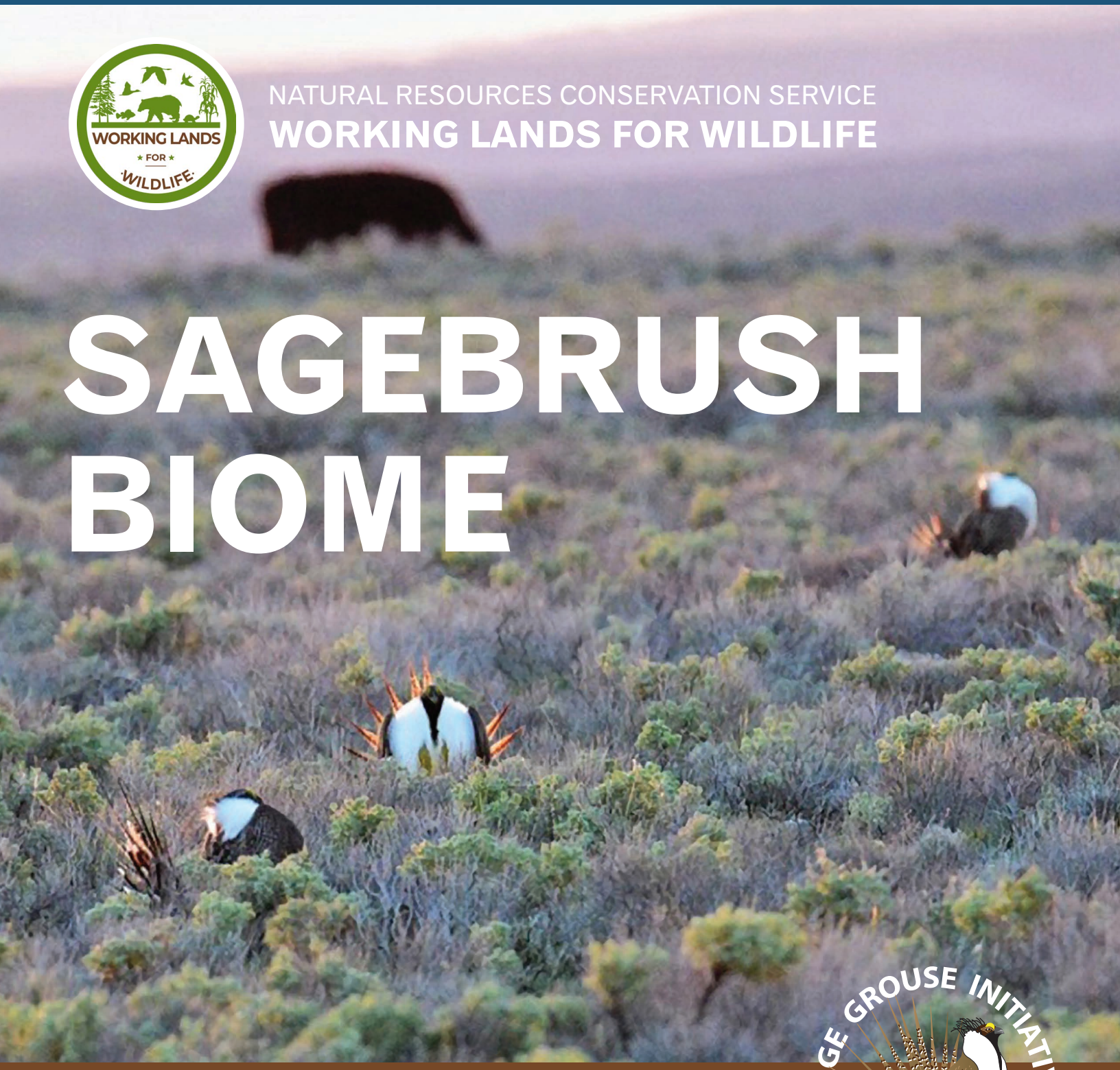
USDA United States Department of Agriculture

