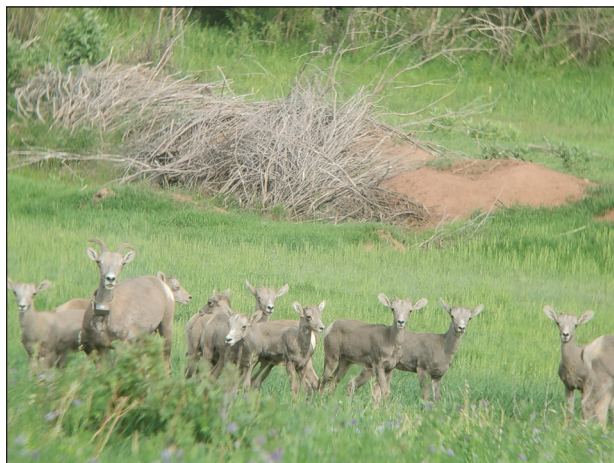


Figure 19. Collared bighorn spotted in summer with a group of bighorn sheep.

This project involves monitoring vital rates, habitat selection and dispersal of 30 collared bighorn sheep. Collared rams give insight into ram dispersal as it relates to population abundance, male to female ratio, and age of collared individuals. Surveying collared ewes allows us to use changing juvenile ratios as an index for survival. Tracking these vital rates helps managers understand what environmental variables impact survival through a lamb's first year. Furthermore, understanding how carrying capacity relates to management objectives requires investigation into the movements of individual sheep as it relates to occupied habitats in Devils Canyon. In 2021, a sample of 10 and 20 adult males and females (respectively) were on air with GPS collars as part of this movement and vital rate monitoring project which began in 2019.

Mortalities (n=3) and lamb recruitment were monitored using marked animals throughout the year.

Enos Creek Riparian Restoration (Goal 2) - Jerry Altermatt

Enos Creek is a second order tributary of Gooseberry Creek. Much of the stream has down-cut, and there is evidence of a lowered water table resulting in conversion of riparian vegetation to upland vegetation within the historic floodplain. Riparian shrub species, primarily willow, are present but the extent and distribution appear to be below potential.

There are signs of historic beaver use along many reaches of the stream, but there is only one active beaver colony below the project area. This colony was established when beavers released by WGFD two miles upstream in 2020 moved downstream and occupied an old beaver dam. Several other translocations of beaver into Enos Creek were made in 2020 and 2021 but no dams have been documented. The reason for the failure to establish is assumed to be due to the lack of deep pool habitat to retain beavers immediately after translocation. Until beavers can build dams and create their own deep water habitat, they are vulnerable to predation and are likely to move to other areas that offer more temporary security.



Figure 20. A typical reach of Enos Creek where BDAs will be installed.

In summer 2021, the terrestrial habitat biologist identified stream reaches that were good candidates for installation of BDAs. BDAs are a proven technique to temporarily mimic the ecological role of beaver dams and to provide deep pool habitat to entice beavers to remain in release areas.

Funding proposals were submitted to install approximately 50 beaver dam analogs on Enos Creek and to follow up with beaver translocations. Three stream reaches totaling approximately one stream mile have been chosen for the installations based on suitability for beaver establishment, including adequate food and dam building resources, sufficiently low gradient and suitable floodplain width to enable

riparian expansion. The installation of BDAs will occur in fall 2022 and will be followed by beaver translocations.

Oliver Gulch Culvert (Goal 3) - Erin Sobel

Oliver Gulch is a tributary to Crandall Creek north west of Cody, WY in the Clarks Fork watershed. Chief Joseph Highway 296 crosses Oliver Gulch and the undersized culvert is failing and a passage barrier for native Yellowstone Cutthroat Trout. The current round culvert is 60 inches diameter and 185 feet long. It is undersized, collapsing and has prevented aquatic passage and sediment transport for more than a decade. There is streambed aggradation upstream and the culvert is plugged with debris at the inlet. WYDOT plans to replace the failing culvert in 2024 and has requested assistance and recommendations for an AOP structure from USFS and WGFD. An 869 foot longitudinal profile, three cross sections, and two pebble counts were completed in fall 2021 to prepare AOP structure recommendations which advised that an eleven foot wide structure would be adequate. The larger structure will allow AOP, sediment transport and accommodate maximum flows. The USFS and WGFD are working together on design recommendations for a reinforced concrete box culvert to pass on to WYDOT for further hydraulic modeling. Funding will be sought in 2022 for materials and implementation in 2024.



Figure 21. *Oliver Gulch HWY 296 culvert is supported by multiple metal beams.*

Little Buffalo Basin Cheatgrass Control (Goal 2) - Jerry Altermatt



Figure 22. *Application of herbicide to cheatgrass-infested winter range in Little Buffalo Basin.*

In August, 2021, 343 acres of private lands in Little Buffalo Basin south of Meeteetse, WY were treated to control cheatgrass. WGFD contracted with 307 Aviation to aerially apply indaziflam herbicide (Rejuvra) at a rate of 5 oz per acre with 5 gallons of water per acre using a Robinson R66 helicopter. A nested frequency study was established prior to the treatment and will be re-read in summer 2022 to evaluate the effectiveness of the treatment. The project site is winter range for mule deer and antelope and there are two sage-grouse leks within two miles. Although currently not classified as elk winter range, increasing numbers of elk have been wintering in the area in the last ten years. Controlling cheatgrass will maintain the integrity of habitats for these species. Funding partners include WGBGLC, WGFD MDI, and WGFD.

Owl Creek/Meeteetse RHAs (Goal 2) - Jerry Altermatt

RHAs are conducted annually across the state to assess condition of seasonal mule deer habitats. These data inform decisions on population objectives at each five-year review. In 2021, 10 aspen and 16 rangeland assessments were conducted.

Quarter Circle 11 Fence Modification (Goal 3) - Eric Maichak

In 2020, 11 miles of 5-strand and woven wire sheep fence were removed and replaced with 4-strand wild-life friendly fence with pole-top at major crossings. One year prior to (2019) and following (2021) modification, crossings were monitored with trail cameras as collecting video clips. After viewing 2,000 video clips and analyzing data in 2021, results suggest no statistical increase in crossing rate of adult and calf elk over, through, or under the new fence. Efforts are underway to convince the landowner to install and test let-down sections of fence.



Figure 23. Trail camera on a fence section modified to improve elk passage.

Renner WHMA Grazing Treatment (Goals 1 and 2) - Brad Sorensen

A spring/summer/fall grazing treatment was conducted on the Renner WHMA in 2021. 383 AUMs were utilized for approximately 5 months in a high intensity short duration approach on a rotational schedule through the 8 pastures. This treatment will reduce litter and stimulate new plant growth on the WHMA.

Sunlight Creek Stream Restoration (Goal 2) - Laura Burckhardt, Brandon Werner, Kade Clark, Mac Foos, and Todd Grosskopf



Figure 24. Transplanted trees within the constructed floodplain.

Sunlight Creek, within Sunlight WHMA, has experienced unnatural stream channel movement and severe bank erosion for the last 40 years. These channel movements have resulted from changes in land use practices and have been accelerated by subsurface flow of irrigation return flows. From 2018 through 2020, the channel instabilities and erosion near the Sunlight WHMA were addressed through river restoration across a 0.82-mile stretch of the creek.

As part of this restoration, a total of 9.7 acres of plantings and tree transplants have been completed within the constructed riparian and floodplain area. In April and May 2021, the WGFD planted 13,000 willow stakes and 25 tree transplants over 5.3 acres of the constructed riparian and floodplain area. WGFD crews and local volunteers harvested approximately

13,000 willow stakes from private land in the Sunlight Basin. The WGFD planted approximately 2,000 of the willows along 720-feet of floodplain sills that they constructed along the Sunlight Creek stream channel. Due to compacted site conditions, willows were planted with hammer drills and a stinger mounted on the bucket teeth of a trackhoe. The WGFD hired a contractor to plant approximately 11,000 additional willows along the Sunlight Creek and Painter Creek channels, and the floodplain areas. Volunteers helped on 11 days accounting for approximately 500 volunteer labor hours. Volunteers included

East Yellowstone TU members, Park County residents, and employees from the BLM. In spring 2022, revegetation efforts will be completed with the planting of an additional 8,100 willows. The Sunlight Creek restoration was possible due to contributions from many partners, including WWNRT, East Yellowstone TU, USFS, and WGBGLC.

Sunlight WHMA Seeding (Goals 1 and 2) - Brad Sorensen and Craig Swanson

Approximately 12 acres of irrigated land was treated and re-seeded with Falcata Alfalfa, Sainfoin, Small Burnet, Meadow Brome, Orchardgrass, Timothy, Idaho Fescue, and Sandberg Bluegrass in the spring of 2021. This was a small acre trial seeding to see if this mix will germinate and if wintering wildlife will utilize it.



Figure 25. Seeding using dew drop drill.

Sunshine WHMA - Dick Creek Barrier (Goal 1) - Brad Sorensen and Erin Sobel



Figure 26. Sunshine WHMA failing diversion on Dick Creek.

The Sunshine WHMA has a water right for 12.82 cfs from a diversion located on private land on Dick Creek. The current Dick Creek diversion dam was installed in the 1990s. Since 2002, a large headcut has formed downstream of the diversion resulting in an 8 foot bed elevation difference and a high risk of failure. If this occurs, Sunshine WHMA will not receive water and Brook Trout will have access to upstream habitat into a core conservation population of Yellowstone Cutthroat Trout. Great West Engineering has designed a permanent fish barrier and diversion to prevent the upstream migration of Brook Trout and improve the water delivery system to Sunshine WHMA. A design approach was identified in 2018. We subsequently learned that WGFD does not have an official easement on the privately owned land

where the diversion is located and negotiations have failed to yield a new agreement. In 2021, Great West Engineering delivered a 100% design for a new diversion and associated pipe line work. Work in 2022 will focus on the cooperative agreement or alternative approaches. Funding was provided through the WGFD Trust Fund and WGFD maintenance and operating funds.

Sunshine WHMA Fence Modifications (Goal 1) - Brad Sorensen and Craig Swanson

Proper fence maintenance and repair is necessary to allow wildlife to freely move in and around WHMAs. Non-wildlife friendly fences are removed or rebuilt to WGFD standards while keeping livestock at bay. Roughly three miles of old livestock fence was removed in an effort to keep the landscape free of unnecessary fence. One mile of this fence was rebuilt to a pole top wildlife friendly fence.

Sunshine WHMA Grazing Treatment (Goals 1 and 2) - Brad Sorensen

A spring/summer/fall grazing treatment was conducted on the Sunshine WHMA in 2021. 1,078 AUMs were utilized for approximately 5 months in a high intensity/short duration approach on a rotational schedule through the 4 pastures. This treatment will reduce litter and stimulate growth on the WHMA

Timber Creek Yellowstone Cutthroat Trout Movement (Goal 3) - Erin Sobel

Timber Creek is a tributary to the Greybull River located west of Meeteetse, WY. The Greybull River drainage is an important stronghold for Yellowstone Cutthroat Trout that supports genetically pure populations. Over the past three years we monitored Timber Creek's fish passage. Four irrigation diversions on Timber Creek were consolidated into one point of diversion with a fish screen to prevent fish entrainment into the canal. The previous four points of diversion pulled water out of Timber Creek by using drop boards in concrete boxes located within the stream channel, which were passage barriers. Concrete boxes were left in place, but drop boards were removed and instream rock cross vanes were added downstream of all concrete boxes to assist with upstream passage for all aquatic organisms. These 2014 modifications made Timber Creek free of fish barriers. However, monitoring showed that Yellowstone Cutthroat Trout and Mountain Sucker upstream passage was most likely not occurring for all species and life stages.



Figure 27. *Main point of diversion on Timber Creek and the fish screen structure.*

In 2018, we installed solar powered PIT tag readers and antennas to track fish and monitor passage in Timber Creek. Tagging began in 2017 with a weir trap and backpack electrofishing to capture and implant PIT tags into the peritoneal cavity of Yellowstone Cutthroat Trout and Mountain Suckers greater than or equal to five inches. Sampling continued in 2018, 2019 and finished in 2020 with only backpack electrofishing for the final year. The overall monitoring goal was to determine the effectiveness of upstream passage past the rock cross vanes and the four concrete diversions. This was done by identifying the proportion of tagged fish making it upstream past all four modified diversions and determining if fish from the Greybull River are migrating upstream to spawn. A total of 1,530 fish were sampled over the four field seasons with 818 fish implanted with a PIT tag. Over the last four years, only 17% of the tagged fish were detected by one or more of the antennas. Of that 17% less than 3% were successful swimming upstream from the confluence and past the most upstream antenna and only 1% emigrated. Fish do not appear to be migrating in substantial numbers from the Greybull River upstream to Timber Creek. Similarly, substantial numbers are not leaving.

Readers detected and recorded fish between May and October. Most movements occurred during May and June when fish would be migrating upstream to spawn. Few fish were detected during the warmer and lower water months. This could be because the fish are staying higher in Timber Creek where there is more water and cooler temperatures than below the irrigation diversion where water is being diverted.

Work in 2022 will focus on designing an approach to remove the old concrete diversions, stabilize the stream bed where concrete is removed, model passage through a long culvert and improve the main diversion and water intake structure.

West Slope Rx Fire (Goal 2) - Brad Sorensen and Eric Shorma

Approximately 350 acres of juniper were treated with prescribed fire in the Cottonwood Canyon area near Lovell. The objectives of the treatments were to remove encroaching junipers from sagebrush communities to improve elk and deer habitat. The burns were conducted by the BLM Cody Field Office with assistance from WGFD. The treatments are part of a larger prescribed fire project in the Little Mountain area that began in 1997, totaling over 13,000 acres treated.



Figure 28. *West Slope burn.*

Big Fork Wildfire Restoration (Goal 2) - Jerry Altermatt



Figure 29. *Private contractor backpack spraying to control Russian olive on the Yellowtail WHMA.*

On April 27, 2013, the Big Fork Fire burned over 1,500 acres on the Yellowtail Area CRM, including the Yellowtail WHMA and adjacent private lands. Included in the burn area were 752 acres that had been treated to remove Russian olive between 2009 and 2013. These areas, because of the heavy biomass of Russian olive slash, burned with high intensity and prolonged heat, causing severe fire effects. This resulted in high herbaceous plant mortality and extensive areas of bare ground. Noxious weeds including white-top, Russian knapweed, and Canada thistle proliferated throughout the burn area but especially in areas of highest fire severity. In 2021, over 1,000 acres of the Shoshone River riparian area were treated with herbicide via backpack sprayers to reduce or eliminate Russian olive and tamarisk re-sprouts and seedlings. Funding partners include WGBGLC and WGFD Trust Fund.

Wood River Fish Ladder (Goal 3) - Nick Scribner and Erin Sobel

The Wood River Supply Diversion is located on the Wood River west of Meeteetse in Park County approximately 14 miles upstream of the Greybull River confluence. An eight foot tall concrete dam diverts irrigation water for storage in Lower Sunshine Reservoir. A genetically pure population of Yellowstone cutthroat trout inhabits the Greybull River drainage upstream of Meeteetse that includes the Wood River. The upper Wood River has been cut-off from the rest of the drainage since completion of this dam in 1971. Reconnection of this habitat was recently achieved with construction of a fish ladder and other diversion upgrades in December. Improvements to the diversion included a 275 foot long technical fish ladder, six inch raise to the dam crest, new concrete sluicewall, radial gate seals, and rehabilitation of the sluiceway apron. These improvements will allow upstream passage to about 50 miles of habitat for fish and likely reduce entrainment into the irrigation canal since the sluicewall height was increased, which may help steer fish down the Wood River versus the canal. Integrity of the dam structure was dramatically improved that will assist Greybull Valley Irrigation District with

operations and reduce long-term maintenance costs. Fish tagging operations will occur in spring 2022 to monitor fish ladder use. All fish of sufficient size will be PIT tagged and monitored for a minimum of two years. A Biomark antennae will be installed at both the entrance and exit of the ladder to document time to move through the ladder, passage success, and number of ladder entries.



Figure 30. *Overview of project completion.*

Boundary Fence Modification (Goal 1) - Brad Sorensen and Eric Shorma

Roughly 1,350 linear feet of WHMA boundary fence was removed and rebuilt to wildlife friendly fence standards. These boundary fences act as barriers to livestock on adjoining lands. Keeping livestock off the farm fields increases forage for wildlife on the WHMA.

Yellowtail WHMA Farming (Goal 2) - Brad Sorensen and Eric Shorma



Figure 31. *Seeding a food plot on Yellowtail WHMA.*

The Yellowtail WHMA has approximately 137 acres of farm fields that are farmed and irrigated for permanent cover by Habitat and Access. A variety of grains were planted for food plots. These food plots benefit waterfowl, pheasants, wild turkeys, and deer by providing cover and a food source. These fields also provide hunting and wildlife viewing opportunities for the large number of recreationists that utilize the WHMA.

The Yellowtail WHMA north farm fields were tilled and seeded as follows: 30 acres planted to oats and 30 acres planted to oat/Japanese millet/pearl millet mix. The remaining acres were left standing as a volunteer crop from the previous year. These food plots provide a diverse, yearlong food source necessary for wildlife survival.

Yellowtail WHMA Farming Leases (Goals 1 and 2) - Brad Sorensen and Eric Shorma

The Yellowtail WHMA has approximately 1,200 acres of farm fields and permanent cover fields. Contract farmers are utilized on a yearly basis to irrigate and farm approximately 1,000 of these acres and are required to leave portions of these crops standing for wildlife to utilize.

Big Fork Canal Cleaning and Maintenance (Goal 1) - Eric Shorma and Mac Foss

Over 13 miles of irrigation canals were cleaned of sediment deposits and debris. The Big Fork canal supplies water to over 600 irrigated acres on the Yellowtail WHMA. Irrigated food plots provide forage and dense nesting cover for migrating waterfowl, upland game birds, and big game.

Yellowtail WHMA Irrigation Upgrades (Goals 1 and 2) - Brad Sorensen, Craig Swanson, and Eric Shorma

Each year, Habitat and Access personnel upgrade the extensive irrigation infrastructure at the Yellowtail WHMA. In 2021, a new concrete check was installed along with additional gated pipe to further enhance habitat on the WHMA.



Figure 32. *New concrete check for irrigation on Yellowtail WHMA.*

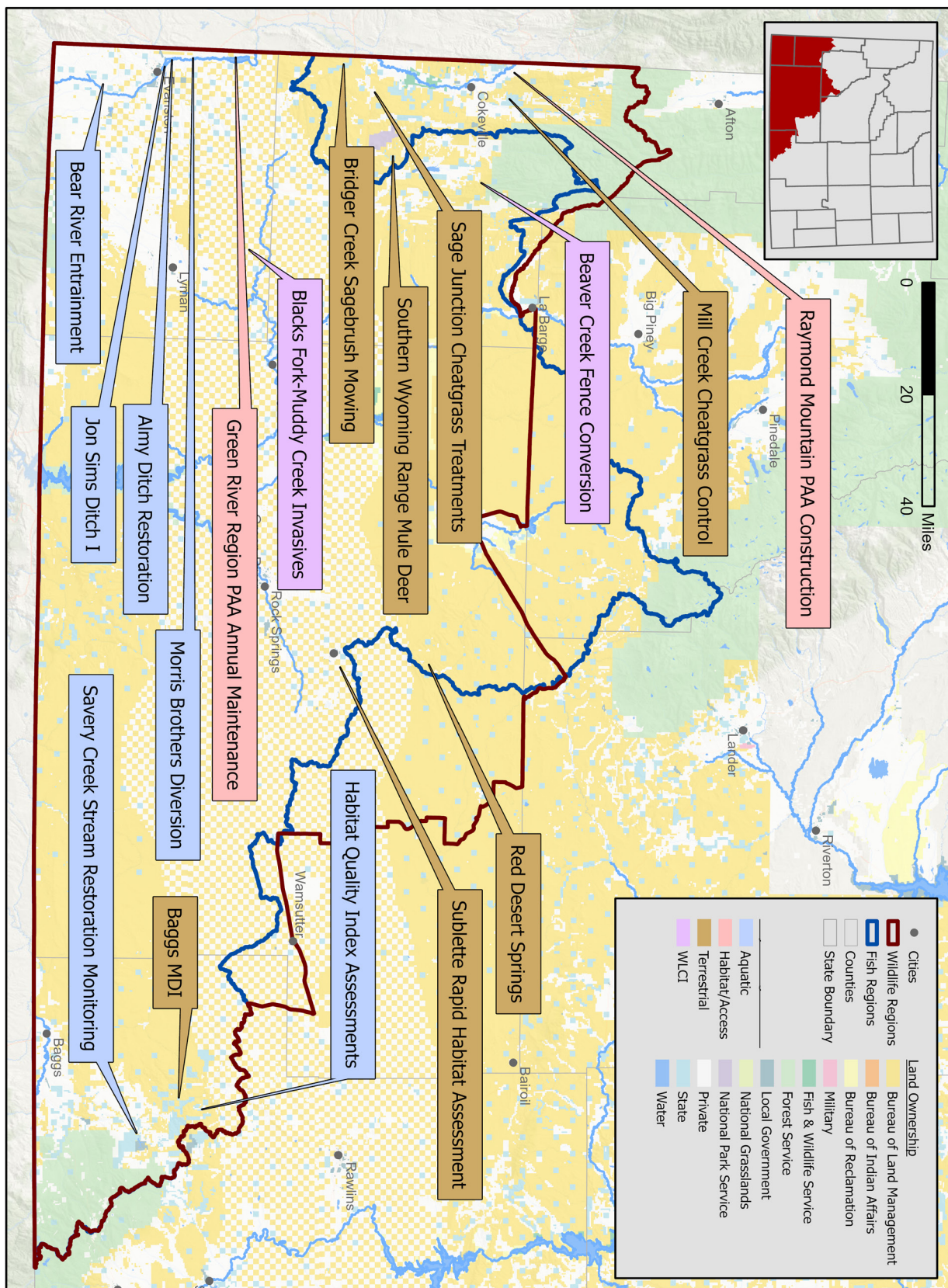
Yellowtail WHMA Lek Meyes Rx Fire (Goals 1 and 2) - Brad Sorensen, Craig Swanson, and Eric Shorma



Figure 33. *Fire ignition of Lek Meyes.*

Yellowtail WHMA is an important stop-over point for waterfowl during spring and fall migration. Increasing open water provides important loafing areas for migrating waterfowl. Prescribed fire was used to increase wetland plant species diversity and open water areas by reducing existing cattails and allowing opportunities for more desirable marsh and grass species to become established. In Spring 2021, prescribed fire was used to burn approximately 60 acres on the Lek Meyes wetland. This was done in cooperation with the BLM.

Green River Region



Bear River Restoration at Almy Ditch (Goals 2 and 3) - Nick Scribner



Figure 34. *Toewood post-installation.*

Almy Ditch is located on the Bear River downstream of Evanston. High flows in 2017 caused the Bear River to capture the feeder canal that leads to the ditch headgate causing extensive erosion and further degrading instream habitat. In August 2021, work began to address about 1,900 feet of channel with realignment and reshaping along with placement of sod and willow mats to promote natural channel stability. Approximately 425 feet of toewood, 2 cross-channel rock j-hooks, and 2 rock barbs were installed. A new permanent rock diversion structure and headgate for the Almy Ditch were installed with the headgate location moving upstream slightly. Lastly, the river cut-off channel formed by the old push-up dam was filled and a W-weir built upstream of a private bridge. This work will eliminate annual

channel disturbance for the diversion and provide a stable channel that maintains better habitat conditions. This project is led by the USFWS Partners Program and includes partnerships with Uinta County Conservation District, WWNRT, WYDEQ, Western Native Trout Initiative, Open Rivers Fund, WGFD, and the private landowner.

Red Rim Grizzly WHMA Fence Conversions (Goals 1 and 3) - Mark Cufaude

1.5 miles of non-wildlife friendly fence was converted by WGFD personnel in 2021. An additional 3.27 miles of fence was converted by a contractor to better manage grazing and resources. Thirty-three miles of materials were delivered to the WHMA in 2021 to convert the remaining non wildlife friendly fence on the WHMA. Funding partners include BOW, NFWF, RMEF, WLCI, WWNRT, WGFD MDI and WGFD maintenance and operation funds.



Figure 35. *New wildlife friendly fence on Red Rim WHMA.*

Bear River Entrainment (Goal 3) - Nick Scribner

Eight different irrigation ditches off the Bear River were sampled from late June through September with the use of trap nets to document fish entrainment. The most upstream site was near the Utah/Wyoming state line with the downstream site several miles north of Evanston. Trap nets were set near the headgate and all irrigation flows passed through the net. The nets were usually checked twice a day and all fish captured were recorded. The total sampling time at the 8 sites ranged from 369-785 hours and were evenly split between day and night. Nearly 4,000 fish were captured with over 90% of them Longnose Dace, Redside Shiner, and Speckled Dace. Very few of our primary species of concern were captured with only one Bluehead Sucker and 39 Bonneville Cutthroat Trout sampled. This work will continue in 2022 and focus on the early part of the irrigation season. Having two years of information will provide ample data to determine if fish entrainment into ditches is a significant issue within this area of the watershed.

Beaver Creek Fence Conversion (Goal 2) - Jim Wasseen



Figure 36. *New wildlife friendly fence in the Beaver Creek Allotment.*

Working with the permittee and the BLM, the Lincoln Conservation District converted 0.5 miles of woven wire fence to wildlife friendly fencing standards. The original plan was to complete one mile of fencing; however, due to extremely steep terrain, a steep forested gully, and a steep side hill of the last 0.5 miles of fence, only 2,865 feet were converted to wildlife friendly fence. It was feared the new fence, if built in the last 0.5 mile, would not withstand the heavy snow pack which destroyed the old fence. Also, due to the rough and rocky terrain it would be extremely costly to construct according to the fencing contractor. The existing terrain provides a fair livestock barrier as it is. The BLM rangeland specialist felt the new fence covered the projected scope of work for the project because livestock were curtailed from entering into pas-

ture number four of the Beaver Creek BLM Allotment allowing it to be rested. Another reason the fence conversion did not extend the full one mile was a new alignment of the fence would have needed to be done to move the fence around the gully, which would potentially require an Environmental Assessment and culture assessment because the new fence would not be on the same alignment. The new fence is built to BLM 4-wire fencing specifications with some let down fence segments within the fence. Notably, the new fence retained 68 used steel T-Posts. The used T-Posts were in good condition and mostly likely will last for the projected lifetime of the new fence. All other materials are new, including wood posts, brace posts, and wire. Funding partners include WLCI and WWNRT.

Muddy and Little Muddy Creeks Invasive Species Control (Goal 2) - Jim Wasseen

The Uinta County Weed and Pest District completed pre-treatment planning (reviewing previous treatments, narrowing the focus area, contacting landowners, hiring contractors, etc.). The Uinta County Weed and Pest District and their contractor treated 9 acres of Russian olive and tamarisk and 50 acres of perennial pepperweed, knapweed and thistle complexes on Dry, Cottonwood, Muddy, & Little Muddy creeks. New sprouts of tamarisk and mature parent trees were found along dry drainages up to two miles from the drainage and providing a seed source for the reestablishment of Tamarisk. Treatment on noxious weeds was targeted to maintain more desirable vegetation along the riverbank and limiting seed propagation downstream in the drainage. Mature trees in isolated pockets away from the drainages seem to be the seed source for the immature trees.



Figure 37. *Tamarisk on Little Muddy Creek; photo courtesy of the Uinta County Weed and Pest.*

Bridger Creek Sagebrush Mowing (Goal 2) - Kevin Spence, Kade Clark, and Rick Harmelink

In cooperation with OSLI and grazing lessees, the Statewide Habitat Access Crew completed sagebrush mowing treatment of 709 acres of crucial mule deer Winter Range in the Bridger Creek drainage south

of Sage Junction. Dense Wyoming big sagebrush stands in the treatment area exhibited monotypic older shrubs lacking vigor and recruitment of younger age classes. Productivity of associated grass and forb understories had also declined. A fine scale mosaic of mowed and un-mowed sagebrush was created where 27% or 191 acres were actually manipulated within the 709 acre project perimeter. Treatment was conducted during September when sagebrush seeds mature, and the mowing encouraged seed dispersal for quicker germination and seedling recruitment. Aerial application of Imazapic or Plateau herbicide was also applied simultaneously to the entire project area and adjacent locations to reduce cheatgrass establishment and maintain native herbaceous vegetation. Improving the ecological condition of these sagebrush sites will enhance habitat for mule deer, sage grouse, and other sagebrush dependent wildlife species.



Figure 38. *Mosaic sagebrush mowing to enhance 709 acres of crucial mule deer winter range.*

Benefits of creating sagebrush age class diversity across this segment of mule deer crucial winter range will not fully be realized for the next 20 - 40 years when sagebrush plants have re-established with enhanced vigor and nutritional browse. More immediate benefits are expected with increased forb species diversity and productivity in mowed areas for meeting nutritional demands for mule deer during the early spring migration. Increases in forbs, the overall production of the herbaceous plant community, and associated insect populations in mowed areas are expected to also enhance late brood rearing habitat for sage grouse and contribute to chick survival. Funding partners include the BLM and WGFD maintenance and operation funds.

PAA Maintenance (Goal 1) - Derek Lemon, Miles Anderson, Kyle Berg, Christopher Evans

Annual maintenance on signs, parking areas, roads, comfort stations, boat ramps, camping areas, and fences was performed by habitat and access personnel in the Green River Region. New comfort stations were installed at Viva Naughton PAA and Woodruff Narrows PAA. New culverts were installed on the Dempsey Point road at Viva Naughton Reservoir.



Figure 39. *Boat dock installed at Upper Sunshine Reservoir.*

Habitat Quality Index Surveys on the Red Rim - Grizzly WHMA (Goal 1) - Jim Wasseen and Mark Cufaude

Five trout HQI sites were surveyed during September along Littlefield, Little Muddy, and Muddy creeks on the Grizzly WHMA. Data from these surveys are used to evaluate the condition trends of

key stream habitat components for adult trout. These trend data assist in evaluating the effectiveness of livestock grazing management strategies applied in riparian areas on the Grizzly WHMA, and to ensure quality aquatic habitat conditions are achieved and maintained. Hot and dry conditions were experienced on the Grizzly WHMA during monitoring. Severe to extreme drought conditions were persistent throughout the summer, water levels were down and although stream temperatures were not measured, one can conclude that water temps were also higher than usual. The hot and dry conditions could negatively impact trout populations on the Grizzly WHMA.



Figure 40. *Littlefield Creek HQI survey station.*

Jon Sims Ditch I (Goals 2 and 3) - Nick Scribner



Figure 41. *Toewood being installed downstream of Jon Sims Ditch.*

The Jon Sims Ditch is located on the Bear River downstream of Evanston. The diversion consisted of a substantial push-up dam that seasonally disrupted fish passage and exacerbated channel instability both upstream and downstream. In fall 2021, a large channel restoration effort of roughly 2,275 feet was completed through this stream reach. Work included channel realignment and reshaping to promote natural channel stability where stream power is balanced with sediment loads. Approximately 1,000 feet of toewood was installed, 1 rock j-hook, 2 rock barbs, and 6 boulder constructed riffles were installed. A permanent rock cross-vane and a new headgate for the ditch were installed eliminating the rock/concrete push-up dam. This work will improve in-channel and riparian habitat conditions, ensure year-round fish pas-

sage, and reduce annual maintenance by water users. This project is led by the USFWS Partners Program and includes partnerships with Uinta County Conservation District, WWNRT, WYDEQ, Western Native Trout Initiative, Open Rivers Fund, WGFD, and the private landowner.

Mill Creek Cheatgrass Control (Goal 2) - Kevin Spence

The WGFD obtained \$70,000 from NFWF which was used by Lincoln County Weed and Pest to complete aerial application of Rejuvra to control cheatgrass on 1,700 acres of mountain big sagebrush and sagebrush/antelope bitterbrush mixed stands in the Mill Creek drainage located on state lands on the southeast side of Raymond Mountain. This project is an ongoing collaborative effort between the state land grazing lessee, NRCS, Lincoln Conservation District and WGFD. Portions of the project area were previously treated with Tebuthiron to reduce sagebrush densities and promote bitterbrush and herbaceous production. In 2018, the project area was treated with Imazapic to control cheatgrass, and LPI monitoring during 2020 revealed a need for follow-up treatment. Rejuvra was applied at a rate of 5.5 oz./acre during September 2021 and is expected to provide longer lasting cheatgrass control compared to the original Imazapic treatment. The combination of all these efforts are expected to enhance transitional habitat for mule deer and moose, and winter-yearlong habitat for elk.

Morris Brothers Diversion Rehab (Goals 2 and 3) - Nick Scribner

The Morris Brothers Diversion is located on the Bear River north of Evanston and provides irrigation water to multiple landowners and the town of Bear River. This diversion required annual maintenance of a large cobble push-up dam in order to divert water. In addition, a leaky headgate was nearing the end of its lifespan and water users were interested in reducing maintenance and debris accumulation while updating infrastructure. Project partners replaced the push-up dam with a W-weir rock structure in fall 2021 (see Figure 42). Additional improvements included a new headgate and construction of a bankfull bench along with willow plantings upstream of the diversion to stabilize an eroding bank. This work will eliminate the need for annual in-channel disturbance, reduce streambank erosion, secure fish passage at all flows, and provide reliable irrigation deliveries to water users. This project is led by the USFWS Partners Program and includes partnerships with Uinta County Conservation District, WWN-RT, WYDEQ, Western Native Trout Initiative, Open Rivers Fund, WGFD, and the private landowner.



Figure 42. *Morris Brothers Diversion before (left) and after (right) construction.*

Raymond Mountain PAA Construction (Goal 1) - Derek Lemon, Miles Anderson, Kyle Berg, Kade Clark, Rick Harmelink, Christopher Evans, Darby Schock



Figure 43. *Raymond mountain PAA trailhead.*

Pinedale, Jackson, and Statewide Habitat and Access crews teamed up for construction of the new Raymond Mountain PAA this year. Completing the teamwork of the WGFD, RMEF, and many other contributors to the project that provides public access to the Raymond Mountain Wilderness Study Area via Groo canyon. This access area opens up 32,900 acres of previously difficult to access public land in the Sublette Mountain Range in western Wyoming for hunting elk and deer.

Red Desert Springs (Goal 2) - Kevin Spence, Kyle Berg, and Jim Wasseen

The Red Desert Springs Project has been an ongoing effort since 2019 to maintain the integrity and function of springs, seeps, and pocket aspen stands which are vitally important for many wildlife species in this xeric landscape. Steel jack fencing was used to create exclosures at two additional aspen stands during 2021 to reduce ungulate impacts, and enhance vigor and productivity of aspen and associated understory plants. These aspen sites are located on the north side of Steamboat Mountain at Love Springs and Monument Ridge, where heavy use by both wildlife and livestock has degraded conditions and threatened the sustainability of these aspen stands.



Figure 44. WGFD and volunteer crew completing a steel jack fence exclosure at Love Spring on Steamboat Mountain.

The steel jack fence was constructed of used drill stem pipe and is semi portable. The fence is a 4-rail design with a maximum height of 6.5 ft. and a bottom rail 18 inches above the ground, which discourages access by large ungulates but allows use by most wildlife species. In a collaborative effort among agencies and volunteers, approximately 4,000 ft of fence material were moved from a stockpile location at the Farson WYDOT yard to the two aspen sites. The two aspen exclosures were constructed by agency personnel and volunteers. Delivery and construction crews consisted of BOW, WFW, MFF, Sweetwater County Sheriff's inmates, Dominion Energy, BLM Rock Springs Field Office, WGFD Pinedale Habitat and Access Crew, and WGFD Green River Region personnel. Previous funding for fabrication of the steel jack fence was provided by BOW, MFF, MDI, RMEF, WFW, JIO-PAPO during 2018.

Sage Junction Cheatgrass Treatments (Goal 2) - Kevin Spence



Figure 45. Aerial herbicide treatments to control cheatgrass on nearly 27,000 acres of key wildlife habitats in the Sage Junction area.

Lincoln County Weed and Pest District utilized \$417,532 of BLM Fuels funding and \$60,000 granted by BLM to WGFD for the Southern Wyoming Range Mule Deer Habitat for cheatgrass control treatments on key mule deer crucial winter/transitional range and sage-grouse core habitat near Sage Junction. These large acreage treatments were allowed under an existing programmatic BLM EA. Approximately 26,883 acres of sagebrush-grassland and mixed mountain shrub habitats were treated with 7.25 oz/acre of Imazapic (Plateau) to control cheatgrass during late summer and early fall. A significant portion of the 2021 efforts were follow-up re-treatment of acres where herbicide had previously been applied to control cheatgrass. These treatments were not only designed to generally control cheatgrass to enhance native vegetation, but many sites were also targeting

cheatgrass control to encourage favorable sagebrush mowing results for the Bridger Creek Project and other locations anticipated during the next few years.

Post treatment LPI vegetation surveys were completed at five representative sagebrush-grassland sites

in the Sage Junction areas at Sillem Ridge, Boulder Ridge, Leed's Creek drainage, South Nugget Canyon, and Collett Creek drainage. Pre and post LPI survey data was compared to evaluate cheatgrass control efforts conducted during the early fall of 2020 using Imazapic. Results showed success in reducing cheatgrass at these sites ranging between 43% and 95%, with the median reduction of 90%. LPI transects will be read again in 2022 to evaluate herbicide treatments completed in fall 2021.

Savery Creek Stream Restoration Monitoring (Goal 2) - Paul Dey

The Savery Creek stream restoration is a collaborative effort led by TU and involving BLM, Little Snake River Conservation District, WWDC, and WGFD focusing on the tailwaters located on BLM and State Lands immediately downstream of High Savery Reservoir. This stream reach is a popular sport fish angling destination. The multi-year and multi-phase effort to restore Savery Creek began with assessment and design in 2017-18 of a roughly 3.5 mile reach starting immediately below the dam. The channel contains a series of fourteen sheet pile grade control structures installed for dam construction mitigation. These structures divide the stream into sub reaches numbered from 1" near the dam through 13" at the downstream end. The channel has actively eroding banks and is wide and shallow. Portions of the channel are incised and disconnected from a somewhat constrained floodplain. Trout habitat is not optimal.



Figure 46. *Measuring Savery Creek habitat features.*

In 2019, WGFD Habitat and Access crews completed 600 linear feet of stream restoration in reaches 10 and 11. In 2020, TU contracted restoration of 2,000 feet in reaches 8 and 9. The contractor used natural channel design criteria and rock barbs and vanes to stabilize streambanks and channel shaping and realignment to stabilize Savery Creek. Bankfull bench features created to stabilize streambanks are ideal locations for riparian shrubs to establish and grow to maturity encouraging elevated water tables laterally to enhance riparian habitat. In addition to stream restoration construction in 2019-2020, this effort provided an opportunity to apply the Wyoming SQT to test the tool and quantify functional improvements. In 2019, pre-project assessment data were collected on reaches 8-11 and in 2020 post-construction data were collected on reaches 10 and 11. In 2021, post-construction data were collected on reach 8 and pre-construction assessment data were collected on reaches 4 and 6. No construction occurred in 2021 but is planned for 2022.

SQT analysis revealed that the designs for all 4 sub reaches yielded functional improvements. Much of this improvement was associated with the addition of woody material and the most degraded reach (11) yielded the most potential improvement. Key SQT insights were: 1) the benefits from woody debris additions were less than predicted; 2) bedform diversity is complicated to measure when many structures are added and functional improvement is limited when the channel planform is not adjusted; and 3) riparian vegetation is tricky to measure post-construction and needs several years to recover before functional improvements are realized. Further monitoring in 2022 is planned to fully evaluate this restoration effort and the SQT.

Southern Wyoming Range Mule Deer (Goal 2) - Kevin Spence

The BLM Kemmerer Field Office and SWCA Environmental Consultants completed the EA for the

Southern Wyoming Range Mule Deer Habitat Project and the Record of Decision was approved in May 2021. However, implementation of habitat improvements identified in the EA for BLM lands were delayed again in 2021, as efforts by the consultant, PaleoWest, in coordination with the Kemmerer BLM Archaeologist continued into December to complete a Class II Cultural Assessment for habitat treatment focus areas. Wyoming State Historic Preservation Office approval of the cultural assessment and associated BLM clearances for treatment areas are expected prior to the 2022 field season, and implementation of habitat improvements on BLM lands is anticipated to begin during summer 2022.

Additional efforts occurred during 2021 outside the scope of the BLM EA to enhance habitat for mule deer in the Southern Wyoming Range. Cost share funding was secured to replace existing woven wire fence with new wildlife friendly fence along movement routes and crucial winter range at the south end of Raymond Mountain and Albert Creek drainage east of the Bear River Divide. Several thousand acres of aerial cheatgrass control treatments were conducted in the Sage Junction, west Bear River, and Mill Creek drainage via a previously approved programmatic BLM EA for herbicide treatments. A sagebrush mowing treatment was completed on state lands in the Bridger Creek drainage to address declining sagebrush condition and promote shrub age class diversity.

RHAs are conducted annually in Mule Deer Initiative herds across Wyoming to better evaluate conditions of mule deer seasonal habitats. Six additional RHA assessments totaling 2,687 acres were completed for the Southern Wyoming Range within Transitional, Summer, and Crucial Winter Ranges, including three rangeland habitat assessments, and three aspen habitat assessments. RHA survey information will be used for Wyoming Range Mule Deer Herd Objective reviews, annual Job Completion Reports, and assist in determining locations of future habitat improvements.

Sublette RHA (Goal 2) - Kevin Spence



Figure 48. *Sublette Mule Deer RHA survey site near the town of Superior.*



Figure 47. *Southern Wyoming Range mixed mountain shrub RHA site in the upper West Fork Ham's Fork watershed.*

Ten RHAs were completed for the southern portion of the Sublette Mule Deer Herd in 2021. RHAs were located at sites within the designated mule deer migration corridor, Crucial Winter and Yearlong Range, and transitional habitat. Four rangeland assessments and six aspen assessments were completed totaling 700 acres. These data will be summarized in the annual Job Completion Report, and provide current habitat condition information for assisting with population management decisions.

Uinta Mule Deer Migration and Roadway Interaction Study (Goal 3) - Jeff Short



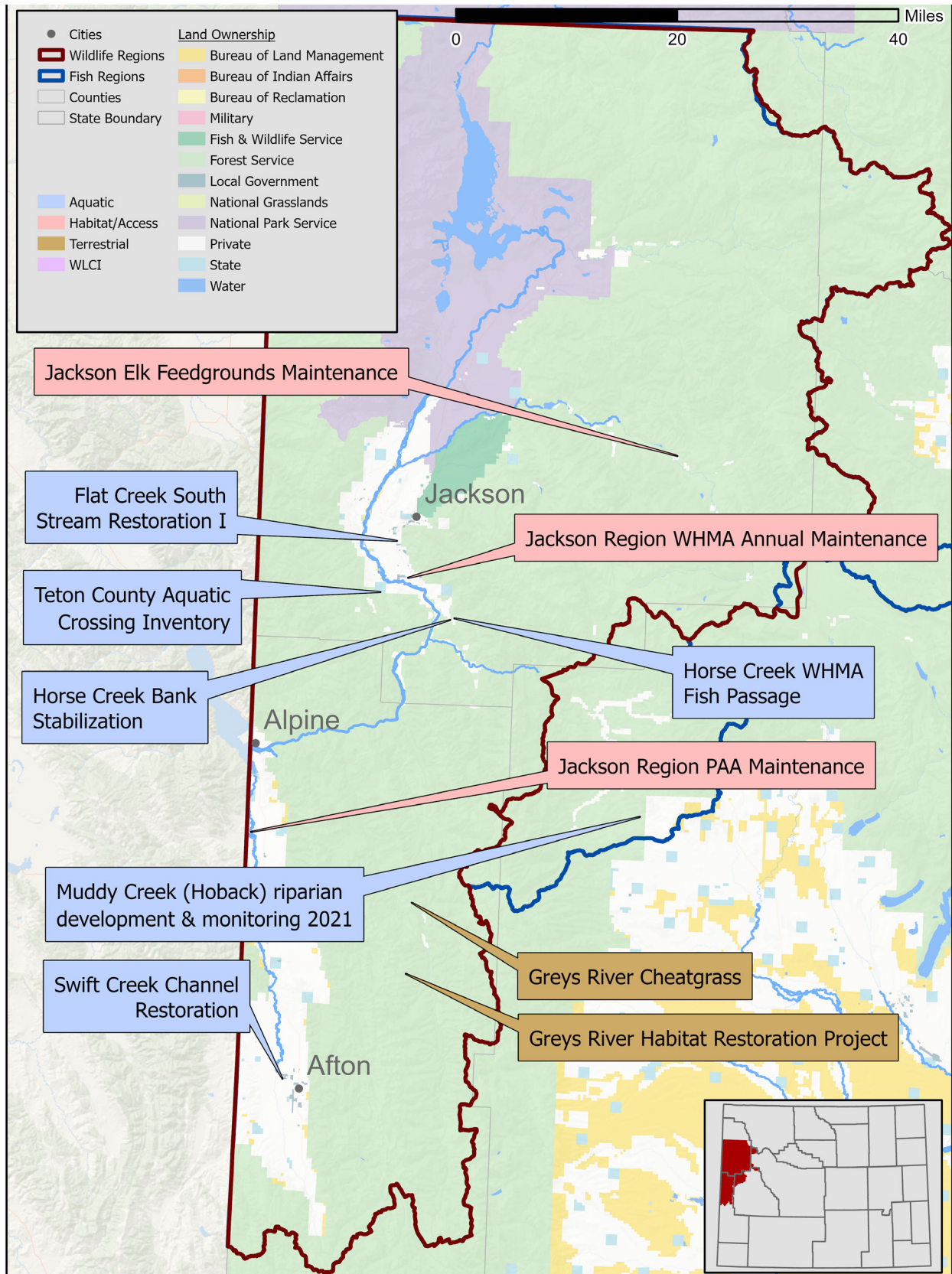
Figure 49. Doe mule deer with a new GPS collar.

Reducing WVCs has been a priority for the WGFD, we have worked with the WYDOT and other partners for many years to develop workable solutions. Both agencies have recently formed the Wildlife Crossing Initiative to help reduce collisions statewide. One of the roadways involved with mule deer WVCs is Interstate 80 (I-80), particularly on the west side of the state. I-80 crosses the range of the Uinta Mule Deer Herd which comprises approximately 12,000 to 14,000 animals. These deer are known to cross I-80, which dissects the winter range for this herd. As deer navigate between seasonal ranges they are exposed to being hit by vehicles along the I-80 corridor and in other locations of the herd unit. The purpose of this study is to collect movement and habitat use data for

mule deer to aid WYDOT and agency partners in reducing wildlife vehicle collisions and conserving ungulate migrations along the I-80 corridor in western Wyoming.

Fifty GPS collars were placed on doe mule deer in March 2021 via helicopter net-gunning. The collars were programmed to collect a GPS location every two hours and transmit one to two locations via satellite daily. The battery capacity of these collars is approximately 3.5 years, therefore, all collars are scheduled to drop off of the animal in March 2023. One of the GPS collars included a camera that automatically records during periods of highest mule deer activity, namely, dusk and dawn. The collar dropped off in August and footage is currently being reviewed. We are hoping to obtain video footage of this deer interacting with I-80.

Jackson Region



Flat Creek South Stream Restoration Phase I (Goal 2) - Anna Senecal

Flat Creek flows from its headwaters upstream of the National Elk Refuge, through the town of Jackson to eventually meet with the Snake River, about six road miles south of town. Flat Creek is integral to the town of Jackson, the Snake River Cutthroat Trout fishery and the aquatic ecosystem. The creek provides multiple beneficial uses including fish habitat, irrigation, aquifer recharge and municipal drinking supplies. The creek also provides a corridor of vital wildlife habitat through town, serves as a visual and recreational amenity for residents and tourists, and provides points of access for the angling and floating public. The creek is 305(d) listed as threatened by WYDEQ for water quality and habitat degradation. Development and grazing have reduced or entirely removed willows from the riparian corridor, straightened the creek and produced an over-wide and shallow channel lacking in spawning riffles and deep pools. These channel conditions reduce spawning activity and may restrict seasonal movement through shallow depths, high summer temperatures, and the formation of unstable winter ice.



Figure 50. Flat Creek pool and toewood construction November 2021.

Stream restoration on private land south of Jackson was initiated in 2016 to restore form and function to 1.2 miles of valuable Snake River Cutthroat Trout habitat on Flat Creek. Project objectives include increasing floodplain connectivity, reducing bank erosion, improving sediment transport and restoring the woody riparian shrub community. Construction contracting was delayed in 2020 due to COVID short staffing and therefore all bids were rejected. Measures were taken to secure funding and permits, and phase I of two construction phases was successfully rebid in 2021. Phase I consists of approximately 0.6 miles of new channel and floodplain grading. The design includes five outside meander bends finished with soil lifts and plantings, and three toewood bends. The plan also includes two engineered riffles for grade control and two reinforced riffles to allow for livestock crossing.

Qualified bids ranged from \$486,794 to \$604,463. The contract was awarded to Clearwater Restoration out of Jackson, Wyoming. Base bid plus select bid alternatives summed to a total contracted amount of \$542,611. Construction began in October 2021 and was largely complete by the end of December 2021. Phase 2 will be bid and constructed in 2022.

Project partners include: WWNRT, Teton Conservation District, the landowner, WWDC, Jackson Hole One Fly, TU, WYDEQ, WFW, WGBGLC, NRCS, and the Community Foundation of Jackson Hole.

Greys River Cheatgrass (Goal 2) - Troy Fieseler

Cheatgrass has gradually become more abundant and has spread throughout the Greys River Corridor in areas that were relatively free of invasive annual grasses not long ago. Currently, the majority of sites can be found on south-facing slopes on Middle Ridge and in isolated locations along the main Greys River road on BTNF lands. During 2021, approximately 450 acres were aerially treated with the herbicide Rejuvra. The importance of this area to wildlife is unquestionable, providing transitional and stopover habitats for migrating mule deer from both the Wyoming Range and Sublette mule deer herds, Parturition and Crucial Winter-Yearlong habitat for elk as well as Crucial Winter-Yearlong habitat for moose.

Cheatgrass has not yet significantly reduced native vegetation in the area. Pre-treatment levels averaged



Figure 51. *Pre-treatment monitoring transect for Greys River Cheatgrass.*

approximately 15% along the leading edge of this invasion. Treating the infestation now, while cheatgrass is contained to relatively small areas, increases the chance of containment. The project is anticipated to expand to other areas on the BTNF, including both the Greys River and Kemmerer Ranger Districts through a collaborative partnership including multiple stakeholders. The USFS provided funding for this project.

Greys River Habitat Restoration (Goal 2) - Doug McWhirter and Gary Fralick

This is a large-scale, long-term project involving multiple agencies and organizations to address a decline in early-succession (young) stages in aspen, big sagebrush, and mountain shrubland vegetation types, as well as a substantial increase in conifer expansion into these vegetation types, mainly due to a century of fire suppression. A variety of habitat treatments, depending on conditions, are needed in these areas to restore community age structure.

The project will have several phases. We currently are in the planning phase but will begin implementing small projects this coming summer. A prioritized list of about 20 prospective treatment areas across the District (each as large as about 5,000 acres) were strategically identified in 2021. Boundaries of some prospective treatment areas were finalized and regulatory requirements were met.



Figure 52. *A view of aspen-conifer types in the Box Canyon Creek drainage.*

Gros Ventre Elk (Goal 3) - Aly Courtemanch and Doug McWhirter



Figure 53. *A GPS collared elk being released.*

In 2021, a total of 15 adult female elk were captured and fitted with GPS collars. This is in addition to 22 adult female elk that were already collared. Information gleaned from these collars will provide insight into winter distribution and movements, survival, and relationships among native winter range elk, and elk that attend either the Patrol Cabin Elk Feedground or the National Elk Refuge. This study is ongoing and will continue for at least another three years. Funding partners include RMEF and WGBGLC.

Horse Creek Bank Stabilization (Goal 2) - Anna Senecal

An eroding Horse Creek bank was reconstructed on the Horse Creek WHMA, located 2.5 miles northeast of Hoback Junction. Horse Creek runs through the WGFD's feedground and experiences bank instability from ongoing and historical land management actions including: irrigation diversion, channel manipulations, removal of woody riparian vegetation and concentrated grazing pressure as a result of winter elk feeding operations.

The feedground hosts an average of 1,200 elk each winter and provides crucial winter range. Public walk-in access is available in the summer and fall. Continued operation of the feedground is critical to maintaining current Fall Creek Herd objectives. In order for the feedground to function, boundary fences must be maintained. The eroding bank in question was threatening the downstream WHMA boundary fence. Reducing stream bank erosion is also beneficial to the Snake River Cutthroat Trout that access the WHMA and upstream spawning grounds. Improving these habitats by stabilizing banks and reducing river sedimentation will improve WHMA aquatic habitat and maintain perennial passage through this corridor.



Figure 54. Contractor inspects the newly constructed bankfull bench, rock and log toe, and rock J-hook at the WGFD Horse Creek WHMA.

Site evaluation began in 2018 when the laterally migrating bank was identified as a major threat to maintaining the WHMA boundary fence. The Jackson AHAB completed surveys, design and permitting between 2019 and 2020. Reconstruction of the bank was completed by Bennett Construction in 2021 in conjunction with upstream irrigation diversion repairs. Five hundred feet of eroding bank were repaired. Two rock J-hook structures, 300 feet of rock and log toe, and 500 feet of bankfull bench were constructed. Banks were sloped and planted with whole willow clumps. The lateral scour pool was over excavated and the point bar opposite was gradually sloped. This site is located within a steel jack elk enclosure. Connection to the floodplain and release from browse pressure will encourage willow and cottonwood recruitment along this bank. Improving stream function here should benefit approximately two acres of willow/cottonwood scrub shrub wetland. Funding from RMEF helped complete this effort to benefit trout, elk, moose, and other wildlife.

Horse Creek WHMA Fish Passage (Goals 2 and 3) - Nick Scribner and Anna Senecal

Construction was initiated in fall 2020 to replace an undersized culvert and improve irrigation infrastructure. The work was paused for the WHMA closure on December 1, 2020 and re-started in early May 2021 after opening of the WHMA. Final work involved: Rock placement and grouting of a rock vane and irrigation sluiceway, willow stake plantings along the reconstructed stream channel, 30 feet of toewood installation, removal of a 3-foot overflow culvert and backfilling, road improvements including adding gravel and final grading, and seeding disturbed areas.

A longitudinal profile through the new bottomless arch culvert was completed to document as-built conditions and repeated after runoff to document changes. These surveys revealed incorrect elevations of the toewood installation, so the contractor reinstalled the toewood in late summer when they were onsite completing additional work downstream. The work downstream included installation of two rock j-hooks, toewood, and channel grading to stabilize eroding streambanks and improve stream function.

These sites will be monitored in 2022 and beyond for maintenance needs and comparison to as-built conditions. Funding partners include USFWS Fish Passage Program, WWNRT, WFW, Snake River Fund, and Teton Conservation District.



Figure 55. *Looking upstream at new crossing and willow plantings.*

Feedground Maintenance (Goal 1) - Derek Lemon, Miles Anderson, Kyle Berg, Christopher Evans



Figure 56. *Stackyard maintenance at patrol cabin feedground.*

The annual maintenance and improvements to 11 WGFD managed elk feedgrounds in the Jackson Region included work on feedground structures, corrals, stack yards, elk migration fences, and grounds. Dog Creek, South Park and Horse Creek elk feeding areas were harrowed in spring 2021 in order to break up elk scat and promote growth of new grasses. A half mile of new pole top fence was built at Dog Creek. Access roads to feedgrounds were maintained and roads resurfaced or otherwise improved at Horse Creek, South Park, and Patrol Cabin feedgrounds. One new steel hayshed and stack yard was constructed at Patrol Cabin feedground. Eight upright poles and seven rafters were replaced this year on various hay sheds and nine sheets of tin were replaced on a hay shed at

Camp Creek.

Jackson Moose Monitoring (Goal 3) - Aly Courtemanch and Doug McWhirter

Moose were collared to increase understanding of their movement patterns in relation to highways in the Snake River corridor between Moose and South Park. Information was also gathered on nutritional condition (including tick loads), reproduction/recruitment, and survival. A total of eight adult female moose were captured and fitted with GPS radio collars in 2021. This is in addition to ten adult females that were already collared from past years. Valuable information has been gained on highway crossings and has contributed to the Highway 22/390 reconstruction planning. Monitoring of moose currently collared will continue through 2024 when collars are programmed to fall off.

Maintenance and Improvements on PAAs (Goal 1) - Derek Lemon, Miles Anderson, Kyle Berg, and Christopher Evans

Regional personnel performed annual maintenance on Public Access Areas in the Jackson Region in-



Figure 57. *PAA maintenance on Salt River.*

cluding all 16 PAAs on the Salt River, Von Gontard's Landing and Coco Belle PAAs. PAA maintenance activities included replacing signs, repairing fences, spraying noxious weeds and painting comfort stations. A culvert was replaced on Burton Lower and encroaching willows were removed from the parking area. 697 tons of gravel was used to fill holes and improve the roads on the south half of the Salt River. A new comfort station was installed at the Narrows Bridge PAA along the Salt River.

Salt River Temperature Monitoring (Goal 1) - Anna Senecal

The Salt River is a blue ribbon fishery hosting excellent habitats for all life stages of native Cutthroat Trout. The Salt River is also increasingly impacted by development as agricultural parcels are converted into residential units. Channel manipulation and riparian vegetation conversions impact the drainage in addition to ongoing temperature shifts associated with the changing climate. Long-term monitoring at this site will help identify and prioritize management actions in this basin. Two temperature loggers were deployed in the lower Salt River drainage in August 2020 to establish long-term water temperature monitoring sites. One logger was deployed at the Clark's Barn public access area near Afton Wyoming and the other at the Miller public access area near Etna, Wyoming.

Maintenance and Improvements on WHMAs (Goals 1 and 2) - Derek Lemon, Miles Anderson, Kyle Berg, and Christopher Evans

Annual maintenance and improvements continued on the seven WHMAs in the Jackson Region in 2021. The Horse Creek, South Park and Greys River WHMAs received annual fence maintenance to reduce trespass livestock and commingling of elk and livestock in the winter. 100 acres of irrigation water rights were spread on Horse Creek WHMA. Horse Creek and South Park were hayed to feed elk in the winter and promote new growth for fall and spring forage; 107.6 tons were produced between the two WHMAs. Annual parking lot and road maintenance was performed on South Park and Horse Creek WHMAs. Noxious weeds were treated by WGFD personnel and contract applicators on all Jackson WHMAs. Signs were inventoried and new opening date signs were installed on all WHMAs.



Figure 58. *Haying at Horse Creek WHMA.*

Muddy Creek BDAs (Goal 2) - Anna Senecal and Luke Schultz

The Roosevelt Fire burned over 50,000 acres across the headwaters of the Hoback River drainage in 2018, and contained many locations of high-intensity burns. In this steep and highly erosive landscape, denuded slopes were expected to create localized landslides and other mass wasting events and general-

ly elevated sediment transport across the watershed. In addition, historical overuse by livestock and, in some cases, artificially elevated wildlife populations led to deteriorated upslope and riparian conditions, and localized channel incision. Muddy Creek and its tributary to Coyote Gulch near the Hoback Rim are streams that display these impairments.

Historically, beaver would have had a strong mediating effect on these riparian systems by constructing dams that slowed flood flows, vertically stabilized stream beds, and inundated floodplains to support vigorous vegetation that resisted erosion. However, with the loss of many beaver populations over the last two centuries, stream systems have suffered. The goal of this project was to emulate the positive aspects of

beaver ecology by constructing BDAs on private lands of Muddy Creek, and to compare conditions in Muddy Creek to those in Coyote Gulch that were not treated with BDAs. Conditions monitored included fish assemblages/populations, riparian vegetation, channel morphology, and stream temperature.

Crews constructed 18 BDAs in Muddy Creek along approximately 0.5 miles of the Muddy Creek floodplain (~1 mile of stream channel) in June 2020 and collected pre construction data on both the control (Coyote Gulch) and treatment reaches (Muddy Creek) to evaluate changes in upcoming years. The study reach was revisited in June 2021. Two additional BDAs were constructed, longitudinal profiles and cross sections were resurveyed, and 2020 BDAs were maintained. Some beaver colonization of BDAs was noted. While surveyed channel changes are minimal after the passing of just one year, partners will continue to track ongoing changes in channel slope and cross section, riparian community adjustments and stream temperatures associated with BDA construction. Partners included USFWS Partners Program, BTNF, and the Rolling Thunder Ranch.



Figure 59. *Luke Schultz surveys stream bed elevations at the Muddy Creek BDA control reach.*

Swift Creek Channel Restoration (Goal 2) - Anna Senecal



Figure 60. *Planting willow poles on Swift Creek using a power drill.*

Swift Creek is a first order tributary to the Salt River which flows through Afton, Wyoming. Few Salt River tributaries have suitable temperature and hydrologic regimes to support trout spawning. Those that do are prioritized for protection and enhancement. Swift Creek is an example of such an opportunity. However, the creek is degraded by human activities, namely dewatering, channelization and riparian conversion. As a result, the creek is highly unstable with massive bank erosion and channel avulsions. Restoration of the creek was pursued to safeguard existing cutthroat trout spawning habitat, while demonstrating appropriate river restoration, enhancement and bank stabilization techniques.

The restoration of Swift Creek was initiated in 2017. Construction began in 2020 and concluded in 2021, to be followed by at least three years of monitoring by TU

with grant funds from WGFD. Additional partners include large contributions from NRCS, WWNRT, WYDEQ, USFWS, and others.