NATURAL RESOURCES CONSERVATION SERVICE

WORKING LANDS FOR WILDLIFE

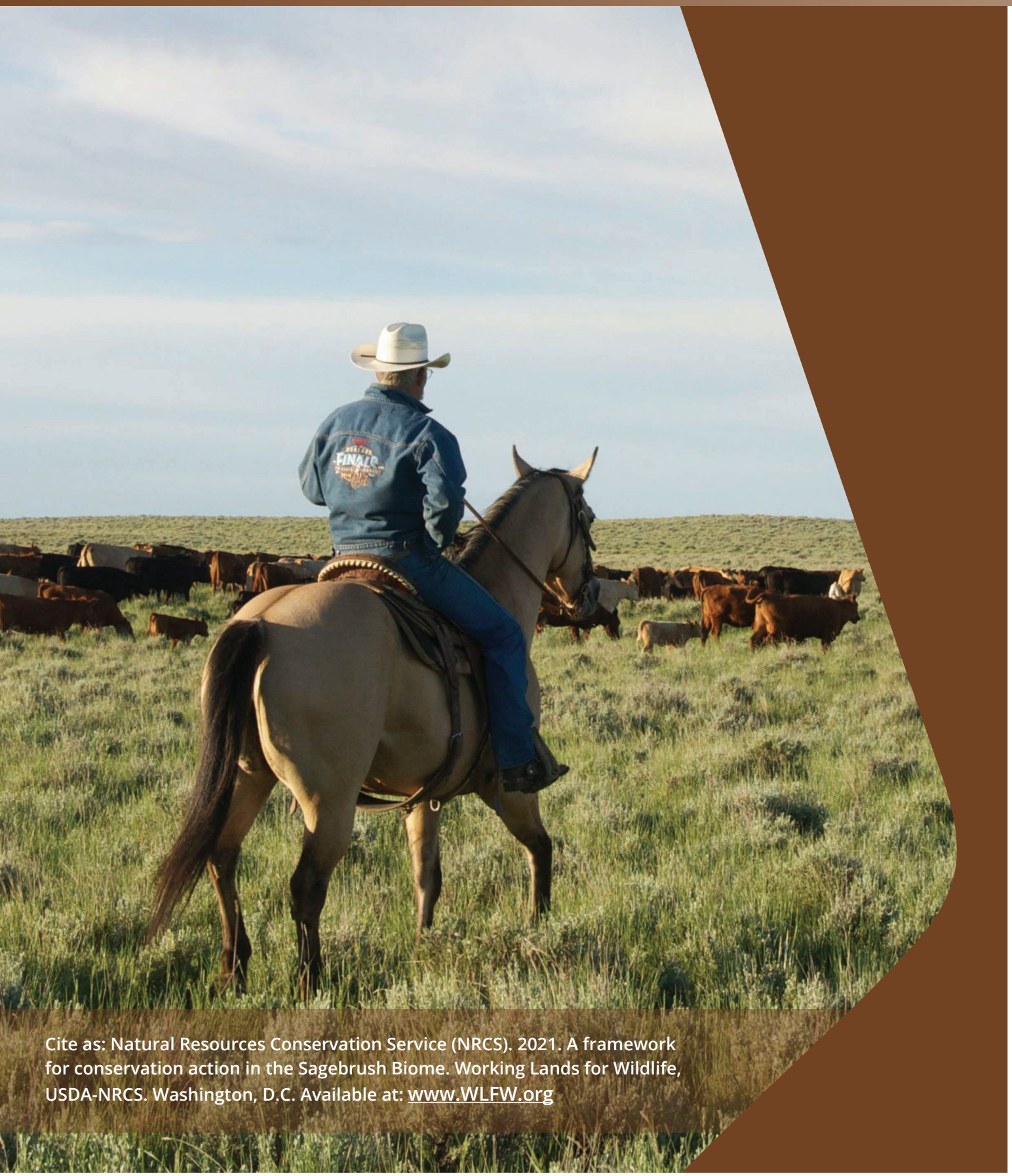
SAGEBRUSH BIOME



SAGE GROUSE INITIATIVE

A FRAMEWORK FOR CONSERVATION ACTION

A Framework for Conservation Action in the Sagebrush Biome



Cite as: Natural Resources Conservation Service (NRCS). 2021. A framework for conservation action in the Sagebrush Biome. Working Lands for Wildlife, USDA-NRCS. Washington, D.C. Available at: www.WLFW.org

Photo: Montana Stockgrowers Association

Cover photo: Ken Miracle



Photo: Tatiana Gettelman

Table of Contents

Conserving Resilient Rangelands for People and Wildlife.....2

About Working Lands for Wildlife.....4

Framework for Conservation Action in the Sagebrush Biome.....6

Threats Addressed In This Framework.....8

Exotic Annual Grass Invasion.....10

Land Use Conversion.....14

Woodland Expansion.....18

Mesic Resource Degradation.....22

This framework is designed to work in concert with a full suite of WLFW-provided online resources (www.WLFW.org) including training, spatial data and scientific publications. Archived technical sessions help staff and partners craft the local solutions represented in this framework. The collection of maps and spatial data enable practitioners to rapidly visualize and analyze opportunities for threat reduction in their local areas. Electronic access to published literature cited throughout this framework enables readers to learn more about the science behind this framework.



Conserving Resilient Rangelands for People and Wildlife

Photo: Mandi Hirsch

Rangelands throughout the world support a diversity of grass, forb and shrub communities. These systems benefit people by providing healthy air, clean water, food and fiber, abundant fish and wildlife habitat, and recreational and cultural values. Covering one out of every three acres in the contiguous U.S., rangelands constitute the lower 48's single largest land use. Grazing by domestic livestock is the common thread that maintains these working rangelands at the ecosystem scale.

Across the western U.S., working rangelands are a primary driver of healthy rural communities and abundant wildlife. While seemingly endless, rangelands are being lost at an alarming rate to land use conversion, woodland expansion, invasive grasses, and dewatering of mesic sites. An ever-growing list of imperiled grassland and shrubland species reflects the continued loss of more than a million acres of working rangelands annually.[1]

"Conservation will ultimately boil down to rewarding the private landowner who conserves the public interest."

—Aldo Leopold, Father of Modern Conservation

- In the West, 70% of all land is rangeland
- 2/3 of this rangeland is privately owned, encompassing the most productive grass and shrublands west of the Mississippi River



Figure 1

Formerly dismissed as 'fly over' country, rangelands today are taking their rightful place as a centerpiece in America's western heritage. Maintaining our nation's rangelands provides an opportunity to reduce climate impacts by storing above- and below-ground carbon across this massive biome.[2] Working rangelands are the glue connecting a patchwork of protected areas that together provide an ecological footprint large enough to sustain nature and people.



Photo: Jeremy Roberts/Conservation Media



About Working Lands for Wildlife

Photo: USFWS

Working Lands for Wildlife (WLFW) is the USDA Natural Resources Conservation Service's (NRCS) premier approach for conserving America's working lands to benefit people, wildlife and rural communities. WLFW uses win-win solutions to target voluntary, incentive-based conservation that improves agricultural productivity and wildlife habitat on working lands. WLFW takes an ecosystem approach, but focal wildlife species guide conservation delivery and are used as barometers for success because they require healthy, functioning ecosystems as habitat. As the world's largest source of conservation funding, the Farm Bill provides the help producers need to make improvements to their working lands. Understanding the Farm Bill's many programs is essential to unlocking its full potential.

WLFW uses co-produced science[3] to develop frameworks that guide conservation actions spanning multiple states and focal species. **Frameworks provide the common vision and coordination to address resource concerns and ecosystem threats across boundaries.** In the western U.S., the Great Plains and Sagebrush frameworks provide a collective roadmap for the conservation of working rangelands. Frameworks build upon past achievements of Lesser Prairie-Chicken and Sage Grouse Initiatives (SGI) that together have conserved 10,309,950 acres of working rangelands with 3,261 participating ranches.

Spatial targeting lies at the heart of WLFW's threat-reduction strategies. WLFW prioritizes proactive conservation in and around intact but

vulnerable rangeland 'core areas'. This focuses efforts in places where they are more likely to be effective and cost efficient, rather than reactive responses in regions that are already highly degraded (Figure 2).

These WLFW frameworks for western rangeland share the same vision: *Wildlife Conservation Through Sustainable Ranching.* As the flagship effort of WLFW, SGI showed what can be achieved through voluntary conservation, helping reduce threats at unprecedented scales, benefiting wildlife, and precluding the need for listing sage grouse under the Endangered Species Act.[4,5] Interwoven in these frameworks are lessons learned from a decade of WLFW implementation, along with new science and technology that inform the how we deliver conservation.