The stream restoration design was developed by Greenwater Restoration LLC. Construction took place during the fall and winter of 2020-2021. Aquaterra performed the in-channel work, structures and fine grading. Avail Construction performed coarse channel excavation and floodplain grading. The upstream 2,687 feet of channel were fixed in place through the construction of bankfull benches, grade control and stable cross sectional geometry. The downstream 2,402 feet of stream were realigned to reconnect the floodplain and maximize interactions between the new stream channel and existing scrub shrub wetland vegetation types on the landscape. Rock and cottonwoods were used for bank stability in the upstream reach which is typically dewatered during the irrigation season. The downstream reach incorporates extensive toewood and log vanes and willow plantings as this section of Swift Creek receives perennial flow as a result of sub irrigation return flows elevating the water table. The majority of work was completed prior to 2021 runoff, but the group decided to keep the water in the old, straightened, incised channel to allow for one complete growing season to stabilize the newly-constructed channel. Given low water conditions and newly-planted benches requiring water, the channels were connected in late May 2021.

In spring 2021, landowners finalized enclosure fencing pursuant to NRCS grazing management requirements. Partners and volunteers harvested and planted willow poles on riparian benches throughout the lower project reach, and currants and woods rose containerized plants on terraces. The newly constructed and vegetated stream channel will be rested for three years.

Teton County Aquatic Crossing Prioritization (Goal 3) - Anna Senecal



Figure 61. *Cabin Creek, the highest passage priority in Teton County, features an undersized concrete culvert.*

WGFD collected data at every accessible water crossing on private or County-owned or managed lands in Teton County. Following data collection and information dissemination, WGFD assisted stakeholders with site ranking. Ranking criteria took a number of factors into consideration. Metrics considered included miles of habitat upstream of the barrier, relative abundance of brook trout, modeled stream temperature, an index of relative cost and local conservation value. Local conservation value is a subjective category that captures the social relevance, project history, and agency and community momentum behind a given project. Metric values were assigned scores that were summed to compute composite rank. The highest composite rank score corresponds to the highest priority project, based on the metrics assessed.

Site ranking identified three sites to be considered by Teton County for fish passage improvements: 1) The Highway 89 crossing at Cabin Creek; 2) Boyles Hill Road crossing at Crane Creek; and 3) Wilson-Fall Creek Road crossing at Taylor Creek. Summaries of the ranking process and site details have been provided to Trout Unlimited to present to Teton County and stakeholders. This information may be used by Teton County to develop a request for proposal soliciting bids for site design.

Munger Mountain II Conservation Easement (Goal 1) - Lands Branch

Administration

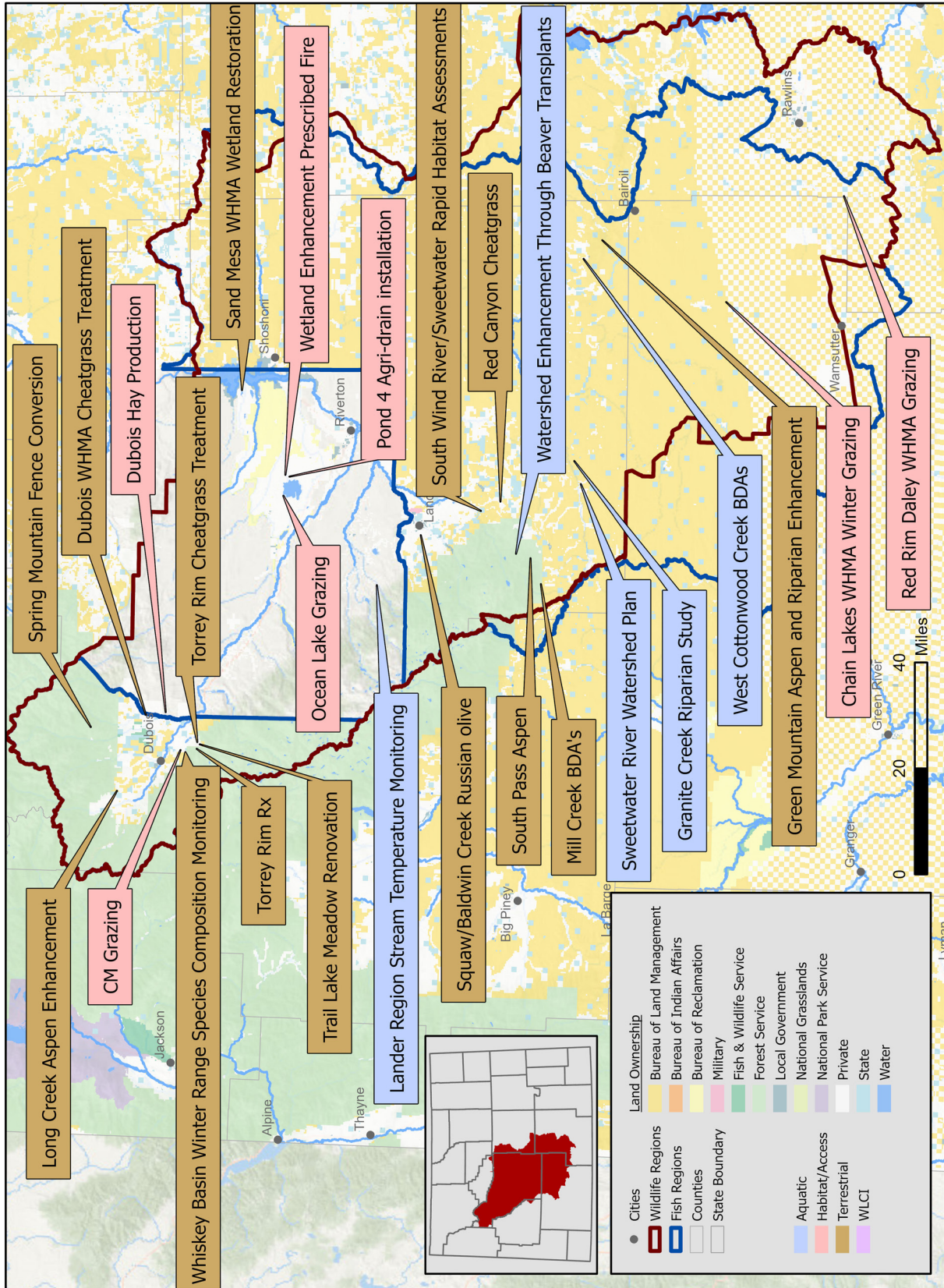
Consisting of forest and ranch lands near the Town of Jackson, the Munger Mountain II Conservation Easement is located along the Snake River and together, with other adjacent conserved lands, forms a corridor connecting the Wyoming Game and Fish South Park WHMA and the Bridger-Teton Nation-

al Forest. The easement conserves crucial habitat for elk, moose, and bald eagles as well as valuable habitat for grizzly bear, gray wolves, and 58 species listed by as Wyoming SGCN. The easement consists of 148.9 acres and is adjacent to Munger Mountain I Conservation Easement, also held by the Department. The Lands Branch worked in partnership with The Conservation Fund, OSLI, Forestry Division, USFS, and The Jackson Hole Land Trust.



Figure 62. *Munger Mountain II Conservation Easement.*

Lander Region



Chain Lakes Winter Grazing (Goals 1 and 3) - Brian Parker and Matthew Pollock

Chain Lakes WHMA is located 32 miles northwest of Rawlins in the Red Desert and is the largest WHMA in the State, containing 62,000 acres. Chain Lakes is grazed in the winter with sheep to remove decadent herbaceous material without adversely impacting overall wildlife habitat conditions. Improve plant vigor and vegetative growth by removing decadent herbaceous material and reducing plant competition and improving plant regrowth and reseeding through hoof action and fertilization from the animal's elimination processes.

Dubois Hay Production (Goal 1) - Brian Parker, Miles Proctor, and Kevin Howard

The Dubois hay operation allows WGFD to generate hay for use at elk feedgrounds, while simultaneously providing supplemental winter forage for elk in the Dubois area. In 2021, the Dubois crew put up 600 tons of hay on Spence and Moriarity WMA and Whiskey Basin WHMA for use on the feedgrounds in Jackson and Pinedale. Every year, more hay is produced and re-farmed fields come into production and are certified weed free.

Dubois Highway 26 Wildlife Crossings Phase II (Goal 3) - Daryl Lutz



Figure 63. *Rendering of the proposed overpass at mile post 59.5 on US Highway 26.*

Roadways and wildlife are both extraordinarily important to Wyoming. However, there are many cases where roadways and wildlife have negative interactions resulting in significant wildlife mortality, partial to complete barriers that impede wildlife migrations or seasonal movements and hazards for traveling motorists. Mule deer migrations in the Dubois area are infamous with thousands of deer descending onto their winter range in the upper Wind River Valley and the Wind River Reservation and around U.S. Highway 26. During winter, deer move across the highway daily. As a result there are at least hundreds of deer hit on the highway during the peak of migration and throughout the winter. Bighorn sheep frequent the highway right-of-way throughout the year but more frequently during the winter months. Elk and moose

are also a concern as they move across the highway. Other species including grizzly bears frequent the roadway with at least one mortality in the past few years.

This phase of the project evaluated and identified effective mitigation strategies to reduce WVCs and maintain or enhance habitat connectivity along an approximate 33-mile long segment (about milepost 40 to 73) of U.S. Highway 26. This section of highway has been identified as a statewide priority for addressing WVCs, particularly with mule deer. The outcome of this work was the completion of the mitigation strategy detailing site specific recommendations to reduce WVCs and maintain migration and habitat connectivity. Recommendations are based on the best-available science, data and information on WVC reduction strategies. This is phase II of the plan to address WVC on this stretch of highway. Phase 1 was the purchase and deployment of VMS completed in 2019/2020. This planning effort included considerable public interest and input in the Dubois, Riverton, Lander, and Jackson communities and is a collaborative effort between WGFD, WYDOT, USFS, BLM, USFWS, Wind River Reservation, and various NGOs.

Phase III will be fund raising and initiation of strategy implementation. The highest priority is the construction of a comprehensive system of 3 underpasses and 1 overpass in Segment 6 from the Longhorn

Ranch to the Military Vehicles Museum (mile post 58-64.5). In addition to the under and overpasses, this system includes wildlife guide fencing and maintaining/improving existing crossing structures. A high level cost-benefit analysis demonstrates that the cost of this comprehensive system would be realized within 27-29 years; the lifespan of these structures is at least 75 years.

Dubois WHMA Cheatgrass Treatment (Goal 2) - Amy Anderson

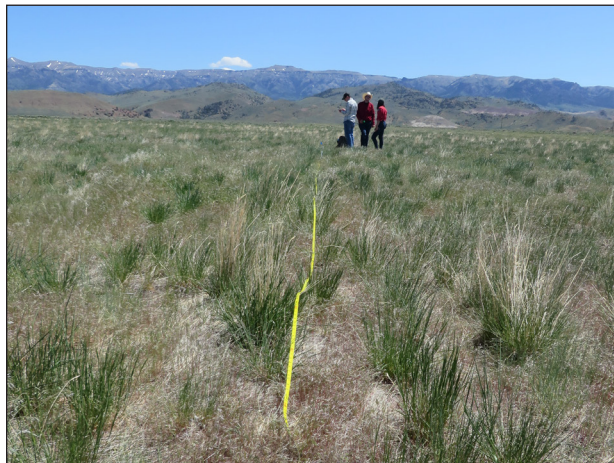


Figure 64. Cheatgrass on the Spence-Moriarity WMA before treatment.

The 2021 treatments in the Dubois WHMAs included a 250 acre aerial application of Rejuvra adjacent to Duncan Bench (which was treated in 2020), and re-treating all roadside areas with Plateau or Rejuvra, depending on the proximity to the road and how far the booms could reach with the Plateau. Cheatgrass was also treated using ground based treatment methods in Byrd Draw and an area adjacent to Ring Lake, where aerial application was not practical. Other invasive species treatments continued as in previous years, including the oxeye daisy treatments in the Wiggins Fork. Funding partners include the Fremont County Weed and Pest and NFWF.

Dubois WHMA Production and Utilization (Goal 1) - Amy Anderson

Annual Production and Utilization transects on Dubois bighorn sheep and elk Winter Range sites have been measured since the WGF D began managing the Whiskey Basin WHMA, Inberg-Roy WHMA, and Spence-Moriarity WMA. Some of the data goes back to the mid-1940's (Whiskey Basin WHMA). Despite much of the Lander Region, and much of the state, reporting drought conditions and low precipitation, the Dubois area appears to have received near normal precipitation through the 2021 growing season. Despite this, forage production was lower than previous years, and continued in a downward trend which started in 2019. This may be attributed, at least in part, to the timing of the precipitation. April and July were wetter months, but low precipitation was recorded in May and June, which are usually wetter months. Utilization of forage on both Whiskey Basin, Inberg-Roy, and Spence-Moriarity remains within allowable levels at less than 60% use across all sites.

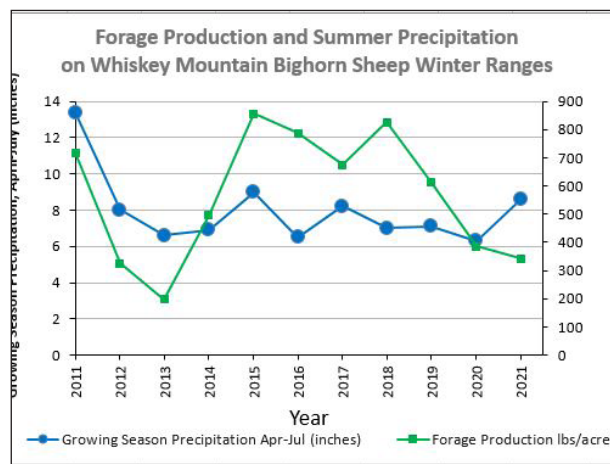


Figure 65. Whiskey Basin WHMA forage production and precipitation.

Antelope Hills: Lower Granite Creek Surveys (Goal 2) - Joanna Harter

The Antelope Hills region of the upper Sweetwater River watershed has suffered degradation resulting in headcuts, hummocks, and stream channelization. These conditions have increased erosion and reduced water-storage capacity and overall hydrologic function of this arid and sensitive ecosystem. In 2015, the Lander Regional BLM Field Office and State Office began the Sweetwater Sub-basin Riparian Climate Resilience Project. This is a multi-agency effort to evaluate the effectiveness of using

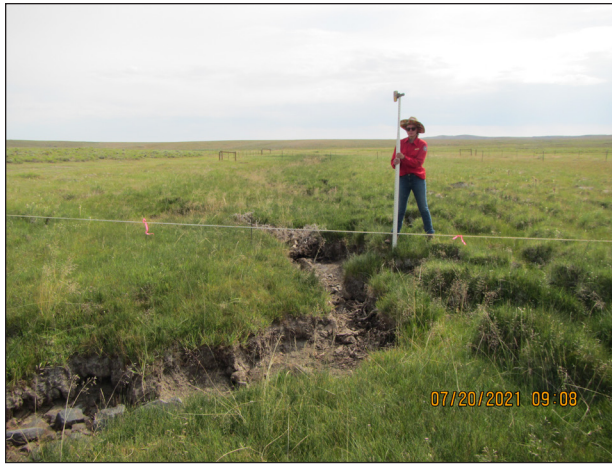


Figure 66. *Surveying changes in Granite Creek to document changes in floodplain connectivity.*

fencing and sagebrush cuttings under continued grazing to stabilize the existing incised channel in Granite Creek, a tributary of the Sweetwater River, and capture sediment to improve floodplain connectivity, riparian vegetation, and water storage. Granite Creek is fed by a series of springs located on both private and BLM lands within the Antelope Hills Livestock Grazing Allotment. Erosion within the riparian system has resulted in an incised channel and headcutting toward the spring source. In 2015, sagebrush cuttings were installed and secured in the incised channel with small wooden stakes. Cattle exclusions were also constructed around some of them to study the effects of no treatment, sagebrush structures alone, cattle exclusion alone, and sagebrush structures and cattle exclusion combined.

In 2021 the BLM collected data on surface roughness to document change in hummocks and vegetation cover and composition. Prior to the installation of structures and fencing, WGFD conducted detailed geomorphic surveys on eight cross sections along Granite Creek in June 2015 to document pre-treatment conditions. These same eight cross sections were re-surveyed in 2021 to document change in the stream channel and floodplain connectivity post-treatment. This was the first data collection post-treatment, part of a 20-year study of the effect of these habitat treatments on channel incision, riparian vegetation, and the ability of the system to sustainably handle the higher and more erratic stream flows expected under climate change. Initial data analysis indicates that creeks with grazing exclusion and sagebrush structures captured more sediment and showed signs of recovery.

Green Mountain Aspen and Riparian Enhancement (Goal 2) - Amy Anderson

Work on Green Mountain in 2021 focused on private lands within the Willow Creek drainage on the eastern side of the mountain. Conifers were cut from riparian areas and aspen stands using chainsaw crews from Summitt Forests Inc. A total of 136 acres of treatment was conducted within two private ranches on Willow Creek. In addition, an increase in beaver activity in Willow Creek will help aspen and willow regeneration.

Treatments on BLM lands resumed in 2021, with 156 acres of conifer removal from aspen stands occurring near the top of Green Mountain, adjacent to Sagebrush Park. In total, 308 acres were treated in 2021. Both BLM and private land treatments will continue in 2022. Partnerships with WSF and Fremont County Fire Protection District have proven very helpful in completing treatments on private and state land. Funding partners include the BLM, WWNRT, WGFD MDI, and Fremont County Fire Protection.



Figure 67. *Beaver activity in Willow Creek will improve aspen and willow stand vigor.*

Stream Temperature Monitoring (Goal 1) - Joanna Harter

From 2020 through 2021, nine water temperature loggers were deployed at established monitoring sites



Figure 68. *Placement of temperature logger in Torrey Creek.*

in streams in the Upper and Middle Popo Agie, Little Popo Agie, Sweetwater, Upper Wind, and East Fork Wind watersheds. Data were recorded every 30 minutes and downloaded from all nine loggers. These data will be used to calculate a suite of metrics to describe each stream's thermal regime (the magnitude, frequency, variation, and timing of temperature events). Stream temperature data have been collected at these established sites for 3-21 years to inform stream habitat and fish management decisions and to share with USGS scientists.

Long Creek/Dunoir Valley/Wiggins Fork Aspen Enhancement (Goal 2) - Amy Anderson

Through a partnership approach to managing important habitats for mule deer, elk and other iconic wildlife, the WGFD, Shoshone National Forest, and WSF are implementing a series of strategic projects that use active vegetation management to enhance ungulate populations, habitat and hunting opportunity in the Long Creek Watershed. The project is using thinning, prescribed fire and restoration of aspen to restore early seral habitats. Use of commercial timber harvest to thin overstocked stands, remove beetle kill and reduce the threat of landscape-scale wildfire will complement the activities. The project has implemented a multi-year plan informed by the best available science, including emerging mule deer migration information from research being conducted on the Shoshone National Forest. A total of 870 acres of aspen enhancement has occurred in the Long Creek watershed since 2015.



Figure 69. *Bench Creek state land aspen before conifer removal. Mechanical conifer removal will be initiated in summer 2022.*

In 2021, activities included mostly planning and coordination for the Long Creek/Dunoir Valley/Wiggins Fork Aspen Project. Field tours were conducted on private, state, BLM and USFS land to determine scope and need for forest enhancement work both for the benefit of wildlife and for reducing the risk of catastrophic wildfire. Fundraising was initiated, as well as preliminary NEPA and clearance efforts. Implementation will begin on state land on Bench Creek, and USFS land on the Wiggins Fork in summer 2022.

Mill Creek BDAs Phase II (Goal 2) - Amy Anderson and Joanna Harter

In conjunction with continued conifer removal from aspen in the Pine Creek/Mill Creek area, the Shoshone National Forest and WGFD installed 10 additional BDAs in Mill Creek to hold water and help aspen to sucker due to increased moisture availability. The hope is to eventually reintroduce beaver to this area once aspen communities are improved and able to support beaver colonies. The Shoshone



Figure 70. *Installation of BDA's on Mill Creek.*

National Forest and WGFD are also working with the BLM to address boundary fence issues. Trees have fallen across the fence creating large gaps through which trespass cattle pass uninhibited. Gates are regularly left open by recreationists and others. These issues are being addressed jointly to protect our investment in the watershed enhancement activities in this area. A total of 20 BDAs are working to improve water holding capacity and riparian vegetation on Mill Creek as part of the South Pass Aspen Enhancement Project. Funding was provided by WFW.

Spence and Moriarity WMA Noxious Weed Management (Goals 1 and 3) - Brian Parker, Miles Proctor, and Kevin Howard

Rocky Mountain Agronomy Center applied herbicide across irrigated meadows on Spence and Moriarity WMA to control noxious weeds, largely white-top and Canada thistle, in early June and July. Additionally, Fremont County Weed and Pest sprayed a variety of noxious weed species on irrigated meadows and rangeland starting in July and continuing through fall 2021. Habitat and Access personnel also dedicated substantial contract personnel time to noxious weed control. Every year, more of the hayfields become weed free certified so it can be used on the elk feedgrounds.

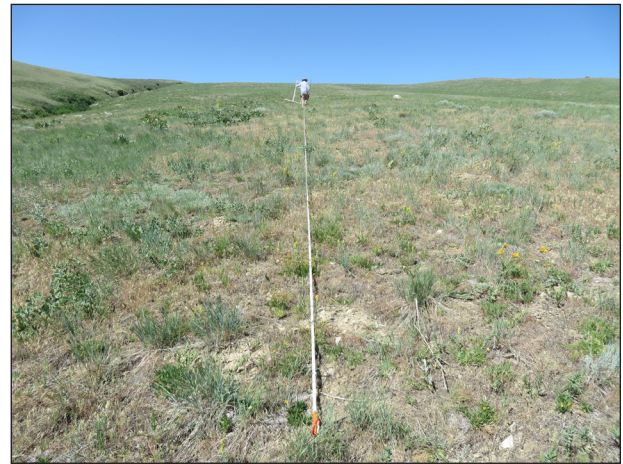


Figure 71. *Annual monitoring of cheatgrass treatments showed need for re-treatment in 2021.*

Ocean Lake WHMA Grazing (Goals 1 and 2) - Brian Parker and Justin Rhine

Approximately 260 AUMs were utilized on Ocean Lake WHMA in order to remove decadent vegetation and promote vigor and palatability of meadow vegetation to benefit waterfowl and pheasants. Grazing occurs during January on a five-year grazing rotation.

Ocean Lake Agri-drain Installation on Pond 4 (Goal 1) - Justin Rhine, Kade Clark, and Mac Foes

An agricultural drain was installed on pond 4 of the Ocean Lake WHMA to replace a dilapidated structure, and allow better control of pond water level. Pond 4 is a roughly 270 acre pond that is habitat for migratory birds, as well as colonial shore birds. With this new Agri-drain, the WGFD will be able to control the wetlands to provide food for waterfowl and more hunting opportunities.

Red Canyon Cheatgrass Re-Treatment (Goal 2) - Amy Anderson

In 2021, WGFD in partnership with Fremont County Weed and Pest District conducted an aerial re-treatment of 802 acres in Red Canyon WHMA. The treatment included the use of Indaziflam (Re-

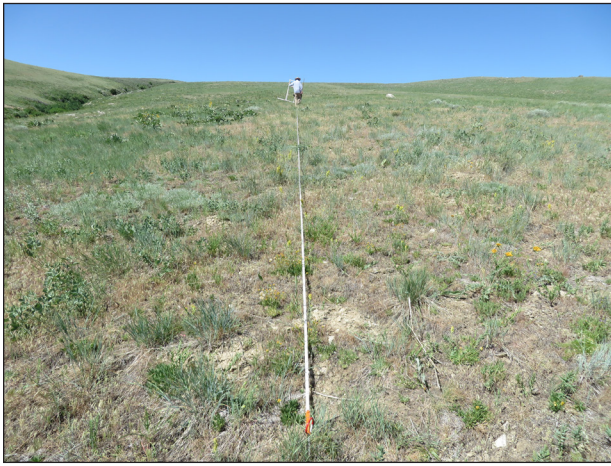


Figure 72. Annual monitoring of cheatgrass treatments showed need for re-treatment in 2021.

juvra) herbicide, a chemical designed to increase the years of control of cheatgrass to reduce the amount of viable seed in the soil. In most areas of Wyoming, Indaziflam controls germination of cheatgrass seed for up to four years. Annual monitoring will determine whether this is the case on Red Canyon.

Hammond Helicopters conducted the application of herbicide in early July 2021. Rejuvra was applied at a rate of 5 oz per acre. Re-treatment will be planned again in either 2024 or 2025, pending results of annual monitoring transects.

Red Rim Daley Grazing (Goal 1) - Brian Parker and Matthew Pollock

Red Rim-Daley WHMA is comprised of OS LI, BLM, and WGFC-owned property. Two operators annually graze the Red Rim - Daley WHMA, collectively consuming approximately 1,650 AUMs. Rotational grazing allows for optimal plant development and rangeland health, both on the WHMA and on rested pastures outside the boundaries of the WHMA that are important wildlife habitats. The grazing lessees also perform fence maintenance, water well maintenance, and other infrastructure improvements and maintenance, as well as deferring grazing on their private ground in exchange for grazing on the WHMA.

Sand Mesa Wetland Restoration (Goal 2) - Brian Parker, Justin Rhine, and Noelle Smith

This project, in cooperation with DU, occurred on Sand Mesa WHMA located 25 miles northwest of Shoshoni. These wetlands had become stagnant and non-functional. A contractor restored two existing reservoirs by replacing water control structures and adding an armored spillway to one of them (see Figure 73). Work was done on these dams to improve their function and comply with safety of dam regulations. Additionally, three shallow water wetlands were created between the two reservoirs. These shallow water wetlands took advantage of old embankments that had been breached, these embank-



Figure 73. Sand Mesa Wetland before (left) and during (right) construction.

ments were re-contoured and had water control structures added to each. Improved water delivery to the upstream reservoir was completed by cleaning out a new delivery ditch to get available water delivered more directly to this first reservoir. DU partnered with the WGFD to lead this project, with support from WWNRT, North American Wetlands Conservation Act, WGBGLC, and WFW.

South Pass Aspen (Goal 2) - Amy Anderson



Figure 74. *Loop Road USFS unit before treatment.*

Project to include private land treatments to both benefit wildlife and create natural fire breaks surrounding private inholdings, protecting them from catastrophic wildfire. Fremont County Fire Protection District and Wyoming State Forestry helped make contact with the Broken Anvil Ranch, and 60 acres in treatments were implemented in the headwaters of Twin Creek. These treatments will continue in 2022-2023. The total treatment acreage for 2021 is 361 acres.

Follow-up monitoring has shown good response of aspen seedlings post treatment. Browsing by ungulates has been an issue with some of these treatments. BLM and USFS range staff are working together to find ways to reduce browse to protect our investment in South Pass Aspen. There has recently been some concern in areas where slash depths are exceeding 18 inches due to the large amount of material removed from the aspen stands. When slash depths exceed 18-24 inches across the treatment units, aspen response appears to be slower than in areas with less material. In future treatment areas, we plan to experiment with combinations of cutting and piling, and lop and scatter to improve aspen suckering response. Funding was provided by RMEF, USFS, WWNRT, WGFD MDI, and Fremont County Fire Protection.

Treatment continued in both Mill Creek and Gold Creek in 2021 on USFS managed lands with a total of 192 acres treated between the two areas. An additional 10 BDAs were installed on Mill Creek above the original ten to continue holding water in the drainage to encourage aspen suckering and understory herbaceous vegetation vigor. The Mill Creek/Pine Creek area is characterized by narrow drainages filled with aspen stands and vigorous understory vegetation all supported by large springs. A large diversity of wildlife use these drainages, as trail cam evidence at BDA locations shows.

Treatment also continued along the Loop Road with an additional 109 treatment acres completed. A new strategy was initiated within the South Pass Aspen



Figure 75. *Loop Road USFS unit after treatment.*

South Wind River/Sweetwater Mule Deer Initiative (Goal 2) - Amy Anderson and Stan Harter

The South Wind River/Sweetwater Mule Deer Initiative continues to be implemented across the Lander Region. Projects include: South Pass Aspen in its seventh year of implementation, Green Mountain

Aspen and Riparian Enhancement, Squaw and Baldwin Creek Russian olive removal, Red Canyon Cheatgrass re-treatment, and Mill Creek BDA's. These efforts address habitat loss associated with invasive species, fragmentation from development, encroaching conifers in aspen, sagebrush and riparian habitats, and generally degraded riparian areas. In addition to the habitat improvement projects, 52 Rapid Habitat Assessments were conducted in areas identified by Lander Region biologists and wardens. Across both herd units, 962 acres of rangeland, 667 acres of aspen, 231 acres of riparian, and 29 acres of wet meadow habitats were assessed. The RHAs will ultimately inform the South Wind River and Sweetwater Mule Deer Herd Unit Objective Reviews occurring in 2025.



Figure 76. *Green Mountain- Willow Creek Riparian Habitat Assessment.*

Wiggins Fork/East Fork Canal and Settling Pond Maintenance (Goal 1) - Miles Proctor, Kevin Howard, Kade Clark, and Mac Foss



Figure 77. *Settling pond maintenance on Spence Moriarty WMA.*

Silt and debris were removed from 25 miles of ditch on the Wiggins Fork and East Fork canals, located on the Spence and Moriarty WMA. This annual maintenance is done to ensure flow of water to WGFD irrigated lands. 2.5 acres of settling ponds were maintained; allowing silt deposition to be more localized within the irrigation system.

Spring Mountain Fence Conversion (Goal 3) - Amy Anderson and Brian Parker

Approximately 1.75 miles of four-wire barbed wire stock fence was converted to continuous panel fence. This fence line is the west boundary of Inberg/Roy WHMA. This fence line is required to exclude neighboring livestock grazing, but must be traversed by migrating elk, bighorn sheep, and mule deer. The conversion from barbed to continuous panel should help mitigate animal injury and entanglement.



Figure 78. *Inberg/Roy WHMA new and improved fence.*

Squaw/Baldwin Creek Russian Olive (Goal 2) - Amy Anderson

The Popo Agie Weed Management Association Russian olive team worked with seven private landowners along Squaw Creek in 2021 to treat 50 acres of Russian olive. The project was designed to treat tributaries within the Popo Agie Watershed to preserve native tree, shrub and herbaceous vegetation communities in the most intact areas. The intent is to continue treatments in Baldwin Creek and other tributaries prior to working on the main stem of the Popo Agie River. Funding partners include Fremont County Weed and Pest, NWTF, Popo Agie Conservation District, and WGFD Trust Fund.



Figure 79. Contractors cutting Russian olive on Squaw Creek during winter 2021.

Improving Passage of Non-Game Fishes in the Sweetwater River (Goal 3) - Joanna Harter



Figure 80. Swim tunnels used to test swimming abilities of SGCN fish at Colorado State University lab.

Two SGCN species, Iowa Darter and Bigmouth Shiner, occupy approximately 94 river miles in the Sweetwater River. Additionally, Hornyhead Chub, another SGCN and one of the rarest fish species in Wyoming, were transplanted to two locations in the Sweetwater River in 2020 and 2021 to restore their historical distribution. Thirteen irrigation diversion dams that limit fish passage and fragment habitat occur within these three fishes' distributions in the Sweetwater River. WGFD habitat biologists and the fish passage coordinator are working with landowners on developing alternatives to these structures to improve passage of the three SGCN species. In 2021, they conducted geomorphic surveys of three of the highest priority dams to begin developing alternatives. However, there is limited data on the swimming and jumping abilities of the three fish species. This information is needed to improve designs of alternatives

to existing diversion dams in the Sweetwater River and in other streams, where habitat fragmentation limits fish movement.