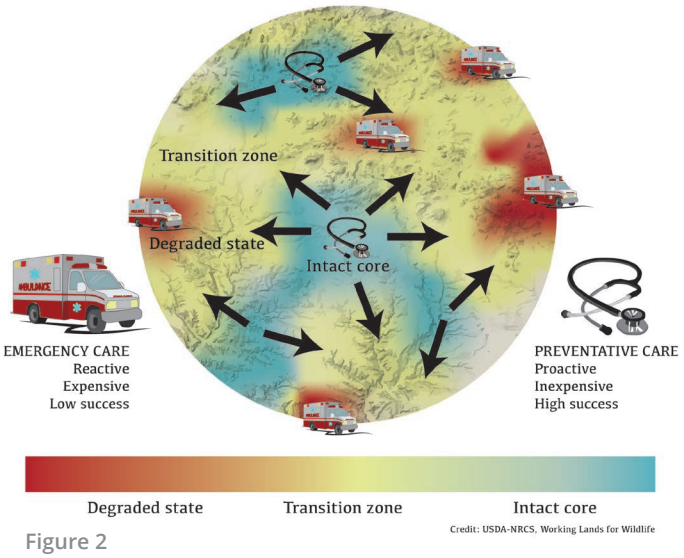


Figure 2

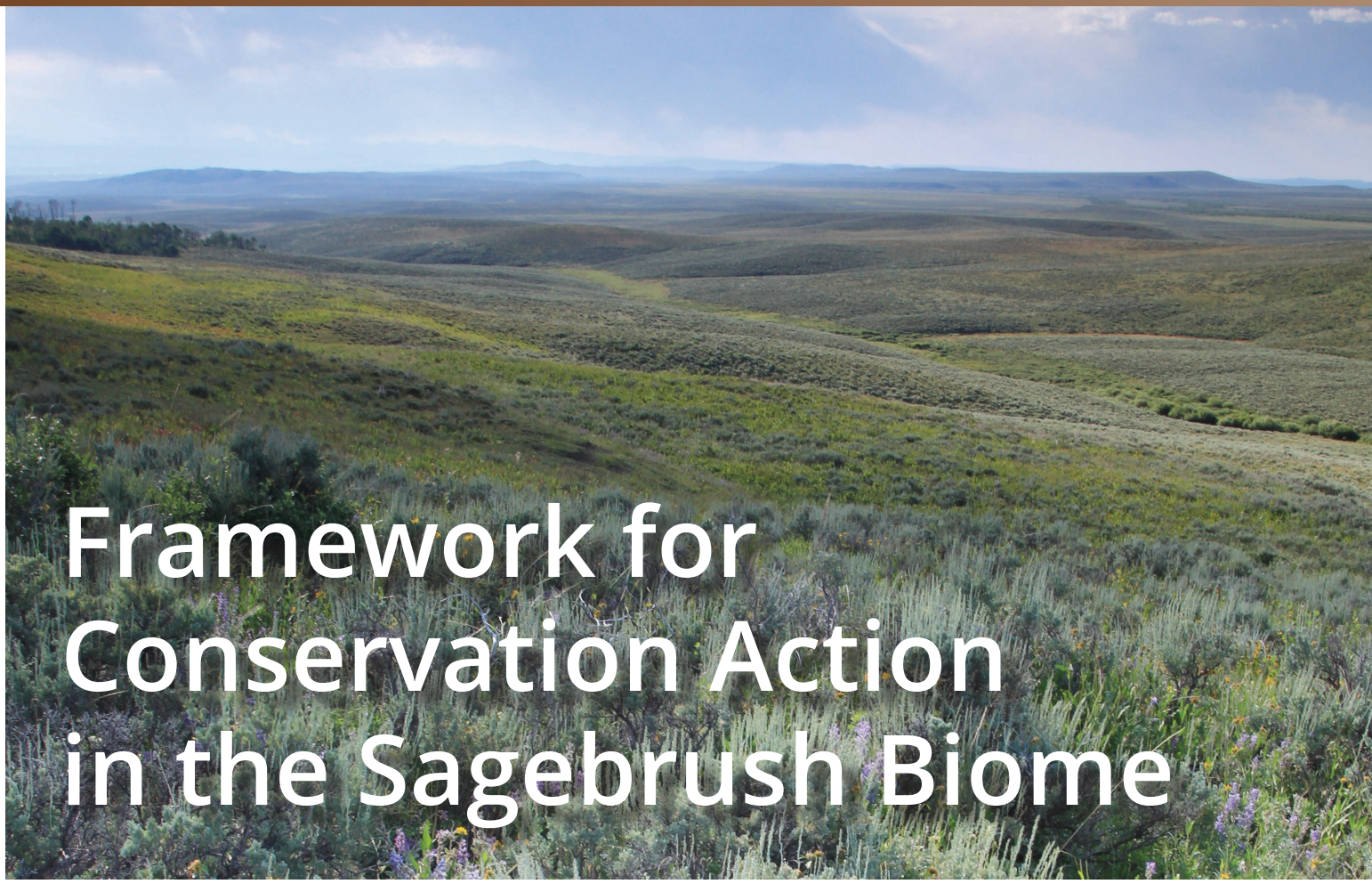


Photo: Ken Miracle



Figure 3

WLFW maximizes outcomes for wildlife and working rangelands by focusing efforts in core areas where local data shows there are wildlife strongholds, and where communities are willing to participate in conservation actions.



Framework for Conservation Action in the Sagebrush Biome

Photo: Jeremy Roberts/Conservation Media

The sagebrush biome is the largest habitat type in North America, spanning 175 million acres in 13 western states and two Canadian provinces. Land tenure is a patchwork of public, Tribal and private lands, with many of the most productive and well-watered valley bottoms in private ownership. **Ranching operations connect mixed ownerships to create the vast tracts of open space that support world-class wildlife populations in the West.** Collectively, more than 350 plant and animal species thrive in these habitats, most notably a host of sagebrush songbirds, migratory big game populations, and both the greater and Gunnison sage grouse. WLFW continues to capitalize on sage grouse as a biome-wide focal species for its wide-ranging distribution, diverse seasonal habitat needs and sensitivity to threats impacting working lands (Figure 4). Maintaining vibrant rural economies in these landscapes results in the multi-generational legacy of stewardship and ranching culture on which sagebrush-reliant wildlife depend.

This framework reflects collaborative, multi-state planning efforts to update SGI 2.0, and continues to build from a decade of success conserving the sagebrush biome. This framework also serves as NRCS' ongoing contribution to the Sagebrush Conservation Strategy administered by Western Association of Fish and Wildlife Agencies. Sharing common cross-boundary threats, NRCS staff across eleven western states collaborated to create this shared vision for conservation action. The WLFW team—as part of NRCS' Areawide

Planning, Science and Technology, and Outcomes branches—crafted an overarching approach, provided emerging technologies and spatial data, and led westwide technical sessions. NRCS State Conservationists and staff subsequently hosted strategy sessions wherein their local partnerships identified threats to address, honed geographic focus areas, and generated estimates of acreage goals and resource needs. The results of the planning effort are reflected in this framework as an all-programs approach to conserving resilient rangelands. As states implement their strategies locally, the WLFW team supports them with annual tracking and reporting of milestones, additional assistance in spatial targeting, and ongoing science-based assessments of conservation outcomes.

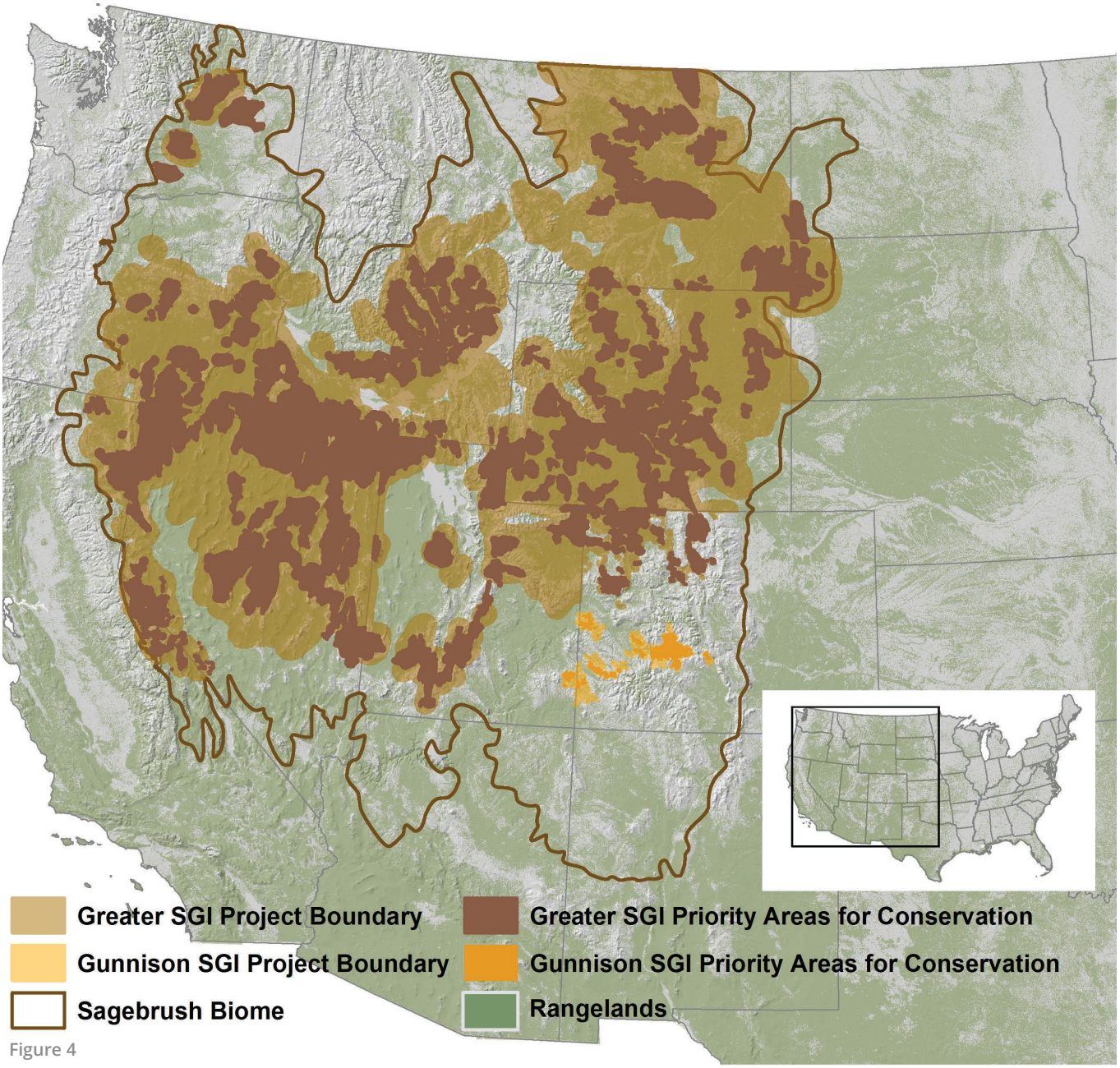


Figure 4



Threats Addressed in This Framework

Photo: Jeremy Roberts/Conservation Media

Stakeholders employ a diverse mix of policy and conservation actions to reduce threats facing sagebrush rangelands. Policies and actions are targeted within sage grouse Priority Areas for Conservation (PACs) that encompass population strongholds (Figure 4). WLFW uses Farm Bill resources to help landowners voluntarily implement conservation actions that reduce threats facing working rangelands.

Each primary threat has a geographic focus, conservation objective, strategic approach and anticipated outcomes. Once working rangelands are stable and intact, a variety of locally identified threats can be addressed as part of a whole-ranch plan.

Threats addressed by this framework include:

1) Exotic annual grass invasion
2) Land use conversion (cropland conversion/ subdivision)
3) Woodland expansion
4) Mesic resource degradation

1.7 Million Acres

Our top priority is conservation of resilient and intact working rangelands. To achieve this outcome we must focus on primary threats driving loss and degradation and do so at scales that matter.

Photo: Tatiana Gettelman/USGS









Figure 5: Photos clockwise from upper left: NRCS, John Carlson, Shawn Conner, Jeremy Maestas

Threats Addressed



Exotic Annual Grass Invasion

Photo: Justin Fritscher

Invasion of cheatgrass and other exotic annual grasses, such as medusahead and ventenata, likely represents the single-largest threat to America's sagebrush rangelands, reducing forage productivity and carbon storage, and threatening wildlife habitat and rural economies. Bold and coordinated action is needed to ensure working lands remain resilient and productive for current and future generations.

- Cheatgrass doubles the risk of wildfire resulting in a vicious cycle over time: more cheatgrass promotes more wildfire, more wildfire promotes more cheatgrass.[6]
- Exotic annuals green up faster than native plants and dry out earlier, robbing soils of limited moisture, exacerbating drought conditions, extending fire seasons and reducing forage for livestock.
- Conversion of deep-rooted perennial systems to shallow-rooted cheatgrass has climate change implications as it results in loss of persistent below-ground carbon.[8]
- Over 30 million acres of sagebrush rangelands have reached >25% annual grass cover.[7]

GEOGRAPHIC FOCUS

Primarily in the intermountain region west of the Rocky Mountains, but also localized priority sites farther east.

Fortunately, 70% of rangelands in the sagebrush biome still have relatively low annual grass cover providing abundant opportunities for proactive conservation if action is taken today.[7]

CONSERVATION OBJECTIVE

Defend relatively uninvaded sagebrush cores from annual grass conversion and expand them through restoration to maintain productive working lands that are resilient to fire and resistant to invasive annuals.

STRATEGIC APPROACH

Efforts to control invasive annual grasses are too often done reactively where infestations are already bad, at relatively small scales, and without regional context for long-term success. Stopping the wholesale conversion of sagebrush rangelands to annual grasslands requires us to think differently about how to tackle the problem. Science shows that invasive species control is more effective and cost-efficient when done early, before infestations become widespread, and when management is informed by what's going on in the surrounding landscape.