In 2021, WGFD funded a graduate research project in the Fish Physiological Ecology Laboratory at Colorado State University to evaluate swimming and jumping abilities of Iowa Darter, Bigmouth Shiner, and Hornyhead Chub. In 2021, the graduate student built new holding systems in the lab, prepared swim tunnels and waterfall apparatuses, and successfully collected and held Iowa Darters and Hornyhead Chub in the lab. Swimming and jumping trials will occur throughout 2022. The research project will also evaluate the swimming and jumping abilities of Brook Stickleback, an invasive fish species, to assist with the design of barriers that could prevent their expansion and negative effects on native fish

populations in Wyoming.

Rock Creek Watershed Assessment (Goals 2 and 3) - Joanna Harter

In 2020, an assessment of the Rock Creek watershed, a sub-watershed of the Sweetwater River watershed, was begun to describe stream and riparian habitat, identify major issues in the watershed, describe appropriate restoration approaches, and outline projects to improve habitat for SGCN fish and other wildlife that rely on riparian habitat. The assessment continued in 2021, focusing on tributaries on the south side of the river. In 2020 and 2021, the Wyoming Habitat Assessment Methodology was used to document current conditions along approximately 62 miles of the Sweetwater River from the US Highway 287 bridge upstream to the State Highway 28 bridge. In 2021, conditions were also documented in 41 stream miles of tributaries.



Figure 81. *A headcut draining a wet meadow tributary of the Sweetwater River.*

Throughout the Sweetwater River, excessive lateral streambank erosion is common, in addition to low density and recruitment of willow communities. These issues are likely due to both historical and ongoing land use. The Sweetwater River valley has experienced extensive human use and modification including pioneer travel along the Oregon Trail and associated livestock grazing, cultivation in the floodplain, construction of irrigation diversions and dams, and stream channel modification and sedimentation due to gold and iron mining. During assessments in both 2020 and 2021, riparian herbaceous vegetation stubble height was often near or less than 2-3 feet in the fall, sometimes up to the water's edge. Wild ungulates graze riparian vegetation and livestock and wild horses contribute additional grazing pressure to these degraded riparian communities along almost the entire length of the river. High runoff combined with reduced stability of stream banks due to degraded riparian vegetation has likely contributed to excessive bank erosion, over-widening of the channel, and channel incision.

In tributaries on the south side of the Sweetwater River, head cuts in spring-fed channels were observed draining wet meadows and reducing water storage. Relict and current beaver activity was observed in multiple tributaries. However, wildlife and livestock grazing on narrow riparian communities has limited their growth and ability to support long-term beaver colonies. Similar observations were made in north side tributaries, although the valleys tend to be wider and support larger willow communities. WGFD is already partnering with BLM and USFS on projects to address stream incision, improve riparian vegetation, and minimize wet meadow drainage in tributaries of the Rock Creek watershed. Several landowners on the Sweetwater River have also taken steps to improve riparian habitat. In subsequent years, habitat evaluations will continue in more tributaries on the north side of the river and this information will be used to develop a full watershed restoration plan and prioritize stream and riparian restoration efforts.

Torrey Rim Cheatgrass Treatment (Goal 2) - Amy Anderson

In 2020, after an invasive species survey spanning the entirety of Torrey Rim, cheatgrass was found in only one location. However, upon further inspection, the affected area actually included much of the slope running from the Whiskey Conservation Camp up to Torrey Rim itself.

With this area being a major movement corridor for bighorn sheep, it was necessary to quickly initi-



Figure 82. *Hammond Helicopters applying Rejuvra herbicide to cheatgrass infested hillside on Torrey Rim- one of the favored winter range sites for the Whiskey Basin Bighorn Sheep Herd.*

ate treatment. With assistance from Fremont County Weed and Pest District, 700 acres of treatment occurred in early July of 2021. The herbicide used is Rejuvra (Indaziflam), and it was applied aerially using a helicopter at a rate of 5 oz per acre. This is a relatively new product which should allow for up to four years of control of cheatgrass. Annual monitoring will determine when re-application of herbicide will be necessary to maintain control of cheatgrass and drastically reduce the seed source in the soil. Funding partners include WWNRT and WGFD Invasive Annual Grass fund.

Torrey Rim Rx (Goal 2) - Amy Anderson

Selective felling of timber was conducted on 181 acres in September 2021 to create fuels to carry fire throughout the larger 684 acre burn unit above Torrey Rim and up to Whiskey Mountain. After fuels have cured, the prescribed burn will occur given opportune burn windows. The projected dates are spring 2023 to burn portions of the WHMA, and spring or fall 2023 to burn in the Wilderness. Ignition is planned using both foot crews with drip torches and aerial ignition using drones and/or helicopters for more difficult terrain.

There will also be a cheatgrass and other invasive species management plan in place for this project should any invasion occur post-burn. Funding was provided by the USFS.



Figure 83. *Torrey Rim Rx- Preferred condition for bighorn sheep- farther sight distance, and increased forb and grass availability.*

Trail Lake Meadow Renovation (Goal 2) - Amy Anderson and Brian Parker

Trail Lake Meadow is a small irrigated meadow that historically provided winter habitat for mule deer and bighorn sheep in the Torrey Valley. The meadow, over time, had converted to mostly smooth brome and basin wildrye, both species that offered very little forage value to wildlife. The Whiskey Tech Committee and WGFD Habitat and Access crew conducted renovation to improve habitat value.

In early spring 2021, the Shoshone National Forest Fire and Fuels crews conducted a prescribed burn of the meadow to remove the decadent thatch of smooth brome and basin wildrye. Later that spring, WGFD contracted with Rocky Mountain Agronomy to apply herbicide to remove the regrowth of unwanted grass species, and this herbicide application was repeated in the late summer. Trail Lake Meadow will be seeded to a native and introduced grass and forb mix in early spring 2022. Irrigation pipes



will be laid out, and irrigation of the meadow will resume during summer 2022. Funding partners include the BLM, USFS, WGBGLC, and WY-WSF.

Figure 84. *USFS- Shoshone National Forest conducting a prescribed burn on Trail Lake Meadow within the Whiskey Basin WHMA.*

Living with Beaver: Solutions to Enhance Riparian and Wetland Habitat (Goal 2) - Amy Anderson and Joanna Harter

The Lander region received at least six calls in 2021 from landowners interested in assistance with beaver activity on their property. Lander habitat personnel continued to emphasize the importance of living with beaver strategies such as tree fencing, immediately and repeatedly tearing dams out of active ditches, protecting culverts, and using pond levelers to reduce flooding risk to roads. Several landowners were receptive to and successful with these actions. WGFD habitat personnel also collaborated with the City of Lander and a local group of concerned citizens to protect large cottonwood trees from beavers along a City river walk where beavers build dams and cut down trees recurrently. Individual volunteers purchased supplies and, with guidance from WGFD, fenced 29 large cottonwood trees and protected an additional 17 trees using a paint/sand mixture. This project was intended to 1) mitigate the potential negative effects on aesthetic trees of recurrent beaver activity and to 2) provide a public example of how to properly protect trees from beavers. Beavers rebuilt dams adjacent to this location in fall 2021, and the effectiveness of the tree protection will be evaluated in 2022.



Figure 85. *Beaver released in a tributary of the Sweetwater River.*

Lander habitat personnel also relocated two adult beavers to simultaneously address a recurrent nuisance issue and to improve stream and riparian habitat with beaver dams. A pair of beavers repeatedly dammed a head gate on the Middle Fork Popo Agie River. The land manager removed the dam material daily for about one month to allow the ditch to continue to function and also installed temporary fencing around important trees. These living with beaver actions helped reduce the negative effect of beaver activity until WGFD habitat personnel could trap and relocate the pair of beavers. One beaver was caught the first night traps were set and the second was caught 13 days later. The pair were transplanted to a tributary of the Sweetwater River on USFS property to maintain and enhance wetland habitat near locations where Western Toads were found in 2020.

West Cottonwood Creek BDA Monitoring (Goal 2) - Amy Anderson and Joanna Harter

The Green Mountain Riparian Enhancement is in its fifth year of monitoring following habitat manipulations. In 2017, in West Cottonwood Creek, eight BDAs were constructed to improve riparian vegetation and floodplain connectivity. This project occurred on private lands and was initiated by the private landowner who was concerned about the decline of mule deer on Green Mountain. A steel jack fence was constructed around a 700-foot long section of stream and riparian area including three of the BDAs to exclude grazing by cattle and wild horses but enable grazing by mule deer and pronghorn.

A five-year monitoring plan was completed to monitor changes in the stream channel and riparian vegetation. Detailed geomorphic surveys from before construction and five-years post-construction revealed that sediment had accumulated behind all BDAs, as intended, narrowing the over-widened stream channel and improving floodplain connectivity. Photos retaken at the same points show that stream banks became more stable over time as sediment accumulated and was later colonized by riparian vegetation. Surveys of vegetation along the streambanks (greenline) and across the riparian area (riparian transects) indicate that the plant community is increasingly composed of obligate wetland plants and rooting structure that improves bank stability. The five-year goals for these BDAs of improving riparian vegetation and floodplain connectivity have been met. A longer-term goal was to improve habitat for beaver colonization. The site still lacks adequate woody riparian vegetation to support beaver but the BDAs and steel jack fence around the upper BDAs are creating conditions conducive to recovery of woody riparian vegetation. The willow stakes that were planted in 2020 will be evaluated for survival in summer 2022 in both the unfenced and fenced areas.

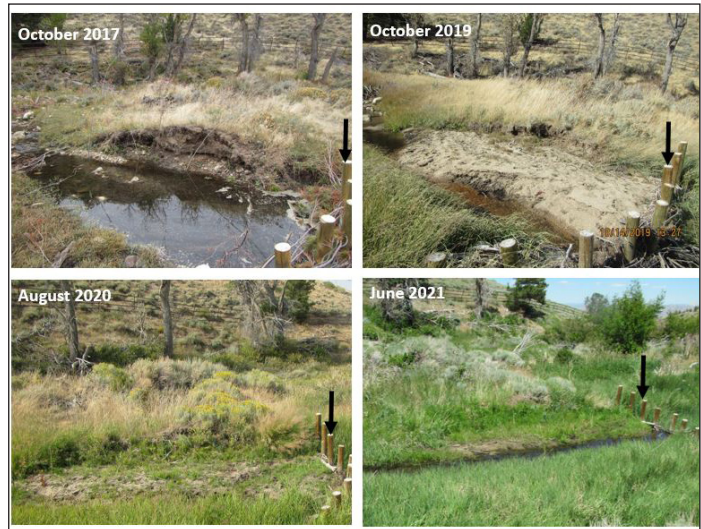


Figure 86. A BDA on West Cottonwood Creek over 5 years. The arrow points to the same post in each photo.

Ocean Lake Wetlands Prescribed Fire (Goal 2) - Brian Parker and Justin Rhine



Figure 87. Prescribed fire on wetlands at Ocean Lake WHMA.

On an annual basis, the WGFD, in cooperation with the BLM and BOR, will perform prescribed burns on wetlands within the Ocean Lake WHMA. The wetlands are drained and burned prescriptively on a rotating basis. Fire reduces cattail monocultures and increases vegetative diversity resulting in net species diversity and increased habitat structure. In 2021, Ponds 5 and 6 were burned, encompassing approximately 160 acres. This prescribed fire benefits waterfowl and upland birds.

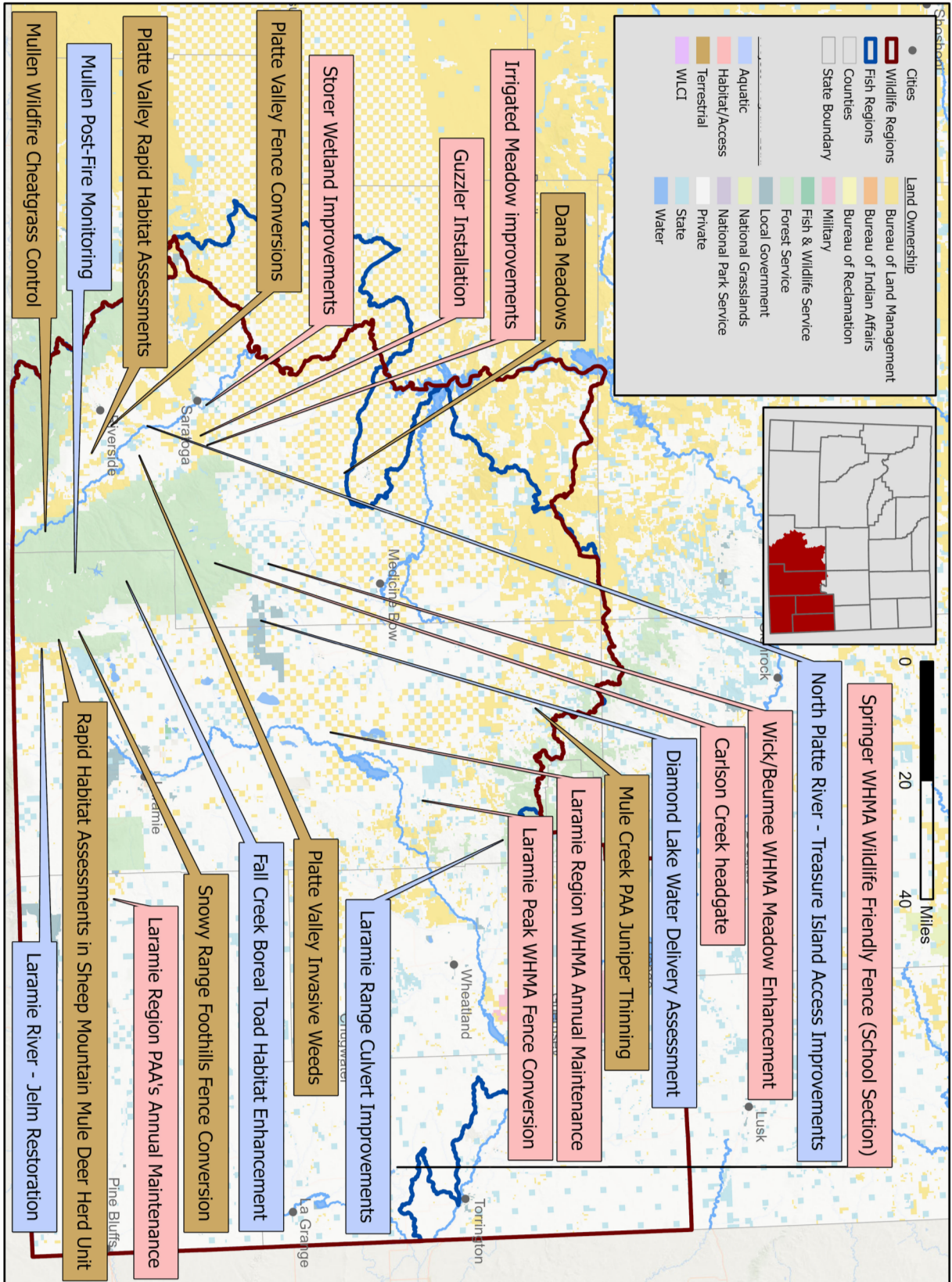
Whiskey Basin Winter Range Species Composition Monitoring (Goal 2) - Amy Anderson and Greg Anderson

On June 16, 2021, the Whiskey Basin Tech Committee, along with a team of volunteers from BLM, USFS, and WGF D conducted eight transects across known winter use areas for the Whiskey Basin Bighorn Sheep Herd. Transects included compiling a plant species inventory, line-point intercept, gap intercept for tracking shrub and sub-shrub canopy cover. The data collected was loosely compared to past data despite differences in collection methods and collection time frames. Moving forward, using the new protocol, it will be easier to collect the data and to compare changes to species composition.



Figure 88. *Data collection on Torrey Rim.*

Laramie Region



Carlson Creek Diversion Structure and Headgate Replacement (Goals 1 and 3) - Jerry Cowles, Mac Foos, and Todd Grosskopf



Figure 89. Carlson creek diversion.

Carlson creek is the initial water source that feeds the Heward pipeline, and contributes water to almost 1,000 irrigated acres on the Wick/Beumee WHMA; which is crucial ungulate Winter Range. In summer 2021, a new concrete diversion was poured that allows for better fish passage for spawning Brook Trout. A larger headgate was also installed to increase usage of 1904 appropriated water rights. Large rock ramps were constructed above and below the structure, to reduce erosion, silt deposition, and to manipulate stream grade for fish passage. Additionally, 1.7 miles of ditch were cleaned and improved below the structure to insure unimpeded flow of water downstream.

Dana Meadows Fence Conversions (Goal 2) - Ryan Amundson and Jim Wasseen

This project is in response to a recent wildfire that burned 14,000 acres of crucial habitat and sage-grouse core area. The BLM is planting 3,000 sagebrush seedlings to reduce wind erosion in various places throughout the fire scar. Many of the fences were also affected by the wildfire. The ranch owner and lessee want to convert many of the woven wire fences to wildlife friendly fences to improve migration for antelope, mule deer, and elk, as well as aid in livestock management. Livestock grazing has been deferred for two years while the vegetation is re-established. The new fences along with two new stock tanks and pipelines will aid the ranch and lessee with the deferment and play an integral role in future rotational grazing systems.



Figure 90. Wildlife friendly fencing on Dana Meadows Ranch.

In fall 2021, the Medicine Bow Conservation District, working with their partners, replaced approximately ten miles of woven wire/barbed combination fence with a wildlife friendly four-wire fence (three barbed, one smooth) on Dana Meadows Ranch's deeded lands. All fences have been marked with reflectors to improve visibility for sage-grouse and assist big game with navigating fences. In addition to the newly replaced fence, 1.07 miles of existing fence has been removed and will not be replaced. The WYDOT has rebuilt approximately seven miles of fence along Highways 72 and 287, converting from woven wire/barbed to five-wire barbed fence. Funding was provided by private landowners, US-FWS Private Lands Program, WLCI, and WGFD MDI.

Diamond Lake Water (Goal 1) - Jerry Cowles and Del Lobb

The WGFD and Wheatland Irrigation District formed a partnership to provide Diamond Lake water each year if it's available. Since 2018, approximately 1,000 acre foot of water has been filling the lake each year along with stocking Rainbow Trout in 2016, Bonneville Cutthroat, Yellowstone Cutthroat, Snake River Cutthroat, and Brook Trout. Water delivery in 2021 to Diamond Lake began on June 3 and ended on June 28. Prior to initiation of water delivery, WGFD installed a datalogger to monitor water



Figure 91. *Diamond Lake near full elevation on June 28.*

level (stage) every 15 minutes in a stilling well adjacent to the water delivery channel. WGFD measured flow in the channel on three occasions. Measured flows ranged from 7.7 to 19 cfs. A stage-discharge relationship was calculated to convert stage readings to 15-minute discharge estimates, which were used to calculate a total of 674 acre-feet of water delivered to the lake. Wheatland Irrigation District and WGFD agreed that the District delivered 600 acre-feet of water, which WGFD purchased at \$100 per acre-feet for a total of \$60,000. The lake level was raised 2.3 feet, reaching the maximum allowed elevation of 7,352 feet. Diamond Lake continues to provide quality angling opportunities for a variety of fish.

Encampment River Bighorn Sheep Research (Goal 3) - Britt Burdett and Teal Cufaude

Over four winters (2017-18, 2018-19, 2019-20, 2020-21) four helicopter/net-gun capture and collar efforts have occurred in the Encampment River bighorn sheep herd unit. As of February 2022, there were 19 collared bighorn sheep within this herd. These collared sheep will be monitored until November 2023. The original purpose of this work was to provide a credible estimate of the number of bighorn sheep that utilize winter range in this herd unit. Additionally, a full array of disease samples were collected from captured bighorn sheep as part of a statewide disease surveillance effort.



Figure 92. *Bighorn sheep ewe mortality in 2021.*

Since the original capture effort, the objectives for this work have evolved. Fine-scale movement data collected from the GPS collars will help managers to understand the movements of this herd, and to delineate the habitats these bighorn sheep select. Managers will use these data to determine high-use ranges and movement routes and to quantify the habitat attributes that might limit the expansion of this herd. This work may also provide insights on habitat components that are important to the resilience and expansion of other small, isolated bighorn sheep herds across the state. From location data collected thus far, it appears the bighorn sheep are using an approximately 12.8 square mile area in shrub-dominated slopes within the Encampment River drainage and avoiding dense conifer stands. Coarse, qualitative habitat analyses show that bighorn sheep movement seems to be constrained by habitat type and Highway 70, despite the availability of suitable habitat to the northwest and southeast of their current area of use.

In 2021, over 3,500 locations were collected on the collared Encampment River bighorn sheep. One bighorn sheep died on 5/4/2021. Game and Fish personnel were able to collect the carcass and submit it to the WGFD Wildlife Disease Laboratory. The cause of death was determined to be disease. Funding for this project was provided by WGBGLC.

Fall Creek Boreal Toad Habitat Enhancement (Goal 2) - Christina Barrineau



Figure 93. USFS and WGF D personnel standing in remnant beaver pond habitat used by Boreal Toad for breeding.

The Fall Creek Boreal Toad habitat enhancement seeks to maintain beaver pond habitat used by the toads for breeding. Fall Creek is located in the Medicine Bow Mountains. Without active beaver, remnant beaver ponds will continue to fill with sediment and vegetation and render the area unsuitable for Boreal Toad breeding. Additionally, willow species in the drainage are severely browsed and lack height needed for beaver dam and lodge building materials. To bridge the gap between existing and optimal Fall Creek beaver habitat conditions, BDAs are proposed to mimic beaver pond habitat. The BDAs will maintain water depths necessary for Boreal Toad breeding. Efforts to boost willow recruitment will also be explored.

In 2021, the Laramie Aquatic Habitat Biologist surveyed a toad breeding reach for channel profile and dimensions. The survey data will be used for design and permitting. Several meetings were also held with the WGF D Herpetological Coordinator and USFS personnel. The group worked on BDA implementation plans and willow recruitment ideas. BDAs are expected to be installed in a short reach of Fall Creek in summer/fall 2022. The Laramie Aquatic Habitat Biologist will assist the USFS with permitting and NEPA requirements. Dormant willow sprigging of less palatable species will also take place in the fall.

Ferris-Seminole Bighorn Sheep Research (Goal 3) - Britt Burdett, Teal Cufaude, and Greg Hiatt

Pedro Mountain has provided a buffer between bighorn sheep occupying the Seminole and Bennett mountains in the Ferris-Seminole bighorn sheep herd unit from domestic sheep that graze on Canyon Creek just to the north of Pedro Mountain. This may have changed as a result of the Pedro Mountain fire that was started by a lightning strike in August 2019. The fire consumed an estimated 23,408 acres and essentially all of the mountain and much of the sagebrush/grasslands surrounding the foothills of the mountain were burned either by the wildfire or by back-burns lit to contain the fire. It is believed the vegetative change due to the fire will result in suitable bighorn sheep habitat and may become enticing to Ferris-Seminole bighorn sheep - particularly those sheep in the Miracle Mile area. Immediately post-fire, WGF D wildlife managers discussed methods to monitor bighorn sheep movements out of the Ferris-Seminole herd unit to the newly burned areas. It was determined that the most effective method to monitor bighorn sheep movements was to capture and collar several ewes and rams in the Miracle Mile area. In February 2020, ten bighorn sheep (four rams and six ewes) in the Miracle Mile area were collared to monitor movements. Each day, wildlife managers receive four

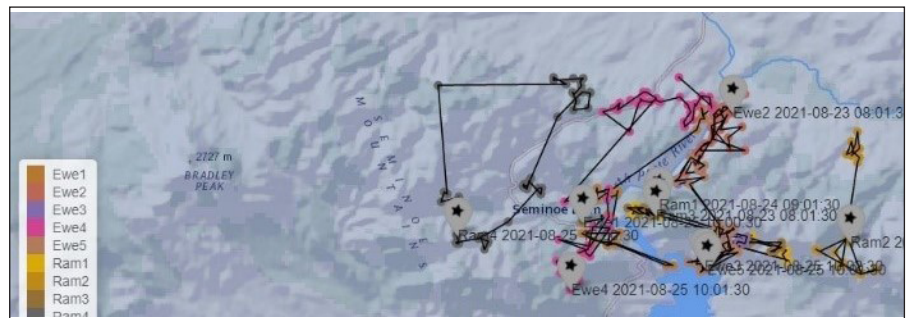


Figure 94. Example map showing Ferris-Seminole bighorn sheep movements in relation to herd unit boundary.

locations for each collared animal. To date, no collared animals have crossed the herd unit boundary. These collars will be deployed through 2022.

The Pedro Mountain area is just now becoming re-vegetated, so wildlife managers are interested in continuing to monitor bighorn sheep in the Miracle Mile area and Bennett Mountains. The goal of Phase 2 of this project is to continue to monitor movements of bighorn sheep in the Ferris-Seminole herd unit through 2024 and allow for immediate management response if any of the collared bighorn sheep wander outside of the herd unit to Pedro Mountain and come within close proximity to domestic sheep. In early 2022, WGFD will capture and disease test bighorn sheep in the Ferris-Seminole herd unit in anticipation of being a transplant recipient herd making this an opportune time to deploy ten additional collars.

The data gathered from these collar efforts will be primarily used to monitor movements outside the herd unit boundaries, but could also be used to evaluate bighorn sheep habitat use in the Ferris-Seminole herd unit. Additionally, managers will use collared animal data to help evaluate annual trend flight results and better estimate the population of this herd. Funding was provided by WGBGLC.

South Guzzler Replacement (Goal 2) - Mark Cufaude



Figure 95. *New guzzler for wildlife on Pennock Mountain WHMA.*

A non-functional guzzler on the Pennock WHMA was replaced with a 500 gallon rain maker guzzler with rain apron. The existing guzzler was a saucer style fiberglass design that had cracked and was no longer holding water. The new guzzler will supply water for sage-grouse and other wildlife.

Forb/Legume Seeding (Goal 1) - Mark Cufaude

A dormant forb and legume seeding of 110 acres was completed in all irrigated meadows on Pennock WHMA. The goal is to provide a diverse and nutritious forage base throughout all seasons for the suite of wildlife species on the WHMA.



Figure 96. *Drilling seed.*

Laramie Peak Bighorn Sheep Disease Surveillance (Goal 3) - Ryan Amundson and Martin Hicks

This project is part of the statewide bighorn sheep disease surveillance effort, to garner baseline information on the various pathogens within our state's wild sheep populations as well as identify seasonal movement patterns, crucial winter range, habitat selection, lambing areas, cause specific mortality and survival estimates. We are concerned with the identification of pneumonia related die-offs in the area in the last three years. In total, there are 22 collars online and transmitting locations currently in this herd. Funding partners include WGBGLC and WWSF.



Figure 97. Collared bighorn sheep in Sybille Canyon.

Laramie Peak WHMA Fence Conversion (Goals 1 and 3) - Jerry Cowles and Micah Morris

This first phase of the project will replace ten miles of dilapidated, woven wire sheep fence with a combination of five and six strand barb/smooth wire standing along the boundary fence. The new wildlife friendly fence consists of one smooth wire with three barbed, all metal T-posts, and H-braces constructed out of drill stem pipe that will last more than 30 years. Several high use wildlife trails will include 30-foot wire gates that will be left open when livestock are not present. The previous fence covered a significant number of big game mortalities due to the lack of crossings and limited wild ungulate access to key shrub communities within the property.

During 2021, the contractor and WGFD removed and converted 3.5 miles of fence to improve the movement of wildlife across the landscape, and reduce future maintenance activities. This phase is anticipated to be completed by fall 2023.

Laramie Range Culvert Improvements (Goal 3) - Nick Scribner

A total of 31 sites were inventoried for fish passage in 2019 and 2020 in the Laramie Range with a focus on the North Laramie drainage. Nine of those sites were irrigation diversions while the rest were road crossings. Several of the road crossings were documented to negatively impact fish passage at various levels due to culvert outlet drop, high velocities, and low water depths. Many of the culverts were in satisfactory condition and unlikely to be replaced soon except for a triple barrel culvert on Cottonwood Creek that was replaced with a bridge by Platte County in 2020/2021. Eight culverts that impacted fish passage were improved in fall 2021 with the installation of rubber baffles. These baffles were two or three feet long by six inches high and conformed to the culvert shape with the use of several metal anchors. The culvert diameter ranged from three to seven feet with six concrete and two metal culverts. Velocity



Figure 98. After baffle installation.

and depth measurements were taken in the four larger culverts where gear would fit. Velocities were reduced an average of 81% from 3.3 feet/s to 0.7 feet/s and depths increased two or three fold from 0.2-0.3 feet to 0.5-0.7 ft. Fish moved into the culverts during and after installation while none were seen prior, indicating that passage conditions have been improved.

PAA's Annual Maintenance (Goals 1 and 3) - Jerry Cowles, Micah Morris, Jacob Sorensen, Mark Cufaude

PAA's serve as critical recreational areas for public hunting, fishing, birding, biking, boating, camping, and other recreational activities. Yearly maintenance and upkeep to preserve the habitat for aquatic and terrestrial species as well as providing quality sportsperson access.

Habitat and Access personnel performed annual maintenance and monitoring of Laramie Region PAA's. In total, 33 miles of boundary or interior fences were maintained to reduce trespass livestock and public recreation on sensitive habitat, delineate area boundaries to reduce neighboring landowner trespass, and convert fencing to wildlife friendly specifications. The Laramie crew installed, maintained, or replaced 687 signs to inform the public of WGFC land boundaries, rules, regulations, cautions, warnings, and travel management information on 40 PAA's. In addition, the crew maintained or provided contract oversight on 60 miles of roadways with 66 parking areas. Laramie Personnel provided oversight and repairs for 11 contracts to service comfort station, litter removal and other needs at the high use recreational sites. Noxious weeds were spot sprayed, documented with various contractors, Weed and Pest districts, and the Habitat and Access crew. Additional biological controls were strategically placed to assist with the eradication of noxious weeds in sensitive areas. Several times throughout the year, the crew made adjustment to the 11 area boat docks for public safety and enjoyment of sportspersons.

WHMA Annual Maintenance (Goals 1 and 2) - Jerry Cowles, Micah Morris, Jacob Sorensen, and Mark Cufaude

The crew maintained 210 miles of boundary and interior allotment fences and converted five additional miles to meet wildlife friendly specifications. In 2021, 915 acres were irrigated several times throughout the irrigation seasons across the Laramie Region to continue efforts to prove up on Commission water rights, which included hay meadows, food plots, and dense nesting cover. Along with irrigation, 18 water control structures were installed at various WHMA's. Many of the irrigated acres are harvested for hay or grain crop with the benefits to include wildlife nesting cover, food plots, and standing forage for wintering wildlife. These grain crops are harvested with 20% remaining for wildlife benefits. Alfalfa, barley, corn, and other small grain crops were planted, irrigated and harvested through a Barter contract to improve habitat or irrigation systems on WHMA's.

The crew worked with several private contractors and county weed and pest districts to eradicate or control 1,183 acres of state designated noxious weeds on the region WHMA's. Road maintenance included installing six cattle guards, cleaning out an additional 12, installing 14 culverts, and maintaining or overseeing contracts to improve 297 miles of roads with 64 associated parking areas. The crew installed 116 new signs while inspecting the 12,357 signs on the region's WHMA's. The crew provided contract oversight and hands on repairs for comfort station and parking area maintenance at all the region WHMA's.