WLFW's approach for tackling this threat relies on statewide maps identifying large, intact core areas with relatively low, or no, annual grass invasion. Core areas serve as anchor points for conservation action and inform a proactive strategy for management: *Defend the Core, Grow the Core, Mitigate Impacts* (Figure 6).[9,10]

Specific actions to reduce this threat vary with landscape context and condition but generally include some combination of herbicides, seeding, and prescribed grazing. Defending relatively

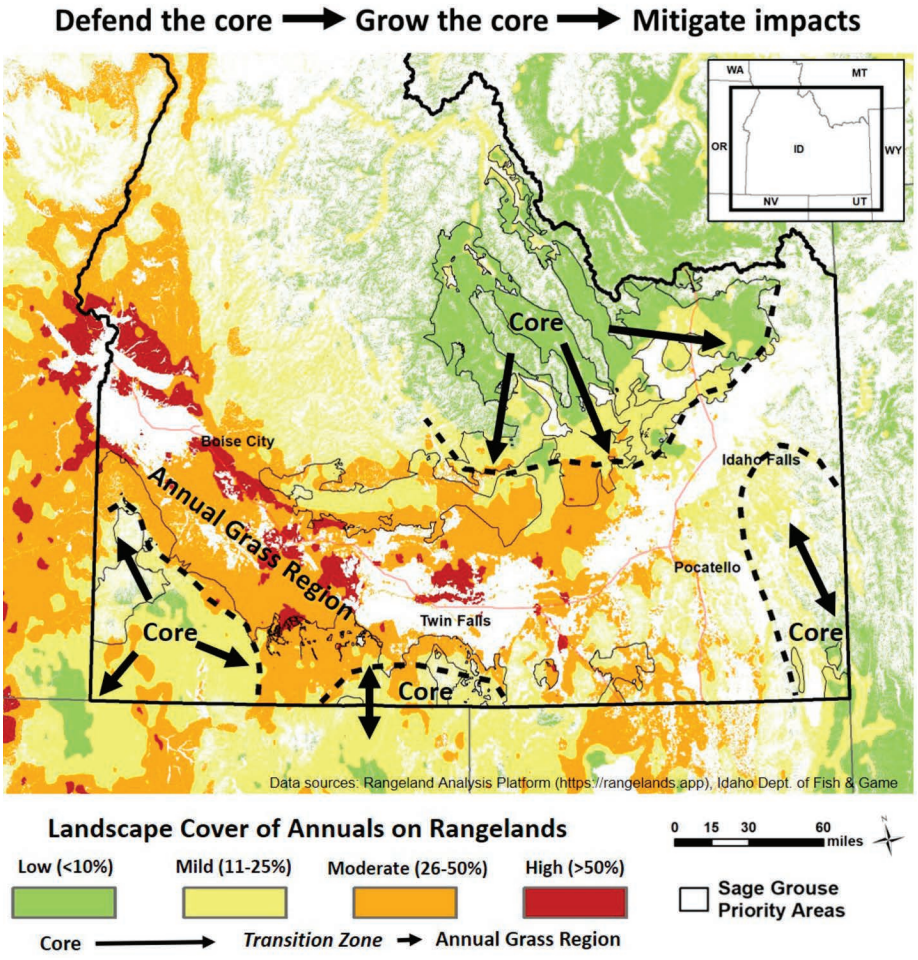


Figure 6



Photo: Kari Greer/USFWS

uninvaded cores from annual grass conversion is a top priority and key strategies include: detection and prevention of early invasions, targeted herbicide use to eliminate or reduce invasive annual grass seed sources, and grazing management to maintain and promote perennial grass health.

A secondary priority is to grow the core, primarily through restoration of perennial vegetation in the transitioning zone, which often requires weed control and seeding. Finally, some perpetual management will be required in annual grass dominated regions to mitigate the most severe impacts of the cheatgrass-fire cycle on life and property. Primary actions there shift to reducing fine fuels through herbicides, targeted or dormant season grazing, and seeding of perennial grasses.

ANTICIPATED OUTCOMES

Setting realistic expectations and timeframes for recovery of desired conditions are essential since tackling invasive annuals is a long-term commitment, not a "one-and-done" land treatment. However, some anticipated outcomes in the near-term include:

- ***Implement large-scale demonstration projects.*** Few examples of successfully addressing this threat exist today, so it's important to establish large demonstration projects across the biome to show we can move the needle on annual grass invasion.

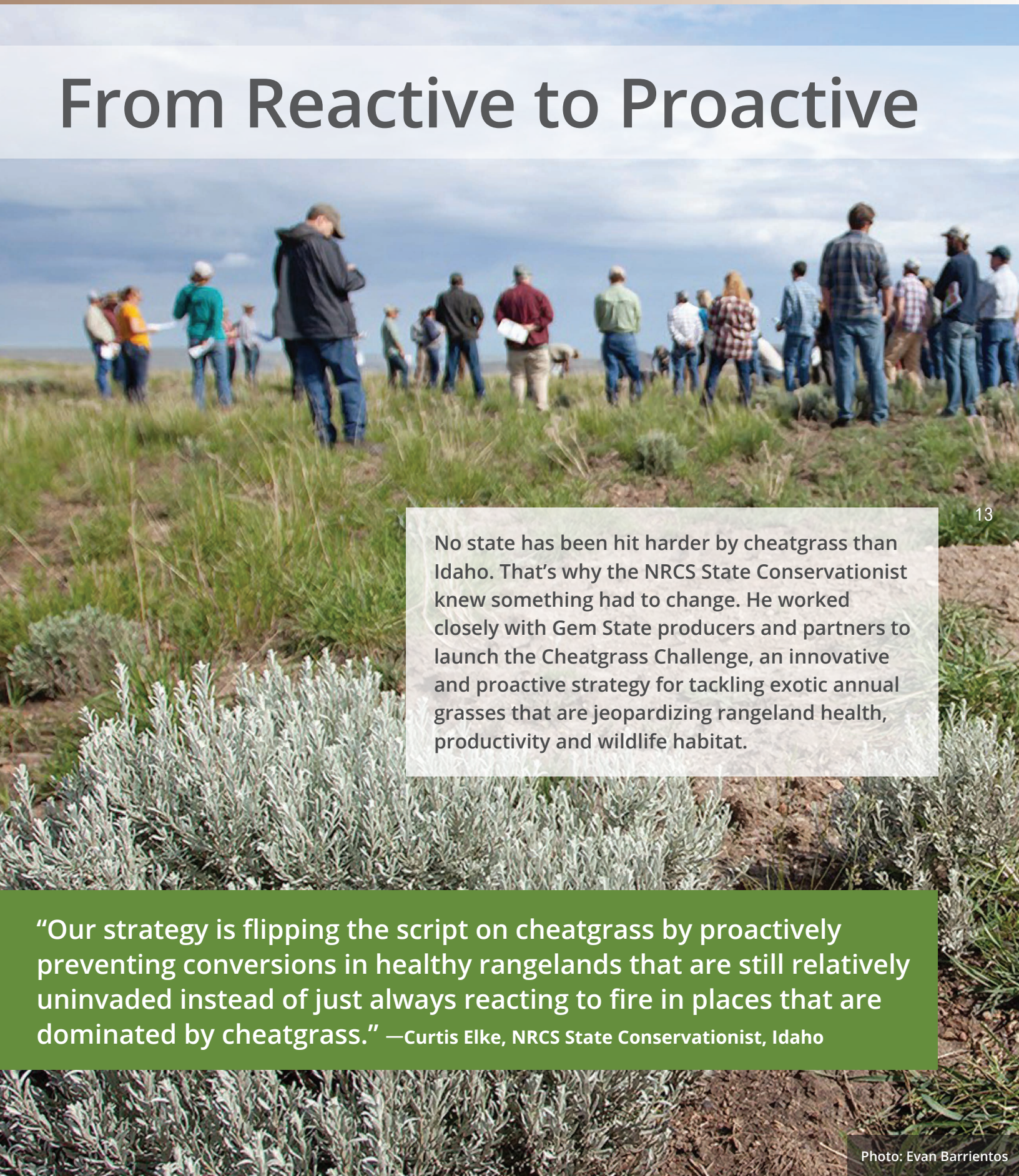
- ***Increase resilience to fire and resistance to invasion.*** Perennial grasses are key to maintaining resilience to fire and resistance to cheatgrass.[11] Project area results indicate sites are trending towards stable or increasing perennials and fewer invasive annuals.