The WGFD's WHMA's have several facilities that require annual maintenance. WGFD facilities are located at Springer, Red Rim Grizzly, Saratoga, Wick Brothers, and Laramie Peak WHMA's and the Laramie Regional Office. Facility improvements included roof replacements and repairs, siding, a kitchen remodel, electrical, plumbing, HVAC, and annual inspections at multiple WHMA's

RHAs in the Sheep Mountain Mule Deer Herd Unit (Goal 2) - Ryan Amundson



Figure 99. *Aspen regeneration three years post-Badger Creek Wildfire.*

In 2021, 6 aspen stands were assessed using the RHA method, totaling 366 acres. An additional 2,242 acres of rangeland/ mixed mountain shrub habitats were analyzed across 6 separate sites. One riparian habitat assessment was completed totaling 46 acres.

Aspen habitats assessed were burned in the 2018 Badger Creek wildfire. Regeneration and recruitment of aspen is excellent to date. Mixed mountain shrub habitats that have not been subject to disturbances in the last 30 or more years continue to have low overall production, vegetative diversity, and lack age class diversity. Riparian habitats, particularly important as fawn rearing habitat, often exhibit signs of over utilization by wild and/or domestic ungulates.

Laramie River - Jelm Restoration (Goal 2) - Christina Barrineau

The Laramie River - Jelm Restoration is located on the upstream (south) public fishing easement portion of the Jelm WHMA. Over the years, several landowners along the fishing easement have expressed concern over bank erosion, channel instability, and trout habitat. In spring 2018, the Laramie River cut-off a large meander bend on the upstream end of the fishing easement. In addition, a large wildfire (Badger Creek) occurred in the watershed and has increased fine sediments into the reach. Other landowners along the public fishing easement have expressed concerns over bank erosion and habitat conditions.



Figure 100. *Laramie River - Jelm Restoration channel grading.*

Implementation of the Laramie River - Jelm Restoration continued in 2021. Restoration construction began in summer 2020 on the upstream (south) public fishing easement portion of the Jelm WHMA. The restoration is a collaboration between the private landowner, NRCS, USFWS, Laramie Rivers Conservation District, and WGFDD with funding from WWNRT and WWDC.

In 2021, approximately 1,800 linear feet of channel were restored. Toewood with sod mat bankfull benches was installed along 714 feet of streambank. Several rock structures were installed including one j-hook, one constructed riffle, one mini-vane, and one cross-vane. Additionally, eight boulder clusters were placed throughout the restoration reach. The restoration will be completed in 2022. Spring construction will include minor grading along streambanks. Seeding and willow staking will occur on newly constructed streambanks and disturbed areas. Additionally, an irrigation intake and associated pipe will be installed along with ditch cleaning.

Landscape Vegetation Analysis (Goal 2) - Britt Burdett

The Landscape Vegetation Analysis (LaVA) project covering portions of the Medicine Bow National Forest was developed in response to changed forest vegetation conditions caused by the bark beetle

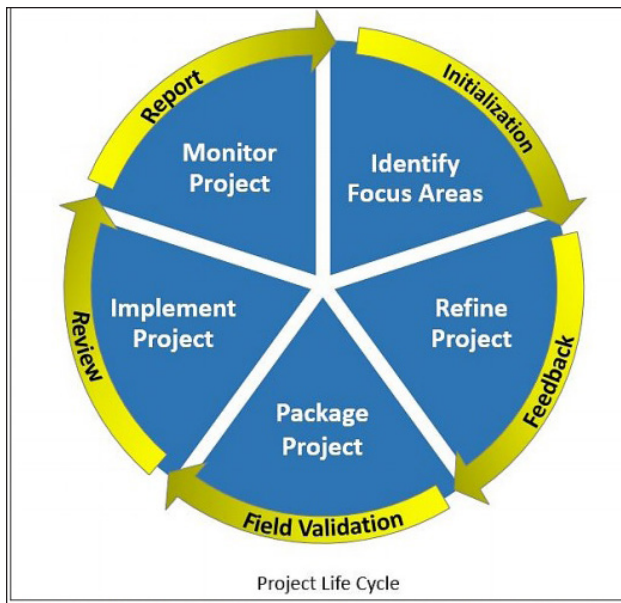


Figure 101. *LaVA Project Cycle.*

and begin project implementation.

Mule Creek PAA Juniper Thinning (Goal 2) - Ryan Amundson

Approximately 587 acres of aspen, sagebrush, and riparian habitats were enhanced through the lop and scatter of junipers on the Mule Creek PAA. Junipers were encroaching upon several important habitat types on the ranch, creating more xeric conditions. A loss of vegetative species diversity, an increase in bare ground, and loss of perennial flows in some stream segments were all attributed to juniper encroachment. By setting back succession in these habitat types, we anticipate improved habitats for game and non-game wildlife species that utilize these areas to meet life cycle requirements. Aspen regeneration in the Laramie Range is lacking in many areas without large scale disturbances such as wildfire. With high elk populations, we continue to plan the size and scale of treatments so that elk browse use of re-sprouting aspens is not excessive. Mule Creek PAA continues to provide high quality habitats for elk, mule deer, and other wildlife, as well as opportunity for late season elk hunting.



Figure 102. *Junipers mechanically harvested in the understory of aspen stands on the Mule Creek PAA.*

Mullen Post-Fire Stream Monitoring (Goal 2) - Christina Barrineau and Del Lobb

In fall 2020, the Mullen Wildfire burned 176,878 acres primarily in the Medicine Bow National Forest in southeast Wyoming. The wildfire burned most of the Douglas Creek Watershed, a tributary to the North Platte River. To monitor wildfire impacts, several stream reaches were selected for HQI surveys. HQI sites coincided with regional fish management fish population monitoring sites. Habitat conditions in five reaches were documented as a monitoring baseline. Four reaches on three streams were located in the burn area. A reference reach on Middle Fork Little Laramie River was not affected by the wildfire. HQI measurements, temperature monitoring, and streamflow measurements were

done on lower Muddy Creek, Douglas Creek below Muddy Creek, Douglas Creek at Pelton Creek, and the reference reach. A partial HQI was done on lower Lake Creek. Ground-based photographs and drone imagery were taken at all five reaches. In addition, streambed pebble counts were done at Muddy Creek and the reference reach. Comparison of baseline and future conditions will be done to assess stream habitat responses to the wildfire.



Figure 103. *Muddy Creek watershed one year after Mullen Fire.*

Mullen Wildfire Cheatgrass Control and Monitoring (Goal 2) - Ryan Amundson and Britt Burdett



Figure 104. *Cheatgrass invasion on south facing slope in the Mullen Fire burn scar in 2021.*

In September 2020, the Mullen wildfire burned approximately 176,800 acres in the Snowy Range on the Medicine Bow National Forest. Through post-wildfire mapping efforts, an estimated 17,174 acres were identified as high risk for cheatgrass invasion based on slope, aspect, fire severity, and known infestations. During summer 2021, 10,300 acres were aerially treated with indaziflam (Rejuvra) to control cheatgrass on the western side of the Snowy Range. We anticipate spraying an additional 4,000+ acres on the eastern side of the Snowy Mountains in 2022.

A monitoring plan was developed by USFS and partners at CSU to understand the relationship between cheatgrass and the natural environment post-fire and post-cheatgrass treatment. One hundred and fifty monitoring plots were established and visited by

multi-agency field personnel during the 2021 summer to assess species diversity (native vs. introduced), cheatgrass presence/absence, percent composition of cheatgrass, and fire severity. This intensive monitoring could not have been achieved without the cooperative efforts of USFS, WGF, USGS, and CSU. Relatively low amounts of vegetation and high amounts of bare soil were observed early in summer 2021. This is not uncommon in the first year following a wildfire. Species diversity varied across sites, with 17-33 species found at most sites. We anticipate the native plant community will recover given the moderate to high species diversity documented in many of the monitoring plots. A subset of the 150 plots will be revisited in 2022 and 2023. Some areas containing mixed mountain shrub stands experienced high levels of shrub mortality. The USFS and a group of volunteers planted mixed mountain shrub seedlings to assist with shrub recovery. We will continue to monitor these areas closely and intervene with seeding or shrub plantings if necessary.

Treasure Island Stream Restoration, Boating Access, and Parking Improvements (Goal 2) - Christina Barrineau and Del Lobb

The Treasure Island Stream Restoration, Boating Access, and Parking Improvements focused on improving North Platte River stability while enhancing boating access and parking conditions at the heavily utilized Treasure Island PAA. The improvements were constructed over a five-week period in fall 2021. Oxbow Earthworks, Inc. constructed the improvements with oversight from Biota Research and Consulting, Inc. Federal boating access dollars funded the improvements.

To enhance river stability, river dimensions were modified over approximately 550 feet of channel to improve sediment transport. A floodplain bench was constructed upstream and downstream of the new boat launch along the west bank. Riparian plantings were placed throughout the floodplain bench. Two rock barbs were constructed along the west streambank to aid boaters and deflect current away from the streambank. Additionally, a coarse riffle was constructed at the downstream end of the reach for grade control.



Figure 105. Aerial photo of river, boat ramp, and parking lot improvements at Treasure Island PAA.

The boat launch was moved about 100 feet upstream from the old launch area. The new and improved launch consists of a two-lane ramp with 10 foot adjacent launch lanes and a 5 foot buffer between the lanes. The ramp surface consists of precast concrete planks with connecting bars. To aid boaters, tie-off posts were installed directly upstream and downstream of the launch along the streambank.

The old Treasure Island PAA parking lot was a gravel and grass lot with no parking markers. Parking improvements included grading the new parking lot and adding fill material. The parking lot was expanded to incorporate the new launch location and additional parking. Parking spots (single vehicle and truck/trailer combos) are now designated using concrete wheel stops. Landscape boulders were strategically placed to hinder vehicles parking in unofficial locations.

Monitoring included pre- and post-construction aerial photography and imagery to document pre-construction and as-built site conditions. Aerial photography monitoring will be utilized in future years. Additionally, the new floodplain bench will be monitored (vegetation transects and wetland delineation) for up to ten years to determine the creation of a new wetland.

Platte Valley Fence Conversions (Goal 3) - Britt Burdett

Within the Platte Valley mule deer herd unit, fence modifications have been prioritized and implemented through the collaborative efforts of local natural resource agencies. Through the PVHP, the Saratoga-Encampment-Rawlins Conservation District, BLM, WGFD, USFS, and private landowners have worked together to identify fences in the Platte Valley in need of wildlife friendly conversion. These fence conversions are intended to increase overall habitat connectivity, decrease big game mortalities, and maintain proper grazing systems. In 2021, seven miles of hazardous fence was converted to wildlife friendly design. Four of the seven miles were within the mule deer migration corridor and/or mule deer crucial range. Since 2019, the PVHP group has converted over 11.5 miles of hazardous fences. The PVHP working group will continue to prioritize large-scale fence conversions within the migration corridor and mule deer crucial range using the Platte Valley mule deer GPS collar data to guide efforts.

Funding was provided by NFWF and the Saratoga-Encampment-Rawlins Conservation District.

Platte Valley Invasive Weeds (Goal 2) - Britt Burdett



Figure 106. Cheatgrass on the Pennock WHMA.

The WGFD and Carbon County Weed and Pest continued invasive weed treatments in the Platte Valley mule deer herd unit with a primary focus on treating migration corridors and winter range habitat. Using a rotary wing helicopter, 1,120 acres of important wildlife habitat on the Pennock WHMA were treated with Indaziflam (Rejuvra) to control cheatgrass infestations. Treatment occurred across State, USFS, and WGFC owned lands within the WHMA. Additionally, Carbon County Weed and Pest continued leafy spurge treatments throughout the Platte Valley, treating 9,173 affected acres. Funding partners include NFWF, WYDOT, OS LI, WGFD MDI, and Carbon County Weed and Pest.

Platte Valley Mule Deer Research (Goal 3) - Britt Burdett and Teal Cufaude

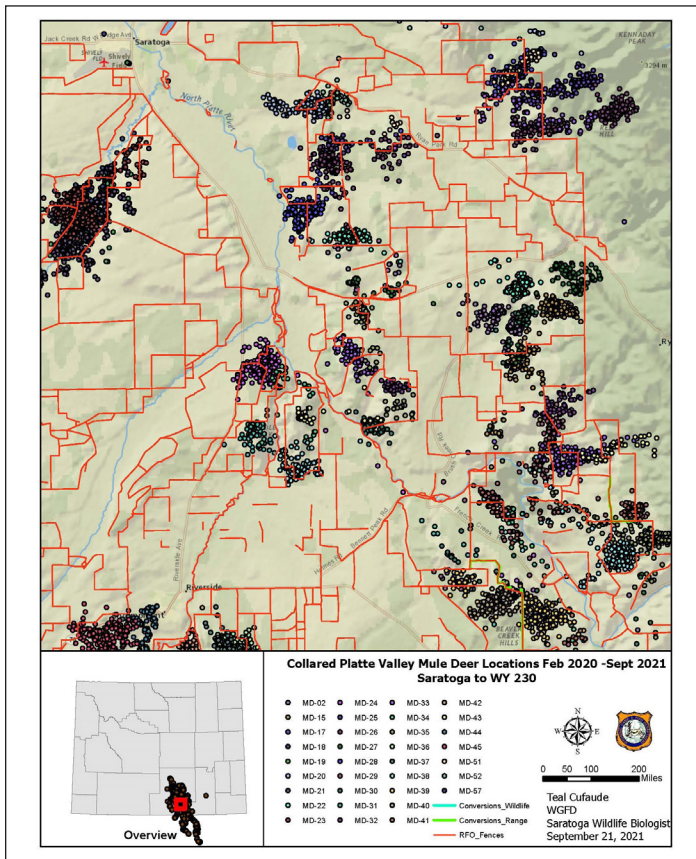


Figure 107. Collared mule deer locations south of Saratoga to WY 230 from February 2020 to September 2021.

Forty-seven Platte Valley mule deer does were fitted with GPS collars in February 2020. The project area encompasses Deer Hunt Areas 78, 79, 80, and 81. The primary objective of this project is to evaluate detailed movement data. The movement data will be analyzed using a Brownian Bridge Movement Model to quantify and delineate important areas used for Platte Valley mule deer migration. The Model results will be refined in accordance with the WGFD’s Ungulate Migration Corridor Strategy to update the designated migration corridor, stopover areas, and bottlenecks. Managers will also collect information on timing of migration and doe survival. In 2021, over 11,500 locations were collected on the collared Platte Valley mule deer. Eleven of the collared deer died (all unknown causes of death) in 2021. The first four collared deer mortalities occurred in January 2021, two deer died in March, two died in April, one died in May, one died in June, and one died in November. Three of the 2020/2021 mortality collars were re-deployed on new mule deer does in March 2021. The remaining mortality collars will be re-deployed in early 2022. Data will be used to inform priority opportunities for habitat improvement projects including fence conversions, shrub enhancements, roadway crossings, and invasive

species mitigation. The collars are programmed to release from the deer in November 2022.

Platte Valley Rapid Habitat Assessments (Goal 2) - Britt Burdett



Figure 108. *Riparian RHA on South French Creek.*

RHAs are conducted in MDI herds across the state to better assess habitat conditions across mule deer seasonal ranges. The summer of 2021 is the seventh year of RHA data collection in the Platte Valley. Four aspen assessments (144.9 acres) and five riparian assessments (86.2 acres) were conducted in the Platte Valley mule deer herd unit in 2021. The information obtained from these assessments will primarily be used for Herd Objective Reviews (conducted every five years) and annual data will be summarized in Job Completion Reports. These data will provide population managers and the public with documentation of the current state of mule deer habitat conditions in the Platte Valley.

Rawhide Elk Collar Project (Goal 3) - Ryan Amundson and Martin Hicks

The WGFD partnered with the Wyoming Military Department (Camp Guernsey) to capture 29 female elk during January and February of 2018. All 29 cow elk from the Rawhide Herd were fitted with GPS collars. Animals were captured from and on lands adjacent to Camp Guernsey, Platte County, WY. Collars were programmed to collect a GPS location every two hours and to drop off after three years. As elk died, collars were collected and redeployed the following January. Some of the collars malfunctioned and dropped off early, these were also redeployed. During 2020, the sample size was maintained and data analysis began in 2021.

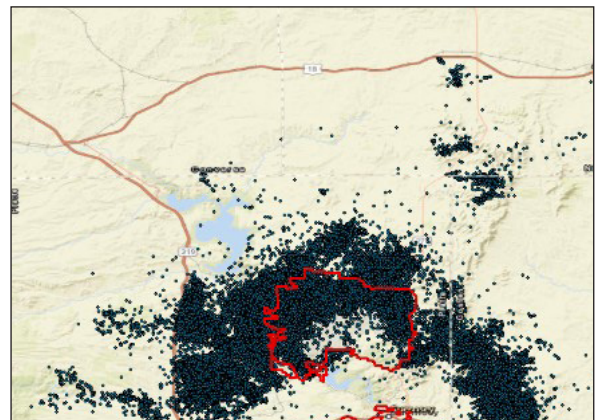


Figure 109. *Map summary of elk collar locations.*

This project will analyze the spatial data collected from these collars by using a resource selection function to determine what habitat variables influence habitat use and movement in the Rawhide elk herd. Habitat characteristics that will be assessed include standard habitat variables in addition to recent fire history, rural residential development, livestock grazing, presence of irrigated crops (pivots), hunter use, and military training. Unique types of military training may also be used to evaluate effects of disturbance relative to different activities.

Sheep Mountain Mule Deer Collar Study (Goal 3) - Ryan Amundson and Lee Knox

During the winter of 2020/2021, 30 doe mule deer were fitted with GPS collars in the Sheep Mountain mule deer herd to fill in data gaps, inform and prioritize future habitat projects, update seasonal range maps, and provide annual survival data. Funding was provided by WGBGLC and MFF.

Snowy Range Foothills Fence Conversion (Goal 3) - Ryan Amundson

The WGFD worked with a private landowner on the foothills of the Snowy Range near Albany to convert boundary fences to wildlife friendly fence specifications. Over 3.5 miles were converted from four and five wire fences that included excessive top wire heights or minimal bottom wire heights, and inad-

equate spacing between the top and second wires. Fence modifications including: pole top, cable top, adjustment of wire spacing, and removal of wires was completed to help facilitate big game movements in transitional ranges for mule deer and elk. Funding partners include private landowners, private donors, and WGFD MDI.



Figure 110 Pole top fence constructed post-wildfire in high wildlife crossing areas.

Springer Fence Conversion (Goal 2) - Jerry Cowles, Jacob Sorensen

In March 2021, the Laramie and Statewide Habitat and Access crew completed a fence conversion project on the Springer WHMA that removed downed woven/barbed wire fence and replaced it with wildlife friendly fence. The new fence, consisting of three barbed and one barbless wire, serves as the new boundary fence. All the removed wire and unused posts were recycled while rotted wooden posts were burned. The new 1.75 miles of fence was constructed of new materials. This leaves 0.5 mile remaining to be replaced in 2022.

Storer Wetland Improvement (Goals 1 and 3) - Jerry Cowles, Mark Cufaude, Darby Schock, and Noelle Smith



Figure 111. Storer wetland complex below Saratoga Lake.

DU, WGFD, and Conoco Phillips worked together to improve water management capabilities on Storer Wetlands. Five water control structures were installed to regulate water levels on the Storer wetlands and manage them as five separate ponds. An additional pond was constructed totaling 28.6 surface acres (see Figure 111). The ability to manage the water levels on each pond separately will allow managers to maximize the productivity of the wetlands for all migratory bird species using the wetlands during migration, breeding, and brood rearing seasons. Funding was provided by private donors and DU.

Wick WHMA Meadow Restoration and Workshop (Goal 2) - Micah Morris and Noelle Smith

WGFD and DU hosted a two-day workshop at Wick WHMA in July 2021. The workshop covered design and installation of low-tech erosion control structures, also known as Zeedyk structures, to restore wet meadows and riparian drainages. There were over 20 participants, including partners from local conservation districts, NRCS, BLM, and local landowners. We installed 12 structures below a wet meadow on the Wick unit to restore head cuts and incisions and improve water retention in the area. These techniques can be widely applied across grasslands, sagebrush, and other riparian areas.



Figure 112. *Workshop attendees learning about Zeedyk structure installation techniques.*

Pilot Hill WHMA (Goal 1) - Lands Branch Administration



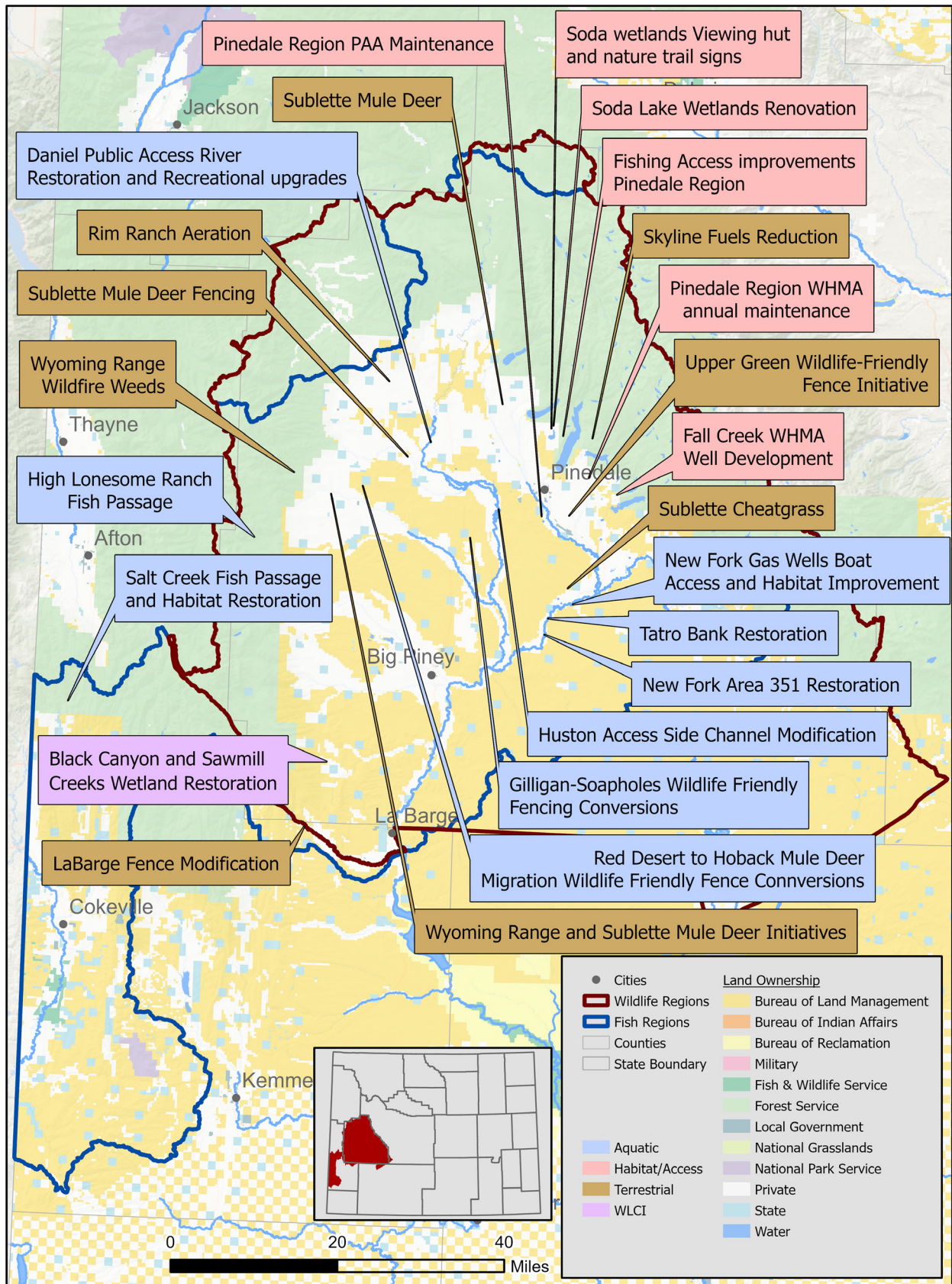
Figure 113 *Pilot Hill WHMA.*

The Lands Branch worked on securing an agreement with Albany County to manage the new Pilot Hill WHMA east of Laramie, Wyoming. As part of this agreement, the WGFD will manage 3,076 acres of property that provides critical habitat for elk, mule deer, pronghorn, and numerous non-game species of greatest conservation need. The area will also provide better access to 65,000 acres of National Forest and State Land property. The area will be closed to human presence from February 1st – April 30th each year to minimize disturbance to wintering wildlife. The Pilot Hill WHMA opened to the public in fall 2021.

Springer WHMA (Goal 2) - Jerry Cowles, Jacob Sorensen

The Springer WHMA is considered by many to be one of the best pheasant and goose hunting areas in the state. Consisting of 3,420 acres along U.S. 85, this WHMA was originally purchased to provide pheasant habitat and increase hunting opportunities in Southeastern Wyoming. In order to provide quality upland and wetland habitat WGFD has determined it beneficial to lease out 500 acres of agriculture crops on Springer. This allows Habitat and Access Biologist to maximize time for higher priorities and the flexibility in crop rotation during drought years, while enhancing habitat for nesting cover and brood rearing of upland and waterfowl species. Today's farming practices on Springer include annually irrigation of adjudicated commission lands while also conserving water in nearby irrigation reservoirs that also provide warm water recreational opportunities.

Pinedale Region



Black Canyon Wetland Restoration (Goal 2) - Jim Wasseen

This effort involves restoring beaver ecology to degraded wetlands and riparian zones that show signs of historic beaver activity along Black Canyon and Sawmill creeks near the headwaters of Dry Piney Creek, a perennial stream tributary to the Upper Green River. Long-term erosion from various natural and human factors throughout the Big Piney-LaBarge area has led to rapidly migrating incised stream channels that reduce soil moisture and productivity causing desertification and high sediment movement. By slowing the stream flow, beaver impoundments can increase base flows, raise water tables, reduce erosive energy, and increase retention time which benefit riparian vegetation and wildlife habitat.



Figure 114. BDA on Black Canyon Creek.

In summer 2021, equipment was purchased, permitting completed, and plants ordered for two sites. BLM staff installed beaver dam analogs at several locations along Black Canyon Creek in August 2021. The low water table and desiccated conditions this site prevented staff from extending the BDAs beyond the creek bed. It is anticipated that staff will return in May after crucial winter range stipulations, to extend BDAs under saturated conditions. BLM staff staked all BDA sites at Sawmill Creek and ordered plantings to be implemented in May at the same time work continues on Black Canyon Creek. Because of drought conditions, the installation of BDAs and planting units were delayed until May after Crucial Winter Range stipulations and spring runoff. Funding partners include WLCI and WWNRT.

Daniel Access Area River Restoration (Goal 2) - Luke Schultz



Figure 115. Construction of a bankfull bench with toewood at the Daniel Access Area.

The Daniel (40-Rod) Access area is 80 acres of WGFC-owned land on the Green River northwest of Pinedale. The property contains about 1,800 feet of river access as well as a boat ramp, parking area and toilet facility. This boat ramp is the most heavily used access in the Pinedale region, but launching or loading a boat was challenging at the site for a number of reasons. In addition, river habitat was deteriorated and the property contained a high vertical eroding bank that lost upwards of 300 tons of sediment annually.

This restoration addressed this instability, reduced sedimentation, improved fish habitat, and upgraded the boat access facility. Surveys in 2019 were conducted by WGFD and used to develop restoration designs in-house. In 2020 materials were mobilized to

the site and final permitting was completed for construction in 2021.

Construction was completed in August and September 2021 by WGFD Habitat and Access crews in collaboration with an operator from Taylor Construction. In stream modifications included the installation of a ~400 feet long constructed riffle that included three boulder sills and a 20 feet wide bankfull bench

with a brush bank, a ~250 feet long deepened pool with toewood along a ~15 feet wide bankfull bench, a 200 feet long bankfull bench with brush banks, and a ~150 feet long enhanced pool with toewood. Along all bankfull benches, trenched willow pickets were installed perpendicular to stream flow using dormant willow cuttings in October 2021. The work also included the construction of a small excavated pool and a small depressional wetland on the west side of the river, and moved the boat ramp upstream about 50 feet to a small backwater behind an island on the upstream end of the property.

Project activities were estimated to reduce bank erosion in the reach by over 90%. The project also functioned as an excellent public outreach activity; informational presentations were presented to school kids at the Pinedale BEEP program, local TU chapter meetings, and extemporaneously at the boat launch during project planning, site preparation, and during and following construction. In all instances, public contacts indicated positive feelings toward the work.

While most of this work was done with in-kind labor from the Aquatic Habitat and Habitat and Access Sections, additional funding from the Jonah Interagency Office and the WGFD Trust Fund were critical.

Water Well Development for Fall Creek WHMA and Feedground (Goals 1 and 3) - Miles Anderson

A water well was drilled, supplying water for feedground draft horses and a wildlife tank system on the Fall Creek WHMA. Continuing drought conditions had made Fall Creek unreliable for supplying water during winter feeding operations and during migration periods for wildlife passing through Fall Creek WHMA. During spring 2022, a solar pump system will be installed and multiple water tanks for wildlife use and a waterline to feedground corrals for the winter feeding operation.



Figure 116. Well Drilling at Fall Creek WHMA.

Fishing Access Improvements (Goal 1) - Miles Anderson, Kyle Berg, Christopher Evans

Several projects to improve fishing access for the public were completed in the Pinedale Region in 2021. Three boat docks were installed at New Fork, Half Moon and Willow lakes and boat ramps were extended at upper Fremont Lake, Boulder Lake, and Half Moon Lake.



Figure 117. Installing new dock at New Fork Lake.

Soapholes Wildlife Friendly Fencing Conversion (Goal 2) - Jim Wasseen

About five miles of fence were converted to wildlife friendly fence standards on the Soapholes and Giligan BLM allotments. Both allotments are within the Sublette Mule Deer Migration Corridor and other important wildlife habitats. Fence modifications will help ensure permeability of ungulate movements during migration and crucial times of the year, as well as allow continued livestock management. Many fences in the area are over 50 years old and in need of replacement to become wildlife friendly.

The Sublette Conservation District, along with their partners, completed two miles of the Soapholes BLM allotment wildlife friendly fence modification in November 2021. The District inspected materials and height measurements of wires, along several locations, to verify wildlife friendly fence specifications. Fence measurements were taken at fence posts as a control to account for variances in height due to topography. Funding partners include WLCI and OSLI.

High Lonesome Ranch Fish Passage (Goals 2 and 3) - Nick Scribner

After several years of planning and working with water users, passage improvements at Munn Ditch on South Cottonwood Creek were constructed in fall 2021. This ditch lies on private land owned by High Lonesome Ranch roughly three miles downstream of the public/private land boundary. Full passage is now possible at this diversion that reconnects over 25 miles of upstream habitat in the South Cottonwood drainage with most of it on USFS land. Prior to construction, the creek flowed through two three-foot diameter culverts onto a concrete splash pad. This created very high velocities at high flows and no pool below the culverts to allow fish to jump the slightly perched outlets at low flows. Frequent debris jams in the culverts and sediment aggradation needed regular maintenance and were a significant concern for the landowner and water users.