- ***Reduce annual grass fuels.*** Where invasive annuals already exist, biomass data indicate annual grass productivity has been reduced in project areas, limiting invasive fine fuels available for wildfire.

- ***Prevent core area transitions.*** Remotely sensed monitoring data show the size of intact cores in priority landscapes are being maintained or expanded and large-scale state transitions to annuals halted.[12]

Success Spotlight

From Reactive to Proactive



No state has been hit harder by cheatgrass than Idaho. That's why the NRCS State Conservationist knew something had to change. He worked closely with Gem State producers and partners to launch the Cheatgrass Challenge, an innovative and proactive strategy for tackling exotic annual grasses that are jeopardizing rangeland health, productivity and wildlife habitat.

"Our strategy is flipping the script on cheatgrass by proactively preventing conversions in healthy rangelands that are still relatively uninvaded instead of just always reacting to fire in places that are dominated by cheatgrass." —**Curtis Elke, NRCS State Conservationist, Idaho**

Photo: Evan Barrientos

Threats Addressed



Land Use Conversion

Photo: Jeremy Roberts/Conservation Media

Conversion of rangeland to crops or new housing developments destroys grazing lands and fragments previously intact sagebrush landscapes. Conversion to cropland disproportionately affects the most productive soils, taking them out of use by livestock and wildlife. While the impacts from constructing homes or other buildings are more localized, the habitat destruction is more severe and virtually impossible to reverse. Both forms of development can sever big game migration routes and reduce habitat below levels needed to support wide-ranging species.

- A single square-mile of new cropland negatively impacts sage grouse in a landscape 12 times that size.[13]
- Dispersed housing developments can create bottlenecks for migrating mule deer and pronghorn.[14]
- Using conservation easements to proactively remove the risk of development maintains vast open spaces required for ranching and wildlife.[15,16]

GEOGRAPHIC FOCUS

Cropland conversion risk occurs primarily in Montana, North and South Dakota, Colorado and Washington, while housing sprawl is rangewide but localized in parts of the 11 states except Washington.

CONSERVATION OBJECTIVE

Avoid further land use conversion within sagebrush cores and restore former croplands to productive rangelands.

STRATEGIC APPROACH

Strategies to stop land use conversion are typically implemented too late and at too small a scale to maintain large and intact core areas. Halting the wholesale conversion of rangelands necessitates a change in mindset to get ahead of threats before they proliferate. Science shows that keeping grazing lands connected is more effective when done early, before crops and houses creep in, and when local actions are informed by landscape context.

The two primary mechanisms for preventing land use change are the acquisition of conservation easements and the transitioning of expiring Conservation Reserve Program (CRP) grasslands to grazing lands. Planting crop fields back to grass can further enhance existing core areas.

Reducing cropland risk relies on maps depicting where cultivation risk intersects with PACs (Figure 7). Clustering easements to conserve grazing lands within PACs will continue as a time-tested strategy for success. Emerging too is a vision to transition expiring CRP contracts into working lands as intrinsically valued components of livestock grazing operations. This innovation is complementary to CRP rather than a replacement for it. Pilot projects show promise like the one in the Nebraska Panhandle that helped producers

In eastern Montana and the Dakotas, 96% of landscapes that still support sage grouse contain less than 15% cropland,[13] providing ample opportunity to conserve and restore intact grazing landscapes if bold action is taken today.

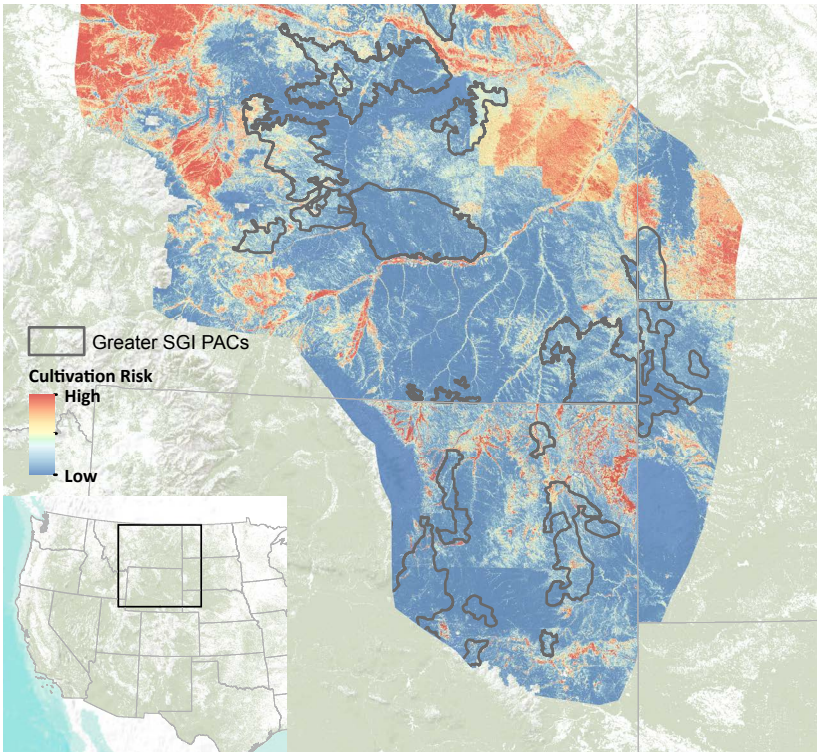


Figure 7. Sources: ESRI, USGS, NOAA

voluntarily transition 20,500 acres of expiring CRP into working rangelands by providing grazing infrastructure and technical assistance in grazing management.[17] This framework will explore potential mechanisms for willing landowners to move between Farm Bill programs,[18] and provide a better understanding of producer needs (e.g., water for livestock) to make the transition to working lands.[19]

ANTICIPATED OUTCOMES

- ***Minimize grouse and big game population losses.*** Core area policy and easements in Wyoming reduced by two-thirds the sage grouse losses that would have occurred in core areas, and these same protective measures also conserved 75% of habitats for migratory mule deer. [15,16]

- ***Maintain wildlife migration routes between priority landscapes.*** WLFW easements have maintained in perpetuity the longest-known sage grouse and pronghorn migration routes in the world.[20]

- ***Prevent loss of grazing culture in rural America.*** Voluntary participation in easement acquisitions enables producers to expand their grazing operations and to pass their ranches onto future generations.



Photo: Jeremy Roberts/Conservation Media

Success Spotlight

Leadership in the Big Sky

Montana leads the nation in using easements to perpetually conserve working rangelands. Over the past decade, partners in the Big Sky State have protected more than 230,000 acres of intact sagebrush grazing land. To deliver these tools at scale, NRCS and its partners built their easement culture from the ground up. This intentional approach included early dialogue with communities to understand their needs, additional investment in people to complete the complex transactions, and combining diverse funding sources.



"The power of partnerships is only limited by our collective ability to think big and move together."

—Tom Watson, NRCS State Conservationist for Montana

Photo: NRCS

Threats Addressed



Woodland Expansion

Photo: Jeremy Roberts/Conservation Media

Woodland expansion into grasslands and shrublands is a global problem as trees displace rangeland wildlife and reduce productivity of grazing lands.[21] Scattered young trees in sagebrush country may look harmless to a casual observer, but science shows conifer expansion can erode rangeland resilience if left unchecked (Figure 8).

- Sage grouse are particularly sensitive to trees, abandoning otherwise suitable habitat with as few as 1 or 2 trees per acre.[25,26]
- In the Intermountain West, conifer trees including juniper, pine and fir have increased up to 600% since the 1800s, with 90% of expansion occurring at the expense of sagebrush rangelands.[22]
- Conifer expansion fragments and degrades sagebrush habitat, reduces forage production, and increases the risk of wildfire and cheatgrass invasion.[23]
- Current efforts to address this threat are barely keeping pace with rates of expansion (0.4%-1.5% per year), so there is an urgent need to scale up targeted conifer removal in priority landscapes.[24]

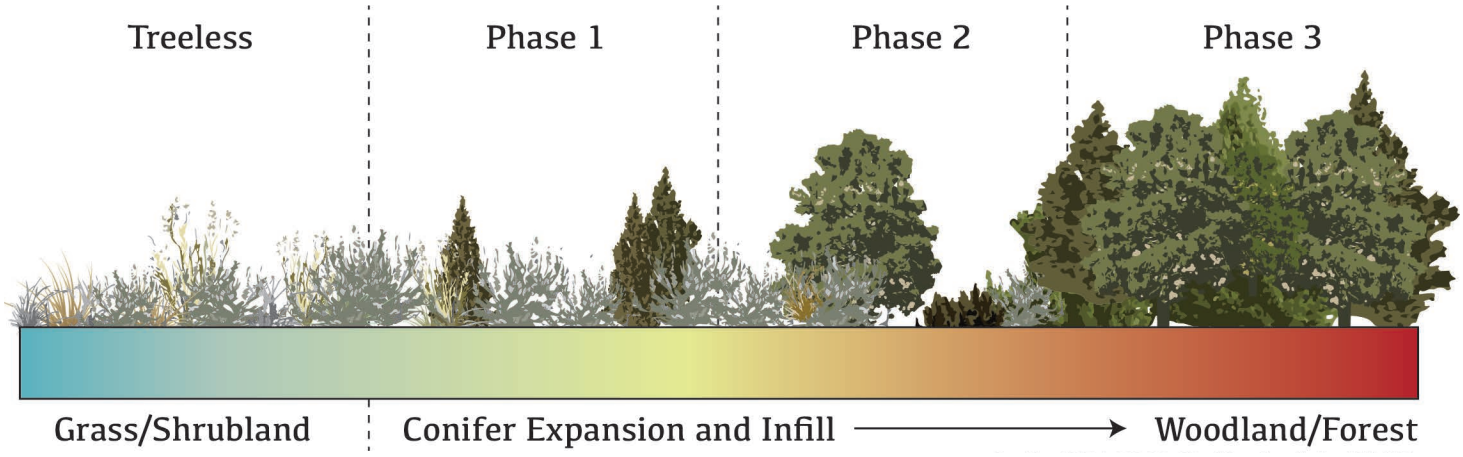


Figure 8. Credit: USDA-NRCS, Working Lands for Wildlife

GEOGRAPHIC FOCUS

Primarily in the Great Basin (CA, OR, ID, NV, UT) but also localized farther east.

CONSERVATION OBJECTIVE

Maintain and grow intact sagebrush rangeland cores through conifer removal in priority landscapes at a pace that exceeds the rate of expansion.

STRATEGIC APPROACH

In the absence of wildfire, proactive intervention is needed to remove conifer seed sources to disrupt the woody plant encroachment process.

WLFW prioritizes maintenance of treeless sagebrush rangelands and restoration of early phase expansion areas, primarily using mechanical tree removal (e.g., hand-cutting, shredding) and slash treatment, which reduces or eliminates conifer seed sources, preserves perennial shrubs and grasses, and minimizes sage grouse predator perches. This work is focused along woodland fringes to maintain and grow sagebrush core areas and grouse populations, as opposed to isolated cuts in a sea of forested land. Conifer removal is highly targeted to vulnerable sagebrush sites, leaving abundant pinyon-juniper and conifer forests elsewhere in the watershed to support woodland-dependent species.

Addressing conifer expansion early is more effective and less costly than waiting until trees are more widespread and densely populated.