Figure 118. Looking downstream at new headgates and reactivated channel.

The solution involved moving the headgate structure upstream about 400 feet where a previously constructed levee was removed to reactivate a 700 foot long historic stream channel. In addition, three rock cross vanes were installed to provide grade control and water depths for irrigation delivery. The old diversion structure was left in place with the addition of angle iron and boards to serve as an emergency spillway for the irrigation canal. Funding was provided by USFWS, TU, and WGFD.

Green River: Huston Access Side Channel (Goals 2 and 3) - Luke Schultz

In 2021, WGFD received several calls from a landowner concerned about flow partitioning between the Green River and one of its side channels about 0.5 miles upstream of the Huston PAA; the Huston Access is also the point of diversion for the Ada Ditch. The landowner expressed concern that the side channel was taking much more water than it had previously, was delivering less water to the diversion and the boat ramp, and threatened to capture the entire river.

A brief survey in July evaluated the relative discharge at the side channel divergence, and suggested that flow partitioning between the channels was close to 50:50, and provided validity to the landowner's concerns. Both landowners at the divergence point for the side channel expressed interest in making modifications to the side channel and river to deliver more water down the original river left channel and reduce the threat of the side channel capturing the Green River.



Figure 119. *Collecting data on the Green River to measure the flow partitioning at a side channel.*

Restoration designs were drafted in fall 2021 to address flow partitioning at the side channel. Side channel modifications involve constructing an additional grade control structure on each channel and changing channel dimensions and elevations to target flow partitioning of 85:15 between the main river and side channel, respectively. We anticipate construction in spring 2022; the quick timeline is necessary to protect valuable infrastructure for both the public and the private landowners.

LaBarge Fence Conversions (Goal 3) - Troy Fieseler

Beginning in 2016, landowners within the LaBarge Creek area began converting fences to wildlife friendly standards to improve wildlife movement across the area - especially for mule deer and moose. Success of initial accomplishments quickly expanded to nearby properties, increasing the benefit to the overall area. To date, over 8.5 miles has been converted to a top-rail design. This has reduced the number of moose and mule deer entanglements which had been significant prior to implementation. Landowners in the area have played a vital role in this project, providing labor for both tear-out and construction of fences. This in-kind contribution enabled funding to stretch across a greater area, resulting in more miles completed on a landscape scale. Funding partners include NFWF and WWNRT.



Figure 120. *Completed top-rail wildlife friendly fence.*

New Fork River: Area 351 Restoration (Goal 2) - Luke Schultz

In early 2021, a landowner on the New Fork near Highway 351 (Johnson Ranch) contacted partners at TU and USFWS about addressing water delivery on a ditch that pulled water from the river. Project partners met with the landowner to discuss the point of diversion and fish habitat improvement. During these discussions, the landowner expressed interest in doing bank stabilization on the property, and was open to discussing reconnecting side channels on the New Fork that were abandoned when the river was channelized through an island at the site of the Sublette Cutoff crossing.

Project partners then contacted adjacent landowners at the Sublette County Historical Society and the Olson 3-H Ranch to gauge their interest in pursuing associated stream restoration work, and both were. Together the three landowners hold nearly seven miles of the river corridor; if the project area were to expand to include State and BLM lands, it could encompass nearly ten miles of the river.

Conversations with the landowners identified four initial work areas. These include (moving upstream to downstream): the diversion for the Johnson Ranch, a ~1,500 feet long, 6 foot high vertical eroding



Figure 121. *Project partners complete river surveys.*

bank on the Olson 3-H Ranch, reconnecting/reactivating the relict channels at the New Fork Crossing, and a 400 feet long, 5 foot eroding bank downstream of Highway 351 on the Johnson Ranch. These reaches have all been surveyed and WGFD is leading the development of restoration designs. Construction could begin as soon as spring 2023.

Project partners have begun fundraising and have support from the Jonah Interagency Office and the WY DEQ 319 Non-Point Source Pollution Task Force program. TU’s Nick Walrath is the project lead, with assistance from WGFD and USFWS’s Dave Kimble.

New Fork Gas Wells Habitat Restoration and Boat Access (Goal 2) - Luke Schultz

The New Fork Gas Wells Boat Access and Habitat Enhancement was conceived in the mid-2000s to address channel instability, poor quality habitat and the loss of a boat ramp on the New Fork River at a ~two-mile long segment managed by the Pinedale Field office of BLM. This reach represents nearly half of all the publicly held river corridor on the New Fork River between Boulder and its confluence with the Green River. Designs were completed by Intermountain Aquatics in 2017 and Aqua Terra Restoration was hired to complete the work in 2021.

Equipment was mobilized in early April 2021, and construction was completed by late May 2021, prior to peak runoff. Construction involved installing approximately 500 feet of toewood with double soil lifts to bring finished elevation to bankfull, two boulder j-hooks, and a roughly 700 foot long bankfull bench with slash, transplanted willow, and toe rock. A boat ramp and associated parking lot were also constructed to provide an access area for river users. All disturbed areas were re-seeded with a bankfull riparian seed mix, several willow pickets with dormant cuttings were installed, and 99 containerized shrubs were planted along the bankfull benches. Enclosure fencing was constructed around bankfull benches associated with the toewood and j-hooks following construction, and will remain in place until vegetation has been adequately re-established (~three to six years).

We have received positive feedback from river users and generally positive reviews from river restoration experts that have toured the site. Additional site visits will be conducted in 2022, and river surveys following runoff will evaluate performance of approaches used in this phase of restoration to inform the subsequent phase(s). This project will continue to provide quality recreation to residents and visitors to Sublette County for many years to come. Partners include WWNRT, WYDEQ, BOR, WG-BGLC, JIO, WLCI, and the BLM.



Figure 122. *Dueling excavators at the New Fork Gas Wells Restoration.*

Feedground Maintenance (Goal 1) - Miles Anderson, Kyle Berg, and Christopher Evans

Annual maintenance was performed on ten feedgrounds in the Pinedale region this year. Maintenance includes hayshed and structure repairs, corral and stackyard cleaning and repairs, harrowing feeding areas, repairing fencing, and maintaining access roads and signage.

Annual PAA Maintenance (Goal 1) - Miles Anderson, Kyle Berg, and Christopher Evans

Annual maintenance on signs, parking areas, roads, comfort stations, boat ramps, and fences were performed by habitat and access personnel in the Pinedale Region. These access areas receive high public use throughout the year.



Figure 123. *New fire rings at Green River Fear campsites.*

WHMA Annual Maintenance (Goals 1 and 3) - Miles Anderson, Kyle Berg, and Christopher Evans

Annual maintenance on Soda Lake, Half Moon, Black Butte, Fall Creek, and Luke Lynch WHMAs was performed by habitat and access personnel in 2021. Activities included sign replacements, road maintenance and repairs, and fence maintenance. Comfort stations, boat ramps, parking areas, wetlands, WHMA structures, watering systems, and campsites were maintained and improved.



Figure 124. *Gate install, Half Moon WHMA boundary fence.*

RD2H Fence Conversions (Goal 2) - Jim Wasseen

In 2014, the longest migration ever recorded for mule deer was documented; connecting the Red Desert (Sweetwater County) with meadows in the Hoback basin area of Sublette County, Wyoming (referred to as Red Desert to Hoback (RD2H) migration route). The area boasts some of the largest ungulate populations in Wyoming. Sustaining these herds' seasonal migration pathways from low-elevation winter ranges to higher-elevation summer ranges is critical. This project continues efforts by many partners to identify, inventory, and modify fencing. This corridor coincides with a large portion of the "Path of

the Pronghorn,” a migration route used by pronghorn to travel between the upper Green River Basin and Grand Teton National Park for over 6,000 years. Older fences may restrict wildlife passage and contribute to mortality, injury and wildlife stress. Partners are implementing wildlife friendly fence modification as landowner interest and funding allows.

In 2021, the Sublette County Conservation District, working with their partners, completed six miles of fence conversions on two different ranch properties (Mountain King Ranch and Ryegrass). An additional 0.5 miles of fence was removed from the Mountain King Ranch. WGFD continues to follow collared animals and various partners have placed game cameras on nearby properties allowing for documentation of passage through fences. Funding was provided by PAPO, private landowners, Sublette County Conservation District, WGBGLC, WLCI, WVNRT, Greater Yellowstone Coalition.



Figure 125. Completed fence on Mountain King Ranch.

Rim Ranch Aeration (Goal 2) - Troy Fieseler, Kade Clark, Rick Harmelink

Habitat improvements have taken place on Rim Ranch for the last decade, ranging from invasive species treatments, aspen restoration and mechanical shrub enhancements. Treatments have been developed through a collaborative partnership as part of a conservation plan for the property with the overall objective to increase resiliency and promote long term benefits to the native plant communities and wildlife. This phase entailed mechanically treating approximately 250 acres with an aerator in mature/decadent mountain big sagebrush communities to improve habitat quality (see Figure 126).

Treatments in sagebrush reduce overstory dominance, increasing production of remaining shrubs and improve grass and forb composition. In addition, this treatment promoted greater age-class diversity of sagebrush - recruiting a greater amount of seedlings and young plants. All treatment polygons occur within transitional habitats of the Sublette Mule Deer migration corridor and also intersect high use corridors of the Sublette pronghorn herd. Funding was provided by the USFWS Private Lands Program.



Figure 126. Pre-treatment conditions vs. five years post-aerator project.

Salt Creek Fish Passage and Habitat Restoration (Goals 2 and 3) - Luke Schultz

A crossing of Salt Creek on USFS Road #10382 contained an undersized and perched culvert that impaired passage for fishes, and a small salt mine in the floodplain was inundated seasonally during high flows. In addition, a series of habitat structures were built throughout the river corridor for about 2 miles upstream of this crossing starting in 1982. While many were still providing quality habitat, several had deteriorated to the point that they were impairing stream function. In 2020, restoration work was implemented to address these issues. The perched culvert was replaced with a 16.5 foot wide aluminum box culvert, and the river was re-aligned into a relict channel to improve stream and riparian function and enhance fish passage. A vegetated berm was built within the floodplain to keep the salt mine from inundating.



Figure 127. *Partners tour the newly installed aluminum box culvert over Salt Creek.*

During and following runoff in 2021, we re-visited this project to see how it held up during the winter and during seasonal high flows. Transplanted willows remained intact along the newly constructed stream banks, and vegetation was quickly re-establishing. Later in the summer, willow transplants appeared to have some die back, but green shoots suggested that the root masses remained intact and viable. At high water (May 24, 2021), the vegetative berm appeared to have functioned as intended; the bankfull bench along the stream bank appeared inundated, but high waters did not flood the same elevations on the salt mine side. Additionally, it appeared many of the dilapidated historical structures that were rectified in 2021 were inundated behind new beaver dams upstream of the salt mine. Brief quantitative surveys showed that riffle crests were stable through the runoff and suggested no major issues with streambed stability. Project partners from the Western Native Trout Initiative and the Open Rivers Fund toured the project in mid-summer.

Partners included TU and the BTNF. Funding was generously provided by the WYDEQ 319 Non-Point Source Pollution Task Force, the WWNRT, the Western Native Trout Initiative, US FWS Fish Passage, and the WGF Trust Fund.

Skyline Fuels Reduction (Goal 2) - Troy Fieseler

The Skyline Fuels Reduction Project includes over 2,240 acres and is adjacent to Pinedale, WY on the Pinedale District of the BTNF. At completion, 1,443 acres are slated for mechanical thinning treatment with prescribed fire and 833 acres are slated for hand treatment thinning and prescribed fire. The project is in its 5th year of implementation, with approximately 270 acres of conifer dominated aspen communities treated with prescribed fire in 2021.

The majority of the vegetation in the area consists of conifer encroached old-aged aspen communities, lodgepole pine communities and Douglas Fir/mix conifer stands. From 2003-2006 a mountain pine beetle epidemic occurred causing widespread mortality of lodgepole pine. Along with high mortality in the lodgepole pine, a decrease in aspen across the landscape is also evident. Due to wildfire exclusion, aspen was identified as being at risk of losing viable root systems and age-classes necessary to maintain clones against competing conifers. Completion of this project is expected to benefit wildlife through the restoration of aspen, shrubs and conifer vegetation.



Figure 128. *Prescribed burn in a conifer dominated aspen community.*

The effort reduces fuels and decreases the risk of high severity wildfire, which currently poses a high risk to numerous public visitors and private landowners. Completion of treatments has provided the opportunity to alter fire behavior and increase public safety. Funding was provided by the WGFD MDI.

Soda Lake Wetlands Renovation (Goals 1 and 2) - Miles Anderson, Kyle Berg, and Christopher Evans

The Soda Lake wetlands received six new Agridrain water control structures with six pond embankments and one dam rebuild during this renovation. Available water can be collected and a management schedule implemented for rotating wetlands to offer a diversity of foraging, brood rearing, and migration habitat for waterfowl and other non-game migratory birds that use the wetlands complex. A new wetlands viewing hut was constructed and interpretive signage installed on the wetlands nature trail this year to go along with the wetlands renovation. Funding was provided by DU, MFF, RMEF, WFW, WWNRT, WGFD Trust Fund, and WGFD maintenance and operation funds.



Figure 129. *Dam construction and install of final structure on Soda Lake Wetland pond.*

Sublette Cheatgrass (Goal 2) - Troy Fieseler

The Sublette County Invasives Taskforce continued implementing cheatgrass treatments during the 2021 field season. Treatments consisted primarily of aerial application on the west slope of the Wind River Range and the east slope of the Wyoming Range. In total, 22,131 acres were treated across all landownerships.

Since 2012, the Taskforce has mapped and treated over 63,000 acres of cheatgrass at a cost of approximately 4 million dollars, protecting native rangelands using both ground and aerial application and the best herbicidal tools available. Extensive monitoring has been established throughout the life of this project and has been cooperatively collected on a continual basis over the last decade. Methods always include photo points and in many places are paired with line-point intercept data to quantify changes in species composition and cover of cheatgrass compared to native species. Approximately 50 transects spread across multiple ecological sites contribute to the dataset and inform management of this invasive species. Most importantly, post-treatment monitoring shows a resilient native plant community available for multiple uses. Funding partners include the BLM USDA Farm Bill Program, JIO, Sage-Grouse

Local Working Group, OSLI, WGFD MDI, and WGFD Invasive Annual Grass funds.

Sublette Mule Deer Habitat Treatments (Goal 2) - Troy Fieseler, Kerry Gold, and Kade Clark

Sublette Mule Deer Habitat Projects are a direct response to cumulative declines across the Sublette Mule Deer Herd range in addition to declines associated with natural gas development in the Pinedale Anticline Project Area and Jonah Natural Gas Field near Pinedale, WY. Projects consist of over 7,400 acres of habitat treatments and monitoring on federal, state, and private lands, mainly in decadent sagebrush, mixed mountain shrub, and aspen communities. Treatments are designed to enhance successional diversity on a landscape scale while improving habitat forage quality and quantity for mule deer in summer and winter ranges within the Sublette Mule Deer Migration Corridor. In 2021 featured habitat treatments including pretreatment monitoring, post-treatment monitoring and planting of native seedlings for habitat restoration. Projects under the umbrella NEPA planning effort for BLM lands commenced in 2016 and will continue through 2022. Projects on private lands are ongoing, and additional projects are likely as relationships with new landowners develop.



Figure 130. *Volunteers installing Zeedyk structures.*

Pretreatment surveys for habitat improvements were conducted on federal and private lands in 2021. On BLM land on the Mesa south of Pinedale, within mule deer crucial winter range and the Sublette Mule Deer Migration Corridor, pretreatment monitoring with LPI surveys was completed for a mixed mountain shrub restoration project. Results indicated excessive canopy cover of Wyoming big sagebrush (average of 38%, range of 20-54%). Mechanical removal of sagebrush was implemented in August 2021 on 46 acres of mixed mountain shrub habitat, reducing overabundant sagebrush cover to no less than 15%. Over 2,700 seedlings of golden currant, serviceberry, and chokecherry were planted on the treatment sites with protective tree tubes installed with the help of contractors and local volunteers, including the Wyoming Wildlife Federation and Jackson Hole Wildlife Foundation.

Additional pretreatment monitoring and subsequent treatments were conducted on private lands in the Pinedale region, including over 350 acres aerated by WGFD's Statewide Habitat & Access crew in the Hoback Rim area of the Sublette Mule Deer Migration Corridor in late summer 2021. All of the treatment areas are subject to two growing seasons of livestock rest. Post-treatment monitoring will be ongoing until composition objectives are reached, which are mainly focused on improved vegetation cover, density, and age class structure.

In collaboration with the NRCS and the Sublette County Conservation District, over 50 hand built erosion control rock structures were installed on Bar Cross Ranch as part of a public workshop to educate local landowners and managers on wet meadow restoration techniques. These structures equate to over three acres of wet meadow restoration in sage grouse Core Area and the Sublette Mule Deer Migration Corridor. WGFD's Digital Content Creator assisted by recording the workshop and producing instructional videos for additional education opportunities. More wet meadow acres are expected to be improved by collaborating with landowners that attended the educational workshop or view the videos.

Livestock rest and post-treatment monitoring were implemented on both private and public lands in 2021. Approximately 1,787 acres of 2019 and 2020 shrub mowing and herbicide treatments were rested

from livestock grazing in 2021. Rest was achieved through pasture rest as well as electric fencing and riders. The same treatment sites were also subject to one and two-year post-treatment monitoring in 2021, consisting of LPis, shrub density belts, annual shrub production surveys, browse surveys and photopoints. Protective tree tubes were removed from about 2,000 native shrub seedlings planted in 2017 as part of a prescribed burn project in the Ryegrass area of BLM lands. Field observations indicate roughly 60% survival of seedlings. Five-year post treatment monitoring commenced on vegetation treatments implemented in 2016 on about 1,700 acres of BLM lands in mule deer crucial winter range. Treatments consisted of aerating, mowing, and herbicide. Monitoring included LPis, shrub density belts, annual production/utilization surveys, browse surveys, aspen circular plots, and photopoints. Post-treatment monitoring of all project sites is ongoing until vegetation objectives are met.

Cooperators and funders include: PAPO, JIO, WWNRT, MDI, Upper Green River Basin Sage Grouse Local Working Group, NFWF, Partners for Fish and Wildlife, BLM, Sublette County Conservation District, NRCS, and private landowners.

Sublette Mule Deer Wildlife Friendly Fencing (Goal 3) - Kerry Gold

Sublette mule deer fencing projects, like the Sublette mule deer habitat projects, are a direct response to cumulative population declines associated with the Sublette mule deer herd, and declines in the sub-herd associated with energy development on the Pinedale Anticline and Jonah natural gas fields near Pinedale, WY. Fences for pastures and property boundaries can be a significant hindrance to habitat connectivity if they are not updated to a wildlife friendly design. Goals of this project are to enhance habitat connectivity by reducing negative wildlife-fence interactions and easing fence crossings for migrating mule deer and other big game species.

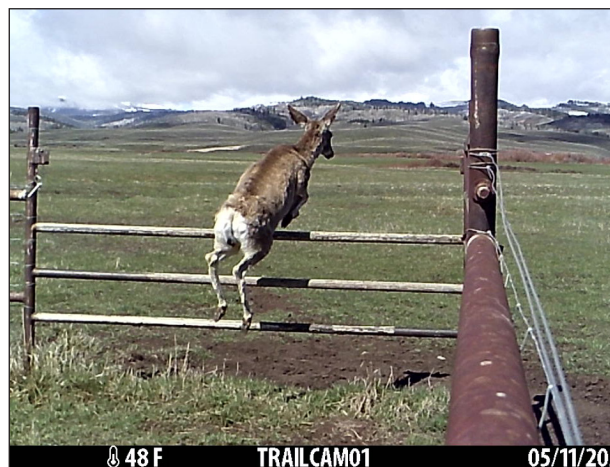


Figure 131. *Mule deer using fence modification at Jackson Fork Ranch.*

In 2021, projects included construction/modification of 16.6 miles of wildlife friendly fencing on private lands in the Sublette mule deer designated migration corridor and mule deer crucial winter range. Also, 2.6 miles of dilapidated fences were removed with the assistance of volunteer groups including Wyoming Wildlife Federation, Jackson Hole Wildlife Foundation, and the Winter Range Foundation. At least 3 miles of wildlife friendly fence conversions are planned in 2022, but are likely to be much more due to recent funding investments in wildlife friendly fencing by JIO. Additional removal of defunct fence lines is planned in 2022 within Sublette County.

The third year of installing drill stem pipe modifications on Jackson Fork Ranch in Bondurant, WY was completed in 2021. The ranch uses a robust woven wire fence design to contain their domestic bison operation, however its location in the Sublette mule deer migration corridor poses risks and challenges to big game species. Eight wildlife friendly modifications were installed in the highest use areas along the fence line in 2021, in addition to 34 modifications installed in 2019 and 2020. Trail cameras used to monitor wildlife use of the modifications show most deer, elk, and moose utilize the crossing structures. More modifications are planned for 2022. Cooperators and funding partners include PAPO, JIO, WWNRT, NRCS, WBGGLC, WGFD MDI, Ricketts Conservation Foundation and private landowners.

Sublette Pronghorn Research (Goal 3) - Troy Fieseler and Brandon Scurlock

The identification and mapping of migration routes and stopovers for Sublette pronghorn continued

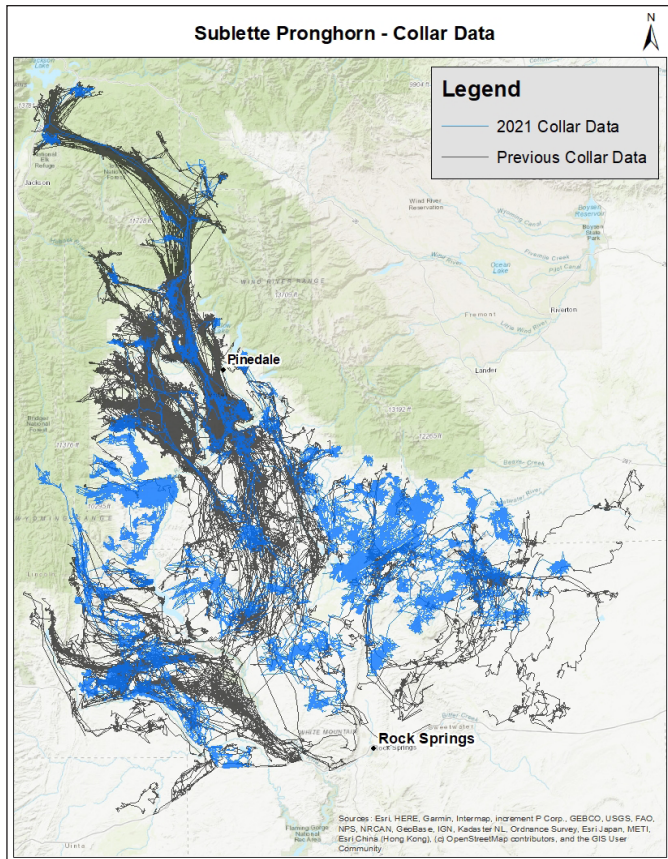


Figure 132. Sublette pronghorn GPS collar data depicting areas of new data collection compared to previously collected data.

New Fork River: Tatro Meander Restoration (Goal 2) - Luke Schultz

The Tatro Meander is on the Lower New Fork River, approximately 1 mile downstream of the Rimmick PAA. A 5-7 foot vertical eroding right bank annually migrated 1-2 feet laterally due to instability along the ~1,700 foot reach, and an estimated 290 tons of sediment were lost from the bank annually. In 2020 about 500' of toewood and 5 boulder vanes were constructed to stabilize the bank, and follow up monitoring was conducted in 2021.

In June 2021, the site experienced the first runoff following construction and held up adequately. A short-duration (2-3 day peak discharge), but near bankfull magnitude event occurred around June 7 with an annual maximum discharge of ~2950 cfs. Site visits indicated that about 8-12 inches of water was running across the surface of the bankfull bench along the upstream pool and the rock vanes through the downstream riffle were completely submerged.

Visits later in 2021 showed that vegetation was establishing well. Wetland grasses and sedges were sprouting along bankfull elevations, and willow cuttings showed roughly 50% sprouting rate, which

during 2021 with an additional 13 female pronghorn fitted with GPS collars in December. The new collaring effort is designed to fill in the gaps left from previous studies, as well as to aid in delineating stopover habitats. Maintaining a total sample of 100 doe pronghorn for a minimum of 3 years is the objective of the study.

Further defining migration routes in the Sublette pronghorn herd will assist future land-use planning and siting of infrastructure while enabling managers to focus conservation efforts such as fence modifications, habitat improvements and improved highway wildlife crossings.



Figure 133. Post-restoration surveys at the Tatro Meander.

is outstanding for the area. However, the high water along the toewood of the bankfull bench showed minor erosion along the bank line of 1-2 feet. Closer inspection indicated that toewood placement was slightly high (near the water line), and additional woody slash along the bank line might have been beneficial. However, the excavated pool along the bench appears to have maintained its depth through the runoff.

Upper Green Wildlife Friendly Fence Initiative (Goal 3) - Troy Fieseler



Figure 134. *Mule deer using wildlife friendly fence.*

Within the Upper Green River Basin and surrounding areas, wildlife friendly fence modifications have been prioritized and implemented for over the last decade to improve wildlife movement across the region. To date, approximately 250 miles of fencing has been updated in Sublette County to meet wildlife-friendly standards and these successful accomplishments across public and private lands have increased awareness and opened the door for new and increased opportunities with private landowners, many of which share boundary fences with our federal partners. Requests for assistance are at an all-time high providing managers with a unique opportunity to be impactful at a landscape scale.

The focus of this project is working with private landowners to select a fence design that will meet their needs as well as reduce wildlife impacts. While fencing is an essential component of our landscape, particularly for livestock management, it can create severe hazards for wildlife. Fences not only impede seasonal migrations, but can also restrict daily movements and access to key habitats as well as result in death and physical injuries.

The focus of this project is working with private landowners to select a fence design that will meet their

During 2021, over 22.5 miles of fencing was converted across four different properties, as well as the permanent removal of over two miles. All fence sections intersect with the designated Sublette Mule Deer Migration Corridor, in addition to migration habitat of Sublette Pronghorn. Furthermore, the Upper Green Wildlife-Friendly Fence Initiative has designed a fence prioritization tool to assist partners in prioritizing and ranking these projects, helping managers approach fence modifications more strategically and holistically across the landscape. Funding partners include NFWF, private landowners, USFWS Private Lands Program, and WGFD MDI.

Whiskey Mountain Bighorn Sheep: The West Side Story (Goal 3) - Troy Fieseler, Dean Clause, and Brandon Scurlock

The Whiskey Mountain bighorn sheep herd encompasses the northern Wind River Mountain Range in west central Wyoming and is divided into three hunt areas. Once one of the most numerous herds of Rocky Mountain bighorn sheep in the United States, the herd has been an important component in bighorn sheep management for Wyoming and other western states for many decades. Traditionally, the bulk of sheep in the herd winter in Hunt Areas 9 and 10 on the northern side of the unit near Dubois, Wyoming. These sheep are largely migratory, moving to higher elevation summer ranges as snow recedes. A smaller sub-population of the Whiskey Mountain bighorn sheep residing in Hunt Area 8 that winter on high elevation windswept slopes in the Upper Green River drainage, is the focus of this recent addition to the project. This subunit of the Whiskey Mountain bighorn sheep herd has never been studied and research into this group may provide insight into the performance of the larger population.



Figure 135. *Ewe awaiting to be fixed with GPS collar.*

The overall herd has experienced poor lamb recruitment since a pneumonia outbreak in the early 1990's and the population has dropped from an estimated 1,500 individuals to fewer than 400 sheep today. In contrast to other bighorn sheep die-off events throughout the West that gradually recover from pneumonia outbreaks, the Whiskey Mountain bighorn sheep herd has continued to slowly decline. To determine the potential interplay among density, nutrition, and immune function for disease, the WGFD and UW initiated a lamb survival study in Hunt Areas 9 and 10 during 2019. Efforts started during March of 2021 within Hunt Area 8.

A total of 14 ewes were captured and fitted with GPS collars and transmitters in March with an additional 4 recaptures in December of 2021. The goal of the research is to understand the contributions of summer nutrition, predation, disease and migration on survival of sheep throughout the herd unit.

Wyoming Range and Sublette Rapid Habitat Assessments (Goal 2) - Kerry Gold

Throughout the Pinedale and Jackson regions, RHAs are conducted within the Wyoming Range and Sublette Mule Deer herd units to assess habitat conditions across seasonal ranges. In 2021, 6,490 acres were assessed between the two herd units in these regions and consisted of four aspen, one rangeland, and eight specialized surveys. The information from these assessments will be used for Herd Objective Reviews and annual data will be summarized in Job Completion Reports (compiled annually). These data provide population managers and the public with documentation of the current state of mule deer habitat for the Sublette and Wyoming Range deer herds.



Figure 136. *High elevation RHA site located in the Wyoming Range Mule Deer herd unit.*

Wyoming Range Wildfire Weeds (Goal 2) - Troy Fieseler

Over the last decade the Wyoming Range has experienced numerous large wildfires totaling approximately 164,000 acres with the most recent Roosevelt Wildfire occurring in 2018 spreading across 62,000 acres. These fires result in vegetative benefits for wildlife and overall watershed health. Numerous management actions have been implemented through key partnerships including noxious weed control, grazing management, fire-line rehabilitation and erosion control efforts. These actions encourage successful restoration improving overall quality of habitat for wildlife and livestock, however, the battle against noxious weeds continues. This project was designed to build off previous successful efforts eliminating and controlling noxious weeds across all wildfires in the Wyoming Range. During 2021, Sublette County Weed and Pest ground crews chemically and mechanically treated weeds including Canada thistle, musk thistle and spotted knapweed across approximately 20,000 acres. Biological control methods, specifically targeting Canada thistle were also released and will be monitored for effi-

cacy in the coming years. Funding was provided by RMEF.

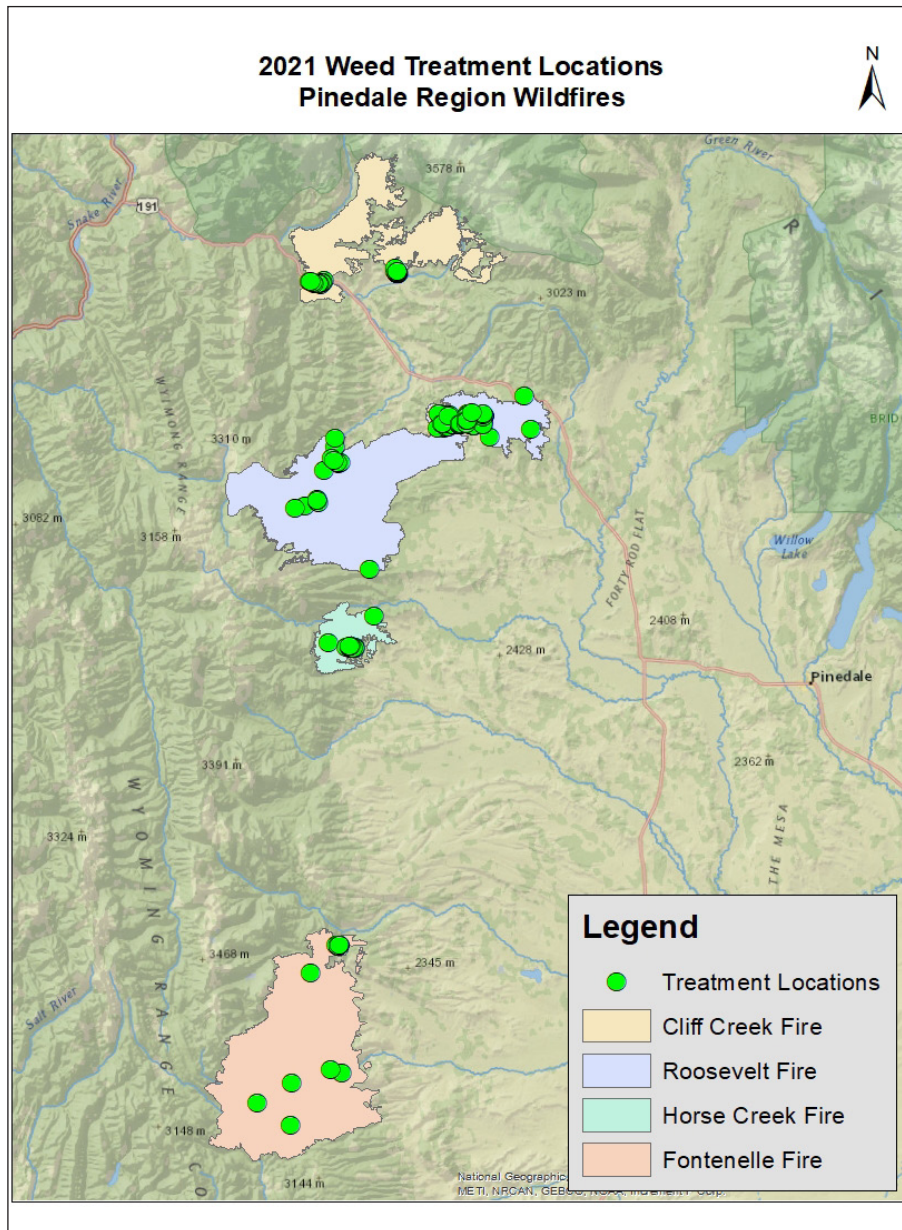
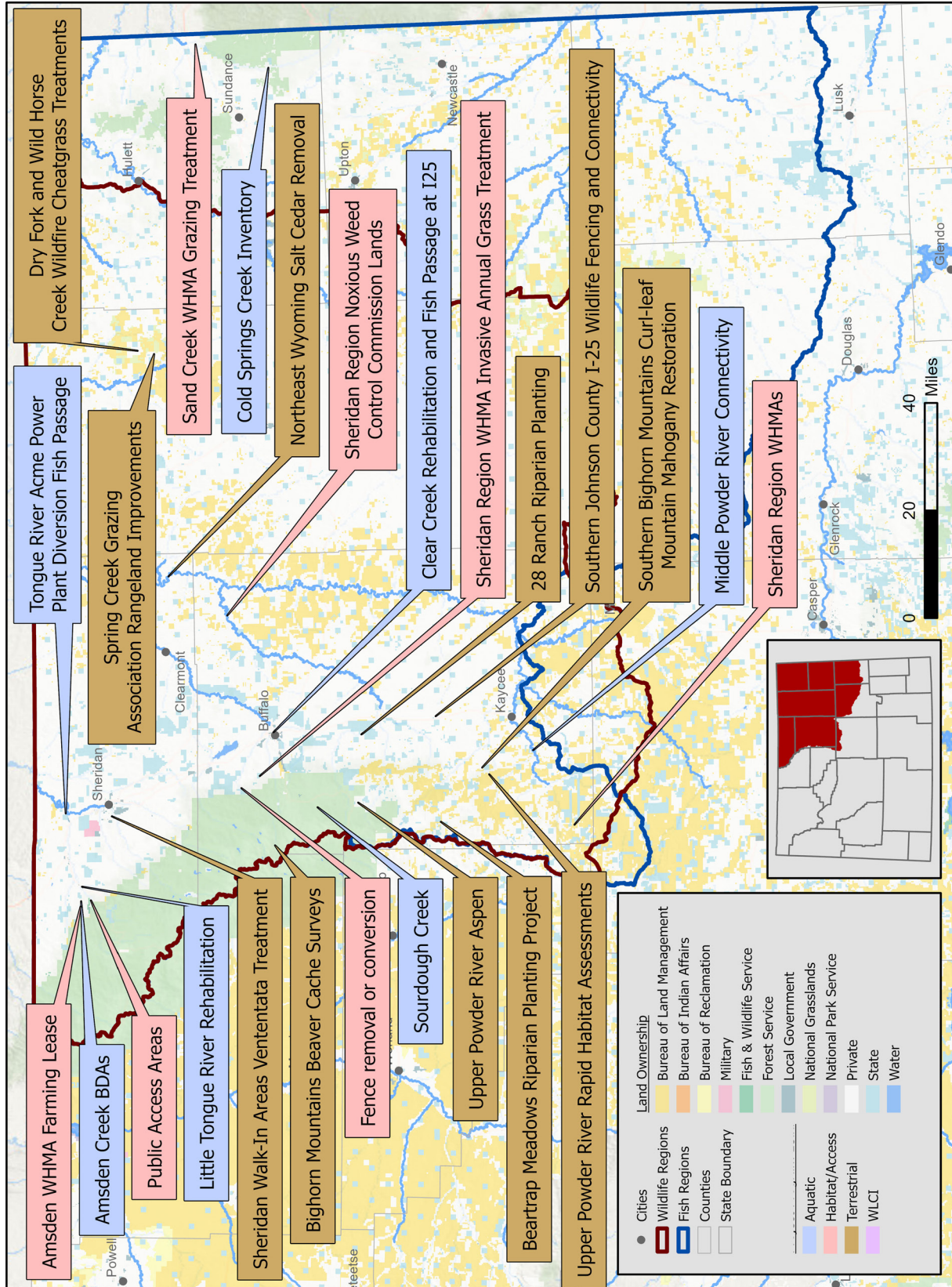


Figure 137. 2021 noxious weed treatment locations within four major wildfires in the Pinedale Region.

Sheridan Region



28 Ranch Riparian Planting (Goal 2) - Todd Caltrider and Travis Cundy

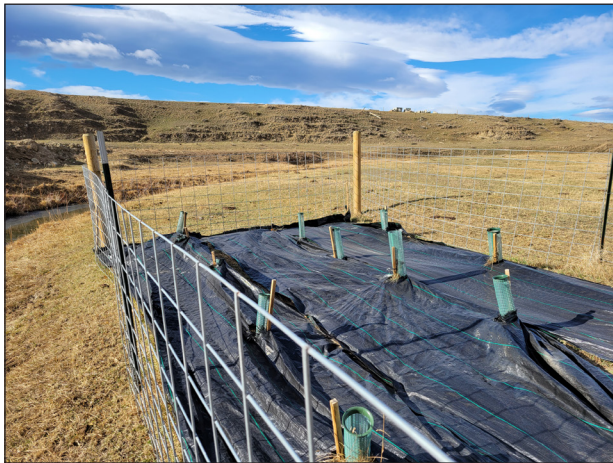


Figure 138. Tree and shrub planting on TA ranch along the North Fork of Crazy Woman Creek.

woody communities on the ranch is unknown, but it is suspected that past grazing practices, improper past herbicide application, invasive species (smooth brome) and stream degradation related to past irrigation infrastructure installation may have contributed to current conditions. To improve riparian habitat for mule deer and other riparian dependent wildlife species, WGFD, with the assistance of the Wyoming Honor Conservation Camp, planted 5,500 willows in riparian habitat along the banks of Middle Fork of Crazy Woman, North Fork of Crazy Woman, and Poison Creek on a mixture of private land and state of Wyoming trust land owned/leased by the 28 Ranch. Coyote willows were collected from various private landowners in Weston County during March. WGFD and the Honor Conservation Camp crews planted the willows during April with waterjet stingers.

In addition to willow planting, 200 native trees and shrubs were planted in May 2021 on the TA Ranch along the North Fork of Crazy Woman Creek. All planted trees and shrubs were protected in fencing enclosures or tree tubes, or both. Trees and shrubs planted include: Peachleaf willow, Silver buffaloberry, chokecherry, Skunkbrush sumac, Wood's rose, Green ash, Boxelder, and Red Osier Dogwood. Funding was provided by WBGGLC, WWNRT, and WGFD MDI.

Amsden Creek BDAs (Goal 2) - Travis Cundy and Seth Roseberry

Until recently, a beaver family unit occupied Amsden Creek on the WHMA. Unfortunately, the complex of dams the family previously maintained began to deteriorate and were ultimately lost during high flows in spring 2019. However, beavers continue to be observed periodically along the creek, most recently in spring 2021, and the woody riparian habitat available on the WHMA remains sufficient to support a family unit. Therefore, a series of beaver mimicry or BDA structures were constructed to provide a foundation for further beaver dam building and to potentially entice beavers dispersing from elsewhere in the watershed to reestablish a colony. The BDAs raise the local water table to reconnect with the floodplain terrace and promote the expansion of riparian plants. The



Figure 139. BDA structures along Amsden Creek.

pooling above the structures also provides escape cover for beaver exploring the area. The ultimate goal is that beaver adopt the analog structures and reestablish a secure and long-lasting colony that detains stream flows in the system for slow release during summer periods. Five BDA structures were built in September during a day long field workshop sponsored by TNC. These structures were intended to introduce participants to low-tech, process-based river restoration approaches. Fifteen volunteers from various agencies and organizations participated in the workshop.

Amsden WHMA Farming Lease (Goal 1) - Brad Sorensen and Seth Roseberry



Figure 140. *Amsden WHMA farming contract.*

The Amsden Creek Wildlife Habitat Management Area has historic hay meadows and a gravity fed irrigation system that allows for the successful growing of an alfalfa/grass crop. To fully benefit and utilize these lands and water rights WGFD has determined it most beneficial to lease the farming/haying rights to a lease for a single annual cutting. On 50 acres of the WHMA, the lessee irrigates and harvests a single hay cutting annually and irrigates for a second growth of forage left for wildlife.

Beartrap Meadows Riparian Planting (Goal 2) - Todd Caltrider and Seth Roseberry

During summer 2021, the WGFD with the assistance of the BLM, planted 556 native deciduous trees in a large spring enclosure on BLM managed lands in Beartrap Meadows. The purpose was to see if native deciduous trees could be planted and established in riparian and mesic areas in the southern Bighorns. This area will provide the BLM and WGFD with a demonstration site and information for future deciduous woody species plantings in the area for the benefit of mule deer and other wildlife species. An assortment of willows, aspen, chokecherry, currant, and Wood rose was planted on the site. Plantings were protected by a previously installed livestock enclosure and tree tubes. Funding was provided by the BLM.



Figure 141. *Deciduous woody riparian planting at Beartrap Meadows.*

Bighorn Mountain Moose Research (Goal 3) - Cheyenne Stewart, Tim Thomas, Sam Stephens, Zach Turnbull

This project is in the final stages with an anticipated 2022 summer completion date. The 2021 calendar year involved GPS movement data analysis from 74 cow moose, and lab fecal sample analysis for establishing pregnancy rates. Fieldwork was completed in 2020 and only seven active GPS collars remaining on female moose with a 2022-scheduled drop-off date. Funding partners include WGBGLC,

WGFD Trust Fund, and Wyoming Community Foundation.

Bighorn Mountains Beaver Cache Surveys (Goal 1) - Todd Caltrider, Travis Cundy, Tim Thomas, Sam Stephens, Zach Turnbull



Figure 142. *Active beaver dam in the Bighorn Mountains.*

During the month of October, WGFD personnel flew beaver cache surveys as part of a long on-going monitoring effort aimed at assessing beaver population trends in the Bighorn Mountains. Drainages with optimal beaver habitat were surveyed via helicopter and observed beaver activity was recorded. During the survey, a total of 6 active beaver caches were observed, as well as 17 beaver dams that appeared to currently be occupied by beavers. WGFD observers also documented 64 inactive or relic beaver dams. Compared to past data, beaver populations appear to be declining. Funding was provided by USFS and WGFD.

Clear Creek Fish Passage Above Interstate-25 (Goals 2 and 3) - Travis Cundy

A large concrete grade control structure on Clear Creek upstream of the Interstate-25 box culvert crossing was a long-standing barrier to upstream fish movements. For years, fish could swim downstream past the structure, but were kept from swimming back upstream to spawn or seek refuge from warm stream temperatures. In 2021, the concrete structure was removed and replaced with a series of alternating riffle structures and pool features along 700 feet of stream corridor above the culvert crossing. The channel slope reduction provided over the longer course of riffle to pool features allows adult life stages of trout and native suckers previously isolated downstream of the culvert crossing to access upstream habitats mostly unimpeded along 9.7 miles of creek. The work also enhanced stream habitat available to the public along 3.5 acres of the stream corridor owned by WYDOT. Partners involved with the rehabilitation included the WVNRT, Clear Creek Conservation District, WYDOT, WWDC, WGBGLC, Wyoming Sportsmans Group and Powder River Flycasters.



Figure 143. *Before and after channel grade on Clear Creek upstream of Interstate-25.*

Cold Springs Creek Inventory (Goals 2 and 3) - Travis Cundy

Inventory was completed to identify potential habitat improvements along Cold Springs Creek on a segment of OSLI land acquired in 2020, and adjoining Black Hills Forest lands. These 6 miles of stream corridor at the end of the perennial flowing portion of the creek support a Brook Trout fishery. Poten-

tial opportunities identified included correcting impaired culverts and past channelization treatments, reconnecting channel cutoffs involving about 4,300 feet of abandoned channel, rehabilitating at-risk and breached reservoirs, and enhancing riparian and wetland habitats through a combination of beaver mimicry treatments, beaver transplants and beaver exclusion treatments at culvert crossings.

Area 10 Mule Deer Study (Goal 3) - Erika Peckham

More life history information on the mule deer inhabiting Hunt Area 10 is needed to better manage this unique area. Hunt Area 10 is of high interest to hunters and the public due to good public land access and the historic numbers and quality of buck deer it formerly produced. Demand for the limited number of available licenses is high (36% resident draw odds), and recruitment into this herd increased with favorable weather the past few years. Information gathered here would likely be applicable to other areas in the herd unit. In addition, the WGFD has an interest learning how deer use the unique habitat types in this area, and how that use may be impacted by increasing elk numbers. Lastly, active coal mining and associated reclamation provides an opportunity to assess mule deer behavior and habitat selection in relation to coal mining. Overall, this study presents an opportunity to garner more information on life history parameters and interactions to improve management practices including movements, habitat selection and cause of mortality.

The study of 35 individuals will run from 2019-2024 and has several objectives and outcomes: 1. Identify and refine mule deer seasonal habitats and timing of use; 2. Identify movement, corridors, and critical habitats; 3. Estimate annual survival and reproductive potential; 4. Identify potential habitat improvement projects; 5. Evaluate habitat condition at preferred sites; 6. Formulate management strategies to address identified habitat concerns/opportunities and risks; 7. Assess CWD status of captured/collared mule deer; 8. Identify potential barriers to movement; and 9. Identify seasonal deer use of reclaimed coal mining areas.

Dry Fork and Wild Horse Creek Wildfire Treatments (Goal 2) - Todd Caltrider

During July, the Dry Fork wildfire and Wild Horse Creek wildfire collectively burned 4,099 acres. Both of these wildfires occurred in the Gillette Sage-Grouse Core area and burned substantial acres of key sage grouse habitat. These wildfires burned within two miles of five occupied sage grouse leks. Before the wildfire, the area contained a mosaic of sagebrush grasslands with low to moderate invasive annual grass infestation. To reduce the threat of increased invasive annual grass following these wildfires and to improve native rangeland plant recovery, the WGFD partnered with the Bird Conservancy of the Rockies to gather available grant dollars to conduct an invasive annual grass herbicide treatment on 3,215 acres of sage grouse habitat burned in the wildfire. Areas were treated in September 2021 via helicopter with imazapic herbicide at a rate of 4 ounces per acre. Funding was provided by the Northeast Wyoming Sage Grouse Working Group, WGFD Invasive Annual Grass Account, and the Bird Conservancy of the Rockies.



Figure 144. *Dry Fork wildfire.*

Bud Love WHMA Fence Removal (Goal 3) - Seth Roseberry and Zach Turnbull

Unused and dilapidated fencing across Wyoming is a safety concern to wildlife, livestock, public users and managers. Efforts to remove or repair these fences help to improve these areas for a wide variety of users. Much of the work is done through physical labor and these projects have been very successful for

involved volunteer groups. Approximately 1.5 miles of old barbed wire stock fence was removed from the Bud Love WHMA by volunteers with Wyoming Wilderness Association and Backcountry Hunters and Anglers.

Little Tongue River Rehabilitation (Goal 2) - Travis Cundy

Spring flooding in Dayton during 2019 caused considerable bank erosion and channel degradation along segments of the Little Tongue River. Two landowners looking to stabilize eroding segments of the floodplain along their properties requested assistance in rehabilitating degraded streambed and eroding streambanks along about 750 feet of stream. The landowners 2019 goals were to regain bank stability, restore the ability of streamside vegetation to reach ground water along sections of the floodplain and restore the function of riffle to pool habitat features available to support the trout fishery. Our goal was to reduce sediment contributions to the Tongue River below the mouth of the Little Tongue River where limitations with routing sediment through Dayton during flooding has long contributed to stream habitat deterioration along segments of the river accessible to the public. Other partners included the Sheridan County Conservation District, WWDC and NWF.



Figure 145. *Before and after photos of a rehabilitated segment of the Little Tongue River.*

Middle Powder River Connectivity (Goal 3) - Travis Cundy

Landowner initiated efforts to replace failing irrigation infrastructure are also helping the WGFD and other conservation partners restore fish passage at three irrigation diversion dams along the Middle Powder River upstream of Kaycee. The Powder River Conservation District is directing these cooperative efforts. The renovations involve replacing ditch infrastructure and installing a series of constructed riffles below each diversion to gain the gradual elevation lift needed to deliver water to the ditches and provide upstream fish passage past the diversions. Renovation of the Moffett Diversion was completed in 2021. This work provided upstream fish passage to a 12.2 mile long fragment of stream. Renovations at two other diversions will continue into 2022. In addition to securing water delivery and providing upstream fish passage between previously fragmented stream segments, the renovations are improving bank stability and streambed stability, promoting vegetation growth on the floodplain and creating holding



Figure 146. *Renovation of the Moffett Diversion on the Middle Powder River.*

areas for fish. Other partners include the NRCS, USFWS, and Resources Legacy Trust.

Northeast Wyoming Salt Cedar Removal (Goal 2) - Todd Caltrider

Salt cedar is a highly invasive plant that is gaining a foothold in the Powder River drainage. Salt cedar removal started in the upper Powder River Basin in Johnson County. Since 2007, Johnson County Weed and Pest District has removed 3,350 acres of salt cedar between Kaycee, WY and the Sheridan county line through a mixture of mechanical mowing and chemical herbicide treatments. In conjunction with Johnson County, Sheridan County Weed and Pest District began salt cedar removal in 2010. Salt cedar density increases greatly downstream of Johnson County. Due to limited funding and increasing density of salt cedar farther downstream on the Powder River, the Sheridan County Weed and Pest has been limited in the number of acres of salt cedar removal that can be completed each year. In 2018, WGFD



Figure 147. *Masticating salt cedar on the Powder River.*

partnered with the Sheridan County Weed & Pest to seek grant funding to treat more acres per year. Since WGFD partnered with the Sheridan County Pest, 789 acres of salt cedar have been removed from the Powder River. During winter 2020-2021 a total of 176 acres were removed. Work will continue during winter 2021-2022. Funding partners include WGBGLC and WGFD Trust Fund.

Powder River/Pumpkin Buttes Mule Deer GPS Collar Study (Goal 3) - Cheyenne Stewart, Tim Thomas, Erika Peckham, Zach Turnbull



Figure 148. *Helicopter capture crew flying over Interstate-90.*

In 2021, the second full year of the Powder River Deer Study was conducted. We continued to monitor 85 GPS-collared doe mule deer along the Interstate-90, Interstate-25, and Highway 16 corridors. Mortality rates remained unusually high, especially for deer in the Interstate-90 corridor. Seven new deer were captured in December and all collars will drop off in November 2022. Sawyer and Telander prepared a report titled “Surface Disturbance and Mule Deer Seasonal Range Use along the Interstate-90 Corridor” using data collected from this project. Funding was provided by WGFD MDI.

Sand Creek WHMA Grazing Treatment (Goal 2) - Brad Sorensen and Seth Roseberry

A spring grazing treatment was conducted on the Sand Creek PAA in 2021 to manage noxious weeds; this is the seventh year of this agreement. Spring grazing in conjunction with a summer herbicide treatment helps manage noxious weeds and facilitate growing opportunities for preferred plant species. This

treatment encompassed a high-intensity, short duration approach of 142 AUMs for approximately 11 days. This treatment will reduce litter and stimulate growth on the PAA. It will also assist Habitat and Access personnel in the management and reduction of noxious weeds. In exchange for grazing, the neighboring ranch allows 2.5 miles of public fishing access. While fitting into the cooperators seasonal grazing plan, this grazing exchange is a great example of the many beneficial partnerships WGFD fosters with private landowners.

Sheridan Region PAAs (Goals 1 and 2) - Brad Sorensen and Seth Roseberry



Figure 149. *Tongue River Canyon PAA.*

PAAs serve as critical recreational areas for the public and sportsmen alike. Yearly maintenance and upgrades are necessary to preserve these areas and infrastructure. 2021 was a unique year to say the least; outdoor recreationists visited many PAAs at record levels. Sheridan Region PAAs as a whole required increased frequency of site visits and maintenance, along with heightened practices to help maintain sanitary conditions amidst Covid19. In addition, boat docks and floating fishing docks were installed on Healy, Osage Pond and LAK PAAs. Muddy Guard 1 & 2, LAK, Healy and Red horse received road repairs and road blading to improve drivability and manage water runoff.

Noxious Weed Control on Commission Lands (Goals 1 and 2) - Seth Roseberry and Brad Sorensen

Approximately 72 acres of invasive plants were treated by Sheridan Region personnel and contractors on WGFC-managed properties in 2021. These invasive plants were treated using chemical, mechanical, and biological methods to stress the plants. Controlling these noxious plants will enhance habitat while allowing native plants to thrive.

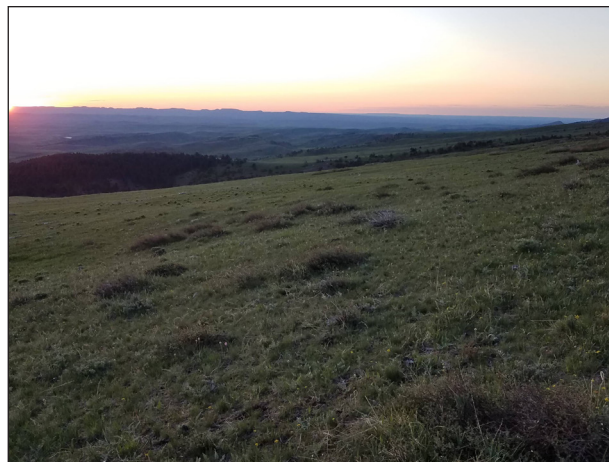


Figure 150. *Kerns WHMA.*

WHMA Invasive Annual Grass Treatment (Goals 1 and 2) - Todd Caltrider and Seth Roseberry

There are four WHMAs on the east side of the Bighorns within the Sheridan Region: Kerns, Amsden, Bud Love and Ed O. Taylor. These areas provide crucial habitat for wildlife along with key public access points to adjacent state and federal lands. In 2016 Sheridan County and northeast Wyoming became ground zero for two highly invasive annual grasses: ventenata and medusahead. Managers quickly realized the threat to forage production and utilization these two species posed and began to map and



Figure 151. *Kerns WHMA invasive annual grass access road treatment.*

treat known acreages. WHMAs in the Sheridan Region became areas of concern for both treatment and prevention to protect critical big game habitats. Utilizing ground and aerial application of Indaziflam and Imazapic to control ventenata, cheatgrass, and medusahead, WGFD began efforts to minimize the spread and impact on native ranges. Treatments were prioritized by invasive grass species and infestation scale to protect the most threatened habitat first. Treatment locations include large acreages of native rangeland along with access routes that are likely vectors for species spread. Controlling invasive annual grasses requires a long-term commitment, which includes monitoring, and multiple re-treatments. The total project is anticipated to last 10+ years through several phases depending on eradication success and will total

over 2,700 acres of WHMA lands.

With funding contributions from RMEF, WGBGLC, WGFD and cooperation with Sheridan County Weed and Pest over 748 acres of ventenata and cheatgrass were treated on the Bud Love WHMA through aerial applications. An additional 5 acres of access roads on the Kerns WHMA was also treated by WGFD personnel.

Sheridan Region WHMAs (Goal 1) - Brad Sorensen and Seth Roseberry

Annual maintenance and improvements continued on the five WHMAs in the Sheridan Region in 2021. The Kerns, Amsden, Bud Love, Ed O. Taylor and Sand Creek WHMAs received annual fence maintenance on a total of 40 miles to reduce trespass livestock and minimize wildlife conflicts with private landowners. 104 acres of irrigation water rights were spread on the Amsden and Bud Love WHMAs. Annual parking lot and road maintenance was performed. Over 20,000 acres of WGFC managed property rights were monitored. Approximately 108 acres of noxious weeds were treated by WGFD personnel and contract applicators.



Figure 152. *Bud Love WHMA electric drift fence.*

Sheridan Walk-In Areas Ventenata Treatment (Goal 2) - Todd Caltrider

The WGFD's Walk-In hunting program provides thousands of acres of public hunting access on private land. Recently, ventenata was discovered in Sheridan and Campbell Counties, and has been found in many of the Walk-In areas in both counties. Ventenata is a highly invasive annual grass that is a huge concern to land managers in the west. Similar to cheatgrass, it is a winter annual that reproduces rapidly, decreases rangeland productivity and increases the risk of wildfire. What separates ventenata from invasive brome grasses is its extremely aggressive rate of invasion and limited palatability. Ventenata has been known to outcompete monoculture stands of cheatgrass and quickly become the dominant species. Ventenata has very limited forage value to livestock or wildlife, due to its high silica content. The purpose of this project is to reduce the spread of ventenata in Sheridan County to maintain quality wildlife

habitat and reduce the risk of sportsmen carrying the seed to other areas of Wyoming. During the summer 2021, WGFD treated 7,522 acres of publicly accessible private and state lands. Treatments occurred via helicopter with indaziflam (Rejuvra) herbicide applied at a rate of 5 oz/acre. Funding was provided by RMEF, WGFD, WGBGLC, WWNRT, NRCS, NFWF, Sheridan County Weed and Pest, and BLM.



Figure 153. *Aerial herbicide applicator stopping to refuel.*

Supplementing Beaver on Sourdough Creek (Goal 2) - Travis Cundy



Figure 154. *Supplemental beaver release on Sourdough Creek.*

Four beavers were released to Sourdough Creek on the Bighorn National Forest during 2021 where their dam building activities can help raise the streamside water table, increase soil moisture availability and improve riparian vegetation growth. In 2020, five beavers were released on the stream to initiate a new colony. No evidence of the previously released beaver were evident near the 2020 release site during summer 2021, which prompted this supplemental release.

Southern Bighorn Mountains Curl-Leaf Mountain Mahogany Restoration (Goal 2) - Todd Caltrider

The Southern Bighorn Mountains Curl-leaf Mahogany Restoration project is a long-term effort initiated by the WGFD and the BLM. This project was started in 2011 as a response to the Outlaw Cave fire in 2006, where 815 acres of curl-leaf mountain mahogany stands were lost due to wildfire. Although wildfire is a natural part of the ecosystem, increased conifer encroachment in curl-leaf mountain mahogany stands increased the ability of wildfire to effectively burn and kill large stands of curl-leaf mountain mahogany. Following the fire, there has been observed regeneration of curl-leaf mountain mahogany, but recruitment is slow and sparse in density compared to the original stands. Curl-leaf mountain mahogany is crucial winter forage for mule deer within the Middle Fork Powder River Management Area (part of this project area). Protecting curl-leaf mountain mahogany stands from catastrophic wildfires is critical to protecting mule deer winter forage resources in the southern Bighorn Mountains. Since 2011, a total of 3,542 acres of mountain mahogany habitat has been treated by removing conifer encroachment in the southern Bighorn Mountains by both the BLM and WGFD (see Figure 155). Co-



Figure 155. *Before and after conifer removal.*

the project area. Future plans are to burn these slash piles to further reduce the fuel loading in Curl-leaf mountain mahogany stands on EK Mountain. This project was made possible by contributions from WGFD, WWNRT and BLM.

Southern Johnson County I-25 Wildlife Fencing and Connectivity (Goal 3) - Todd Caltrider and Zach Turnbull

WGFD and WYDOT collaborated on a monitoring project to assess the effects of installing game proof fencing on big game movement patterns across I-25 between Kaycee and Buffalo. Mule deer mortality due to vehicle collisions on I-25 between Kaycee and Buffalo is one of the highest in the state and a high priority for mitigation as identified by the public during the Upper Powder River Mule Deer Initiative public input meetings. To assess the potential effects of game proof fencing along I-25 on big game movement trail cameras, which were provided by the Western Transportation Institute, have been collecting images of big game movement along I-25 for the past 3 1/2 years. The trail cameras were installed at existing below grade structures currently used by big game to pass under I-25. Funding was provided by the BLM. Remote cameras were removed in April 2021.



Figure 156. *Buck mule deer use of underpass documented by the camera study.*

Spring Creek Grazing Association Rangeland Improvements (Goal 2) - Todd Caltrider

This project assists the Spring Creek Grazing Association with rangeland improvements designed to facilitate better grazing management and improve wildlife habitat and connectivity in Thunder Basin National Grasslands. The Association is a collaborative comprised of private landowners in the Spring Creek drainage who lease grazing on USFS land northeast of Gillette, WY. The Spring Creek portion of the Thunder Basin National Grasslands lies in the Gillette Sage Grouse Core and Connectivity Area(s). In addition to providing valuable habitat for sage-grouse, this area hosts large numbers of big game animals and is a popular hunting area. Project activities include providing cost share to the Association for livestock water development and associated pipelines and materials for building wildlife friend-



Figure 157. *Livestock stock tank with a solar well installed to improve livestock grazing distribution.*

ly cross fences. With the addition of supplemental livestock water facilities and cross fencing, permittees can better manage livestock grazing within these pastures and address problem areas that were previously over utilized. Decreasing utilization on highly productive areas, such as mesic draws, benefit wildlife by increasing hiding cover and increasing forage production. Other activities included assisting the Association with retrofitting existing woven wire fences to a wildlife friendly four wire fence design. This increases habitat connectivity for a variety of wildlife species, especially big game. In 2021, 4 water wells were drilled, 3 livestock watering tanks were installed, 3,966 feet of cross fencing were installed, 4.36 miles of existing fence was modified to a wildlife friendly design, and 3 archaeological clearances were

completed for water development projects. Funding was provided by BLM, NFWF, WWNRT, and WGFD. Work will continue in 2022.

Tongue River Acme Power Plant Diversion Fish Passage (Goal 3) - Travis Cundy

A derelict sheet piling structure is located in the Tongue River alongside the decommissioned Acme Power Plant. The structure served as the cooling water diversion intake for the power plant. It impedes upstream fish passage and boating along the Tongue River. It occurs at river mile 32 above Tongue River Reservoir and is the last unaddressed impediment to fish movements in the river between the mouth of Tongue Canyon at river mile 60 and the Interstate Diversion at river mile 23. A design study was initiated to identify options to eliminate the impediment without exacerbating any environmental contamination concerns around the old power plant. The Sheridan County Conservation District is leading the design contract with funding from the WGFD habitat trust fund. Additional funding partners are being recruited and the implementation of a passage solution is expected during 2022.



Figure 158. *Cooling water intake structure.*

Upper Powder River Aspen (Goal 2) - Todd Caltrider

Aspen communities are highly productive habitats that provide ample forage and cover for mule deer and a variety of wildlife species. Like many areas throughout the west, aspen communities in the Upper Powder River are threatened by climate change, over-browsing, and lack of disturbance. This project is focusing on improving aspen habitats located in spring, summer, and fall seasonal ranges in the Upper Powder River Mule Deer Herd Unit. A large portion of the mule deer in this herd unit migrate to upper elevations in the Bighorn Mountains during the spring, summer and fall seasons to capitalize on productive vegetation. Currently, aspen stands in the Upper Powder River appear to be older age class and recruitment is poor due to excessive ungulate herbivory and increased conifer shading. To perpetuate aspen communities, action must be taken to reduce conifer encroachment and decrease ungulate



Figure 159. *Aspen treatments in Upper Powder River mule deer herd unit.*

herbivory.

The majority of the aspen stands in the Upper Powder River Mule Deer Herd Unit are located off the Hazelton road in the north portion of the herd unit. Land ownership is a mixture of state, BLM and private land and some of the largest aspen stands in the southern Bighorn Mountains can be found here. This project is a cooperative effort between WSF and private landowners to enhance and perpetuate aspen stands. Conifer encroachment will be removed from aspen stands and slash will be managed to reduce ungulate herbivory (i. e. jackstrawing, coarse slash treatment, slash barriers). In 2021, four acres were completed. Additional acres are planned for treatment next year. Funding was provided by WWNRT.

Upper Powder River Mule Deer GPS Collar Study (Goal 3) - Cheyenne Stewart

The project was initiated in December 2018 and field data collection was completed on January 1, 2022. Data analysis will begin in 2022 with results and reporting expected to be completed in 2023.

The goal is to better understand mule deer survival, seasonal movement patterns, recruitment, body condition, and habitat use patterns in the Upper Powder River Mule Deer Initiative herd. This will be accomplished by analyzing data from 70 radio-collared adult doe mule deer over three years, including four annual captures.



Figure 160. *Released deer.*

Upper Powder River Rapid Habitat Assessments (Goal 2) - Todd Caltrider and Zach Turnbull

Sheridan regional personnel completed a total of 11 RHAs in key mule deer habitats in the Upper Powder River mule deer herd unit in 2021. Two riparian RHAs (17 acres), four shrub/rangeland RHAs (2,500 acres), one aspen RHA (18 acres) and four special RHA (158 acres) were completed. The information obtained from these assessments will primarily be used for Herd Objective Reviews (conducted every five years) and annual data will be summarized in Job Completion Reports (compiled annually). These data provide population managers and the public with documentation of the current state of mule deer habitat conditions in the Upper Powder River mule deer herd.

Many personnel contributed to the content of the 2021 Statewide Habitat Plan Annual Report. Thank you to all those who contributed. This report was compiled and edited by Ian Tator, Paul Dey, Ray Bredehoff, and Chelsea Ramage.

APPENDIX A

Statewide Habitat Plan Implementation

The SHP, found at <https://wgfd.wyo.gov/Habitat/Habitat-Plans/Strategic-Habitat-Plan>, is implemented annually by biologists and managers from throughout the WGFD. The Habitat Technical Advisory Group, comprised of program managers, is responsible for updating the plan, annually reviewing project proposals, making funding recommendations, and ensuring that WGFD activities are directed toward achieving SHP goals, strategies, and actions. To track progress toward achieving SHP actions, in 2021 the HTAG began assessing progress on goals as a standing agenda item for each meeting. The team started by reviewing progress toward Goal 1, Strategies I-III in March and progressed through Goal 2, Strategy II at the December meeting. Meeting notes document discussions and status. The team identified progress occurring on 23 of the 30 Strategies or Actions reviewed (77%). This includes progress on 7 of 9 Actions considered especially relevant to address climate change resiliency. Actions for which little to no progress has occurred include:

- Goal 1.IV.C. Identify IF segments for assessment to determine if they have been impacted by junior water users.
- Goal 1.V.A. Create or re-assign a position devoted to water management issues
- Goal 1.V.C. Work with partners and legislators to find and implement water management solutions
- Goal 1.V.E. Pursue acquisition of water rights as water law and public acceptance allow
- Goal 2. I. B. Conduct a statewide riparian habitat assessment to determine resilience and climate vulnerability
- Goal 2. I. C. Conduct a widespread stream channel assessment to locate and characterize incisions and other functional aspects and identify areas with significant departure from functioning condition
- Goal 2. I. F. Promote and support the development and refinement of stream, riparian, and wetland GIS data products like the National Hydrography Database.

Lack of progress on the Goal 1 actions above is unlikely until additional staff time can be secured with a new position or with re-assignment of duties. The Goal 2 actions should be considered prospects for research projects. In 2022-25, the HTAG will continue reviewing and pushing for progress on all SHP actions.

APPENDIX B

Habitat Program Expenditures

WGFD funds (figures rounded to the nearest \$1,000.00) expended for the on-the-ground projects primarily directed at implementation of Statewide Habitat Plan (SHP) goals and management on WGFC lands during calendar year 2021 (these figures do not include personnel salaries, supplies, materials and equipment used for routine WGFD maintenance and operation and WGFC property tax and lease payments):

WGFD Funds Expended on SHP Goals: \$2,533,000

Non-WGFD funds expended for implementation of SHP goals for calendar year 2021 from or in collaboration with various sources including: 1) Wyoming Wildlife and Natural Resources Trust, 2) USDA Farm Bill federal government funds, 3) other federal government funding programs, 4) other state and local government funding sources, 5) non-governmental organizations, 6) Wyoming Governors Big Game License Coalition, 7) private landowner contributions (including in-kind), 8) corporations and businesses, and 9) private donors.

Non-WGFD Funds Expended on SHP Goals: \$8,005,000

Grand Total for SHP Goals: \$10,538,000

WGFD applied funding from outside sources amounting to approximately \$3.16 for each WGFD dollar expended for on-the-ground fish and wildlife habitat activities. This outside funding is critical for implementing the SHP and conserving our wildlife resources. Overall, personnel directly involved in implementing SHP goals oversaw spending of approximately \$13,731,000 of WGFC funds, State Wildlife Grants from US Fish and Wildlife Service, WGFC Trust Funds, and other Grant monies. This figure includes wages, benefits, equipment, operation expenses, supplies and on-the-ground improvement material expenses allocated as follows: approximately 54% for personnel, which includes habitat inventories, monitoring, project contract oversight, project design and implementation and promoting collaborative habitat management efforts with the general public, conservation partners, private landowners and land management agencies. Without the dedication and passion of field personnel, none of these habitat projects would happen. The remainder of the funding was allocated as follows: 5% for vehicles and heavy equipment and 41% for materials and supplies.

Personnel overseeing the WGFD Education, Information and Publications Programs spent approximately 12.5% of their time in 2021 on SHP goal activities, totaling just over \$320,000 of WGFD maintenance and operating funds.

Lastly, personnel within the Lands Administration Branch conduct WGFC property rights monitoring, property rights acquisition and disposal, payment of WGFC property taxes on each county and lease payments to the OSLI. Property taxes paid to counties by the WGFC in 2021 totaled approximately \$735,000.00. These taxes include WGFC owned state offices, fish hatcheries, bird farms, houses, WH-MAs and PAAs.

APPENDIX C

HPP WER Tables

During the Calendar year 2021, HPP completed 553 Wildlife Environmental Reviews (WERs) for federal, state, local government, and private sector proponents. The majority of these reviews were completed for state and private sector project proponents (42.31% and 37.61% respectively). HPP completed 183 WERs for Sage-grouse Executive Order compliance and 23 WERs for Mule Deer and Antelope Migration Corridor Executive Order compliance. The project types most frequently reviewed by HPP were related to roadwork/fences, mining, municipal planning and development, and oil and gas.

Federal WERs			
Sender	# of WERs	Percentage	% of Total
Animal and Plant Health Inspection Service	1	2.04%	0.18%
Bureau of Land Management	19	38.78%	3.44%
Bureau of Reclamation	1	2.04%	0.18%
Federal Energy Regulatory Commission	1	2.04%	0.18%
National Park Service	1	2.04%	0.18%
Natural Resources Conservation Service	3	6.12%	0.54%
U.S. Army Corps of Engineers	2	4.08%	0.36%
U.S. Fish and Wildlife Service	5	10.20%	0.90%
U.S. Forest Service	14	28.5%	2.53%
Western Area Power Administration	1	2.04%	0.18%
WY Army National Guard	1	2.04%	0.18%
Total	49		8.86%

State WERs			
Sender	# of WERs	Percentage	% of Total
Office of State Lands and Investments	44	18.80%	7.96%
State Engineer's Office	5	2.14%	0.90%
Quality	54	23.08%	9.76%
Wyoming Department of Transportation	124	52.99%	22.42%
Wyoming Game and Fish Department	7	2.99%	1.27%
Total	234		42.31%

Local Government WERs			
Sender	# of WERs	Percentage	% of Total
City/Town	17	27.42%	3.07%
County	45	72.58%	8.14%
Total	62		11.21%

Private Sector WERs			
Sender	# of WERs	Percentage	% of Total
Company	118	56.73%	21.34%
Consultant	89	42.79%	16.09%
Landowner	1	0.48%	0.18%
Total	208		37.61%

APPENDIX D

Habitat Program Accomplishments: The Numbers

Activities resulting in on-the-ground accomplishments and promotion of collaborative habitat efforts, directed toward the habitat program during the calendar year 2021 are summarized below:

Activity	2021 Accomplishments	5 Year Average Accomplishments
Stream and Riparian Activity		
BDAs installed	44	14
BDAs maintained	24	20
Beaver transplanted	26	16
Detailed stream assessments	45 on 7 miles	20 on 5 miles
Detailed stream channel and riparian monitoring	29 on 21 miles	12 on 7 miles
Fish barrier installed	0	1
Fish barriers inventoried	7	51
Fish passage structures installed	15	10
Fish passage structures maintained	4	12
Fish passage structures monitored	58	18
Fish passage upstream miles connected	94 miles	62 miles
Fish screens installed	0	1
Fish tracking or entrainment investigations	9	4
Instream flow segments	0 on 0 miles	1 on 5 miles
Instream flow studies	0	1
Instream structures installed	77	46
Post-stream project reach channel/riparian monitoring	21 miles	12 miles
Public fishing access projects	8	13
Riparian protection and management	1 on 0.5 miles	3 on 1 miles
Stream flow measurements	51	59
Stream restoration projects maintained	0	5
Stream restorations or bank enhancements	19 on 4 miles	15 on 4 miles
Stream temperature monitoring sites	36	24

Activity	2021 Accomplishments	5 Year Average Accomplishments
Survey or design for stream restoration	14 on 2 miles	14 on 5 miles
Watershed stream assessments	32 on 64 miles	14 on 52 miles
Habitat and Upland Activity		
Annual vegetation production utilization sites	52	37
Aspen Rapid Habitat Assessment	45; 4,652 acres	67; 4,698 acres
Aspen, cottonwood, willow browse monitoring	0	5
BLM, RMP, or USFS Cooperator Status	3	4
Conservation easements in progress and acquired	149 acres	136 acres
Exclosures maintained	9	55
Fences installed	112 miles	57 miles
Fences maintained	48 covering 50 miles	67 covering 225 miles
Funding applications prepared for other entities	8	21
Funding sources/contracts/grants administered	155	181
Group training and continuing education	13	10
Herbicide vegetation to thin sagebrush	0 acres	434 acres
Herbicide weed treatments	100,278 acres	63,033 acres
Land management plan participation	3	2
Livestock Grazing Management or Wildlife Habitat Stewardship Plans	8	11
Mechanical shrub treatments	692 acres	1,226 acres
Mowing, chopping, ripping, aerator treatments	1,061 acres	3,032 acres
Noxious weed control	164,610 acres	57,925 acres
Post-management prescription monitoring	31 on 94,840 acres	13 on 42,183 acres
Post-vegetation treatment monitoring	183 sites; 119,011 acres	160 sites; 101,595 acres
Pre-vegetation treatment monitoring	96 sites; 17,172 acres	160 sites; 101,595 acres
Prescribed burns	690 acres	1,128 acres
Private landowner contacts	237	363
Private landowner/permittee contacts yielding projects	75	83
Rangeland Rapid Habitat Assessment	59; 14,856 acres	69; 25,636 acres
Riparian Rapid Habitat Assessment	33 on 625 acres	24 on 746 acres
Riparian research studies	0	3
Special Rapid Habitat Assessment	17; 4,780 acres	12; 3,713 acres
Spring developments	0	3
Technical assistance requests	62	97
Trees or shrubs planted	21,337 on 10,074 acres	17,534 on 4,821 acres
Upland exclosure developed	1	5
Upland grass, forb, and food plot seeding	0 acres	407 acres
USDA Farm Bill contract involvement	6	11

Activity	2021 Accomplishments	5 Year Average Accomplishments
Upland habitat inventories (e.g. GIS)	45 on 1,557 acres	45 on 45,272 acres
Water guzzlers or water tanks installed	4	4
Water pipelines installed	0 miles	0.7 miles
Water wells converted to solar pumps	1	0.4
Water wells drilled	5	2
Wetland delineations	1 on 0.6 acres	4 on 18 acres
Wetland development and renovation	3 on 570 acres	35 on 581 acres
Wildlife crossing assessment	0	1
Wildlife crossing monitoring	10	8
Wildlife crossing structure installed	8	11
Wildlife field cooperative research projects	33	37
Feedgrounds maintained	21	19

APPENDIX E

Accomplishments on Wyoming Game and Fish Commission Owned Land

WGFD accomplished the following metrics on WGFC-owned land in 2021:

Activity	2021 Accomplishments	5 Year Average Accomplishments
Access improvements	8	8
Farming contracts	22 on 1,335 acres	10 on 1,240 acres
Fence maintained	81 on 231 miles	55 on 1,065 miles
Fences installed or converted	8 miles	8 miles
Food plot	10 on 290 acres	7 on 257 acres
Lands grazed	26,934 acres	71,239 acres
Irrigated	1,015 acres	3,463 acres
Irrigation upgrades	4 on 174,240 feet	12 on 47,985 feet
Livestock/forage reserve/meadow rejuvenation grazing	12 on 46,409 acres	20 on 61,815 acres
Meadow enhancement	0	4 on 13 acres
Meadow mowed/farmed	18 on 1,219 acres	11 on 1,313 acres
Noxious weed control	4,200 acres	3,662 acres
Prescribed burn	103 acres	82 acres
Property right monitoring	100 on 119,569 acres	53 on 67,100 acres
Road maintenance	54 on 48 miles	63 on 135 miles
Sign installation	61	117
Spring development	0	1
Water control structures	14	9
Weeds treatments	0	35,277 acres
Wells converted	1	1

APPENDIX F

SHP Report Miles and Acres

Summary Methodology

Miles and acres summaries reported in the annual statewide habitat plan report, and used for reporting progress toward department statewide plan goals, are generated from information provided by aquatic, terrestrial and habitat and access biologists. Biologists, as part of their annual reporting duties, enter information into the SHP Habitat Plan project database (also referred to as the Project Viewer). This web-based database was developed and is maintained by the Wyoming Geographic Information Science Center at the University of Wyoming. Project data entry occurs in February and covers activities from the previous calendar year. Entries are solicited via an early January email request, typically from the Statewide Habitat Manager Office Manager, to employees who work on habitat issues. Biologist enter information about projects (project defined as an effort requiring at least three days effort), and “widgets” (efforts less than 3 days or items that are not project-related). The entry information for projects includes text and photos to use in the annual printed report. Other entered information identifies the project lead, funding partners and amount expended in the calendar year, and goals.

Source data for miles and acres is from project activities and widgets entered by biologists. Biologists identify a category for each project entry: Assessment and Inventory, Habitat Protection, Maintenance, Monitoring, Project Implementation, Research, and Technical Assistance. Within each category, biologists choose project activity type. The entry is completed by entering a point, or drawing a line or polygon indicating project location and extent. Depending on activity type, the user is prompted to indicate a count (e.g. number of structures), and an amount (e.g. stream miles of restoration). The program also calculates counts and amounts from the number and extent of points, lines or areas. Most miles and acres come from projects; however, there are a few monitoring activities under widgets that also contribute. These include: “Post-stream project reach channel/riparian monitoring” (miles), “post-management prescription monitoring” (acres), “post-vegetation treatment monitoring” (acres), and “post-treatment monitoring” (acres).

Three individuals, consisting of the aquatic and terrestrial program managers, and the habitat and access section chief, review all entries from the employees in their respective programs. Reviewers edit report text and ensure all the fields are fully completed. This includes ensuring adequate photos are attached and shape files were created or attached. Entries are examined to ensure the proper category and activities are identified for the given project. For example, if a project is entered under the “Project Implementation” category, but no on-the-ground work occurred in the calendar year, the category might be changed to “Assessment and Inventory”. For individual biologists, program managers review projects and widgets to ensure that the same activity is not counted twice. When done reviewing, program managers either send the project back to the biologist for further editing or approve it. Approving the project signals the Office Manager that the report text is ready for compilation into the annual report, and the funding and activity information is ready for summarization.

The terrestrial and aquatic program managers perform independent summaries of miles and/or acres activities, focused on the activities that largely occur within their respective programs. The terrestrial program manager compiles the acres summary and the aquatic program manager completes the miles of stream summary. Summaries are generated through a reporting feature in the SHP database that

generates a CSV file containing all project and widget activities.

For compilation of aquatic miles, the CSV file is sorted by the Aquatic Habitat Program manager to isolate the ten stream length activities to be summed (Table 1). Entered stream distances, rather than stream distances calculated from traced line segments, were used to determine overall total stream mileage. Ideally, calculated values would be used because they can easily be verified. However, biologists commonly already have previously measured stream distances that accurately represent lengths. In fact, these are often directly measured in the field. Therefore, only entered values were used.

For compilation of riparian and upland habitat acres, the CSV file is sorted by the Terrestrial Habitat Program manager to isolate the 27 activities to be summed (Table 2). Entered acres, rather than acreage calculated from traced polygons, were used to determine overall total acres treated.

Table 1. Categories and activities summed to generate miles of stream habitat activity.

Category	Activity
Assessment and Inventory	Stream reach assessment (Rosgen survey, HQI, etc.)
	Stream restoration or passage design
	Watershed assessment (WHAM)
Project Implementation	Beaver dam analogs installed (stream distance influenced)
	Beaver restoration (stream distance influenced)
	Fish passage miles connected
	Stream restoration or bank enhancement
	Riparian protection, enhancement or management (<0.5 mile wide along stream)
Monitoring	Post-stream project reach channel/riparian monitoring
Habitat Protection	Instream flow filing segments

Use the following table for acres.

Table 2. Categories and activities summed to generate acres of riparian and upland habitat activity.

Category	Activity
Assessment and Inventory	Aspen Rapid Habitat Assessment
	Rangeland Rapid Habitat Assessments
	Riparian Rapid Habitat Assessments
	Special Rapid Habitat Assessments
Project Implementation	Herbicide treatment to thin sagebrush
	Herbicide weed treatments
	Livestock grazing management plans or wildlife habitat stewardship plans
	Mechanical shrub treatment
	Mechanical tree removal
	Mowing, chopping, and Lawson aerator treatments
	Noxious weed control
	Prescribed burns
	Riparian habitat protection, enhancement, and management
	Trees or shrubs planted

	Upland exclosure developed
	Upland grass, forb, and food plot seeding
	Upland habitat assessment (GIS)
	Wetland development or major renovation
	WGFC managed lands farming contract
	WGFC managed lands food plot
	WGFC managed lands forage reserve
	WGFC managed lands grazed
	WGFC managed lands irrigated
	WGFC managed lands meadow mowed/farmed
	WGFC managed lands noxious weed control
	WGFC managed lands weed treatment
	WGFC prescribed burns
Monitoring	Aspen, cottonwood, and willow browse monitoring
	Post-management prescription monitoring
	Post-vegetation treatment monitoring
	Pre-vegetation treatment monitoring
Habitat Protection	Conservation easements in process and acquired
	Fee title acquisition

Personnel Directly Implementing The Statewide Habitat Plan

Administration or Statewide, 5400 Bishop Blvd., Cheyenne, WY 82006

Aquatic Habitat

Paul Dey, Aquatic Habitat Program Manager, Cheyenne	(307) 777-4505
Lara Gertsch, Aquatic Habitat Supervisor, Ten Sleep	(307) 684-5607
Del Lobb, Instream Flow Biologist, Cheyenne	(307) 777-4559
Nick Scribner, Fish Passage Coordinator, Lander	(307) 335-2641
Erin Sobel, Fish Passage Biologist, Cody	(307) 527-7322

Wyoming Landscape Conservation Initiative

Jim Wasseen, Coordinator, Rock Springs	(307) 352-0313
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Habitat and Access

Eric Wiltanger, Chief, Cheyenne	(307) 777-4551
Ray Bredehoft, Branch Chief, Cheyenne	(307) 777-4682

Conservation Engineering

Loren Woodin, Conservation Engineering Branch Chief, Cheyenne	(307) 777-4582
Darby Schock, Sr. Professional Land Surveyor, Cheyenne	(307) 777-4622
Daniel McGillivary, Project Engineer, Pinedale	(307) 367-4347

Statewide Habitat Access Crew

Todd Grosskopf, Supervisor, Cheyenne	(307) 777-4537
Kade Clark, Coordinator, Jackson	(307) 259-5812
Rick Harmelink, Biologist, Lander	(307) 332-2688
Mac Foos, Biologist, Casper	(307) 233-6404
Brandon Werner, Biologist, Casper	(307) 733-2321

Lands Administration

Roy Weber Supervisor, Cheyenne	(307) 777-3356
Brian Rognon, Appraisal Reviewer, Lander	(307) 335-2606

Statewide Terrestrial Habitat

Ian Tator, Terrestrial Habitat Program Manager, Cheyenne	(307) 777-4565
Chelsea Ramage, Office Manager, Cheyenne	(307) 777-4576
Jill Randall, Migration Coordinator, Pinedale	(307) 367-4353
Noelle Smith, Migratory Game Bird and Wetland Habitat Biologist, Lander	(307) 335-2637

Information and Publications

Sara DiRienzo, Public Information Officer	(307) 777-4540
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Casper Region - 3030 Energy Lane, Casper, WY 82601

Aquatic Habitat

John McCoy, Aquatic Habitat Biologist	(307) 473-3424
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Habitat and Access

Matt Pollock, Coordinator	(307) 473-3426
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Terrestrial Habitat/Wildlife Research

Justin Binfet, Wildlife Management Coordinator	(307) 473-3408
Willow Bish, Terrestrial Habitat Biologist, Douglas	(307) 298-2269
Heather O'Brien, Wildlife Biologist	(307) 473-3416

Cody Region - 2820 State Hwy 120, Cody, WY 82414

Aquatic Habitat

Laura Burckhardt, Aquatic Habitat Biologist (307) 527-7322, ext. *829

Habitat and Access

Brad Sorensen, Supervisor (307) 527-7322, ext. *818

Craig Swanson, Biologist (307) 527-7322, ext. *834

Eric Shorma, Biologist, Lovell (307) 527-7125, ext. *834

Terrestrial Habitat/Wildlife Research

Corey Class, Wildlife Management Coordinator (307) 527-7125

Jerry Altermatt, Terrestrial Habitat Biologist (307) 527-7322, ext. *813

Bart Kroger, Wildlife Biologist (307) 347-2997

Eric Maichak, Regional Disease Biologist (307) 527-7125

Sam Stephens, Wildlife Biologist, Greybull (307) 765-2313

Green River Region - 351 Astle, Green River, WY 82935

Terrestrial Habitat/Wildlife Research

Sean Yancey, Wildlife Management Coordinator (307) 875-3223

Kevin Spence, Terrestrial Habitat Biologist (307) 875-3225, ext. 8621

Jeff Short, Wildlife Biologist, Fort Bridger (307) 782-6810

Jackson Region - Box 67, Jackson, WY 83001

Aquatic Habitat

Anna Senecal, Aquatic Habitat Biologist (307) 733-2383, ext. 235

Habitat and Access Maintenance

Derek Lemon, Coordinator (307) 249-5820

Wildlife Research

Doug McWhirter, Wildlife Management Coordinator (307) 733-2321 ext. 230

Aly Courtemanch, Wildlife Biologist (307) 733-2383

Gary Fralick, Wildlife Biologist (307) 883-2998

Lander Region - 260 Buena Vista, Lander, WY 82520

Aquatic Habitat

Joanna Harter, Aquatic Habitat Project Biologist (307) 332-7723

Habitat and Access

Brian Parker, Supervisor (307) 335-2612

Justin Rhine, Biologist (307) 335-2640

Miles Proctor, Biologist, Dubois (307) 455-2421

Kevin Howard, Biologist, Dubois (307) 455-2421

Terrestrial Habitat/Wildlife Research

Daryl Lutz, Wildlife Management Coordinator (307) 335-2616

Amy Anderson, Terrestrial Habitat Biologist (307) 335-2604

Greg Hiatt, Wildlife Biologist (307) 324-2116

Stan Harter, Wildlife Biologist (307) 332-2688

Laramie Region - 1212 S Adams, Laramie, WY 82070

Aquatic Habitat

Christina Barrineau, Aquatic Habitat Biologist (307) 721-1372

Habitat and Access

Jerry Cowles, Supervisor (307) 721-1378

Micah Morris, Biologist (307) 721-1388

Jacob Sorensen, Biologist, Yoder (307) 532-2387
 Mark Cufaude, Biologist, Saratoga (307) 326-3225

Terrestrial Habitat/Wildlife Research

Martin Hicks, Wildlife Management Coordinator (307) 745-4046
 Britt Burdett, Terrestrial Habitat Biologist, Saratoga (307) 760-0489
 Ryan Amundson, Terrestrial Habitat Biologist, Wheatland (307) 331-0787
 Lee Knox, Wildlife Biologist (307) 745-4046
 Teal Cufaude, Wildlife Biologist, Saratoga (307) 326-3020

Pinedale Region - 117 S. Sublette Ave., Pinedale, WY 82941

Aquatic Habitat

Luke Schultz, Aquatic Habitat Biologist (307) 367-4347, ext. 243

Habitat and Access

Miles Anderson, Supervisor (307) 367-4347, ext. 225
 Kyle Berg, Biologist (307) 367-4347, ext. 252
 Chris Evans, Specialist (307) 367-4347

Terrestrial Habitat/Wildlife Research

Brandon Scurlock, Wildlife Management Coordinator (307) 367-4347, ext. 224
 Troy Fieseler, Terrestrial Habitat Biologist (307) 367-4353
 Dean Clause, Wildlife Biologist (307) 367-4353

Habitat Mitigation

Kerry Gold, Habitat Mitigation Biologist, Jonah Interagency Office (307) 367-5387

Sheridan Region - 700 Valley View, PO Box 6249, Sheridan, WY 82801

Aquatic Habitat

Travis Cundy, Aquatic Habitat Biologist (307) 672-8003, ext. 230

Habitat and Access Maintenance

Seth Roseberry, Coordinator (307) 672-8003, ext. 240

Terrestrial Habitat/Wildlife Research

Cheyenne Stewart, Wildlife Management Coordinator (307) 672-7418
 Todd Caltrider, Terrestrial Habitat Biologist, Gillette (307) 283-3410
 Tim Thomas, Wildlife Biologist (307) 627-7418
 Zach Turnbull, Wildlife Biologist, Buffalo (307) 684-2801
 Erika Peckham, Wildlife Biologist, Gillette (307) 670-8164

List of Acronyms

AOP - Aquatic Organism Passage	WGBGLC - Wyoming Governor's Big Game License Coalition
AUM - Animal Unit Mouth	WGFC - Wyoming Game and Fish Commission
BANCs - Bank Assessment for Non-point source Consequences of Sediment	WGFD - Wyoming Game and Fish Department
BDA - Beaver Dam Analog	WHMA - Wildlife Habitat Management Area
BLM - Bureau of Land Management	WLCI - Wyoming Landscape Conservation Initiative
BOR - Bureau of Reclamation	WMA - Wildlife Management Area
BOW - Bowhunters of Wyoming	WSF - Wyoming State Forestry
BTNF - Bridger-Teton National Forest	WVC - Wildlife-Vehicle Collision
CFS - Cubic Feet per Second	WWDC - Wyoming Water Development Commission
CRM - Coordinated Research Management	WWNRT - Wyoming Wildlife and Natural Resource Trust
CSU -Colorado State University	WYDEQ - Wyoming Department of Environmental Quality
CWD - Chronic Wasting Disease	WYDOT - Wyoming Department of Transportation
DU - Ducks Unlimited	WY-WSF - Wyoming Wild Sheep Foundation
EA - Environmental Assessment	
GPS - Global Positioning System	
HTAG - Habitat Technical Advisory Group	
HQI - Habitat Quality Index	
JIO - Jonah Interagency Mitigation	
JIO-PAPO - Jonah Interagency Mitigation - Pinedale Anticline Project Office	
LPI - Line Point Intercept	
MDI - Mule Deer Initiative	
MFF - Muley Fanatic Foundation	
NEPA - National Environmental Policy Act	
NFWF - National Fish and Wildlife Foundation	
NGO - Non-Governmental Organization	
NRCS - Natural Resources Conservation Service	
NWTF - National Wild Turkey Federation	
OSLI - Office of State Lands and Investments	
PAA - Public Access Area	
PIT - Passive Integrated Transponder	
PVHP - Platte Valley Habitat Partnership	
RHA - Rapid Habitat Assessment	
RMEF - Rocky Mountain Elk Foundation	
ROW - Right-Of-Way	
SGCN - Species of Greatest Conservation Need	
SHP - Statewide Habitat Plan	
SQT - Stream Qualification Tool	
TNC - The Nature Conservancy	
TU - Trout Unlimited	
USFS - U.S. Forest Service	
USFWS - U.S. Fish and Wildlife Service	
USGS - U.S. Geological Survey	
UW -University of Wyoming	
VHF - Very High Frequency	
VMS - Variable Message Signs	
WER - Wildlife Environmental Reviews	
WFW - Water for Wildlife	