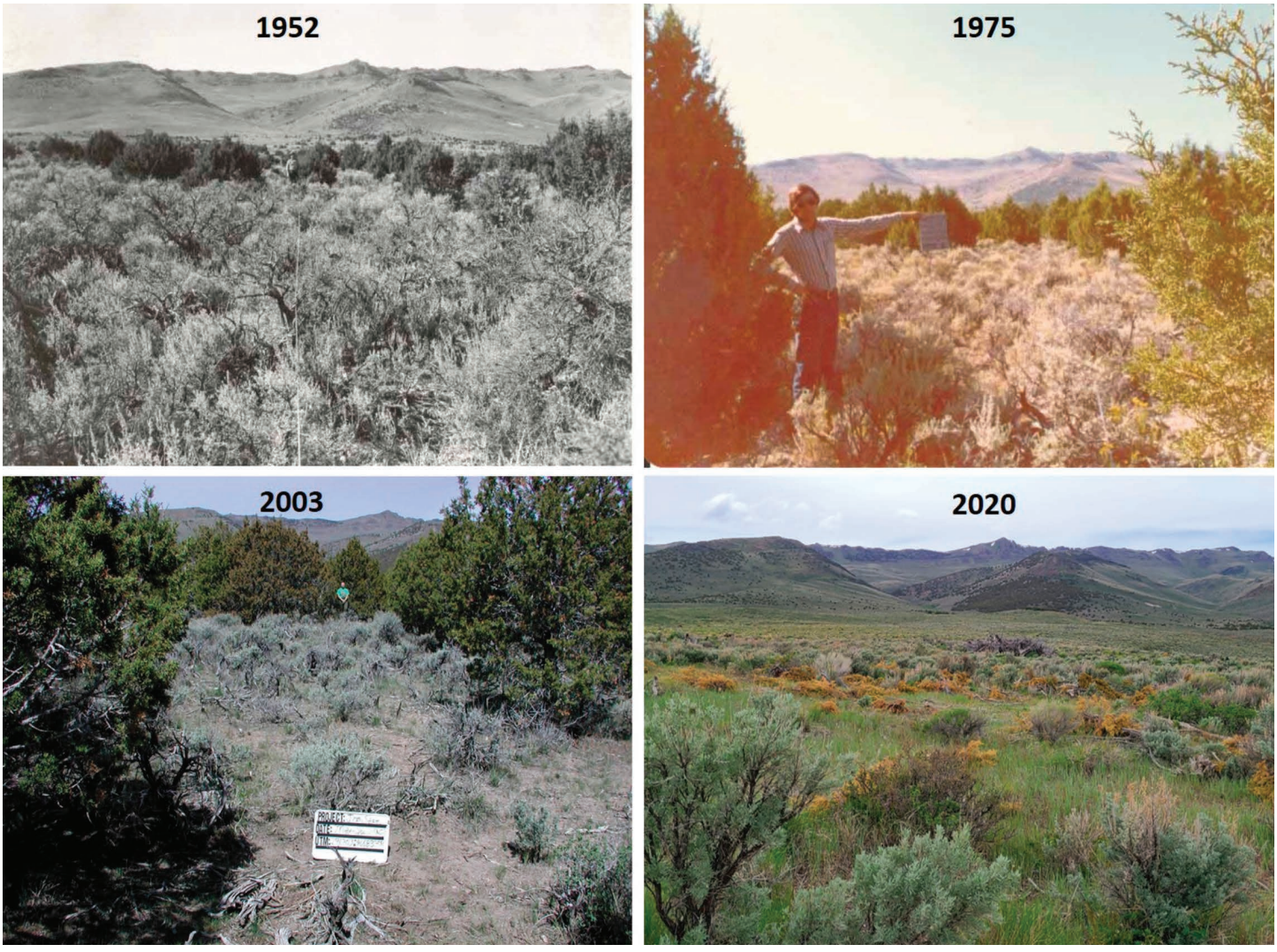
ANTICIPATED OUTCOMES

- ***Increase resilience to fire.*** Early phase conifer removal reduces woody fuels, mitigating risks of high-severity fire effects, and prevents loss of perennial grasses that are key to maintaining resilience to fire and resistance to cheatgrass.[11]

- ***Prevent loss of grazing land productivity.*** Grass and forb cover can be cut in half when conifer cover reaches 40%,[27] which reduces forage available for livestock. Conifer removal to prevent woodland expansion sustains ranch income and carrying capacity.[28]

- ***Maintain sage grouse populations in priority landscapes.*** Conifer removal can increase sage grouse nest, brood and adult survival.[23] In Oregon, sage grouse population growth rates were 12% higher following landscape-scale conifer removal.[29]

- ***Benefit other sagebrush-dependent species.*** Outcomes show mechanical conifer removal doubled Brewer's sparrow abundance[30] and improved mule deer fawn overwinter survival by 15%.[31]



Credit: BLM and NRCS

Success Spotlight

All Hands, All Lands

Successfully reducing threats across the checkerboard private-public ownership of sagebrush country requires collaboration. For more than a decade, Utah rancher Jay Tanner, his family, and neighbors have been teaming up with partners to take back their watershed by removing expanding conifers. Through Utah's Watershed Restoration Initiative, ag producers, NRCS, Bureau of Land Management, and state partners are working side-by-side to seamlessly remove encroaching trees across boundaries to restore productive range for cattle and wildlife.



"I'm thrilled with the response. It's almost unbelievable how the native species are coming back. What's more, the springs that were dry for decades are flowing again, now that the water-loving conifers are gone." **— Jay Tanner, Della Ranches, Grouse Creek, Utah**

Photo: Jeremy Maestas

Threats Addressed



Mesic Resource Degradation

Photo: Shawn Conner

On the range, water is life. Riparian, wet meadow and other mesic areas—places where land meets water—are rare but disproportionately important to wildlife and working lands. These areas are reservoirs of late-season productivity providing reliable water and forage for livestock and wildlife during the dry summer and fall. Unfortunately, past degradation and de-watering has reduced their size and function.

- In the sagebrush biome, mesic resources comprise less than two percent of the landscape yet 80% of wildlife depend upon them to complete their life cycle.[32]
- Over half of riparian areas and more than 80% of wet meadows are privately owned, reflecting the importance of these habitats to working lands.[33]
- Protecting and restoring these emerald islands in the sagebrush sea is essential to improving overall rangeland resilience to drought, fire and flooding.

GEOGRAPHIC FOCUS

Priority watersheds across the biome.

CONSERVATION OBJECTIVE

Protect intact but vulnerable mesic resources from loss and degradation. Increase the size and resiliency of mesic resources through restoration of degraded valley bottoms and associated watersheds.

STRATEGIC APPROACH

Conserving mesic resources in an arid environment is beneficial wherever it occurs, but the scope of degradation is large and limited resources necessitate a strategic approach. WLFW prioritizes protection and early intervention to maintain and enhance vulnerable wet habitats over intensive restoration of streams and meadows that are deeply incised and lack floodplain connectivity. The degree of channel incision, potential valley bottom width, and vegetation conditions are important factors informing prioritization.

From a wildlife standpoint, targeting conservation actions in close proximity to sage grouse breeding and nesting habitats helps ensure a reliable source of insects and forbs to feed growing chicks as uplands dry out in the summer sun.

Conservation outcomes are greatest where community-based partnerships work together across boundaries to address riparian and upland threats in a watershed approach.

A diverse set of strategies are used to address this threat. Conservation easements are targeted to protect vital privately owned meadows, ensuring water and working lands remain intact and productive for generations. Restoration and management strategies include: improved riparian grazing management, low-tech restoration of degraded streams and meadows using Zeedyk structures and beaver dam analogues, and conifer removal around headwater springs and meadows.[34]



Photo: Brianna Randall

ANTICIPATED OUTCOMES

- ***Protect productive working lands and water.*** Conservation easements ensure water and productive wet habitat remain in working lands. Early restoration to stop headcuts prevents loss of productive wet meadows to incision and erosion, also storing more water on the land.[35]

- ***Increase resilience to drought, fire and flooding.*** Restoration increases valley bottom productivity by 25% and keeps plants greener longer, leading to higher drought resiliency.[37] Healthy riparian and wet meadow corridors are also more resistant to fire damage,[36] providing critical refugia for wildlife and livestock in burned landscapes. By slowing down water, properly functioning riparian areas reduce downstream damage from flooding.[38]

- ***Improve habitat quantity, quality and persistence.*** Restoring mesic resources increases available wet habitats required by 80% of all wildlife species.[32] Improved hydrology keeps soils wetter longer and more consistently, boosting plant productivity and increasing wetland plant abundance and diversity.

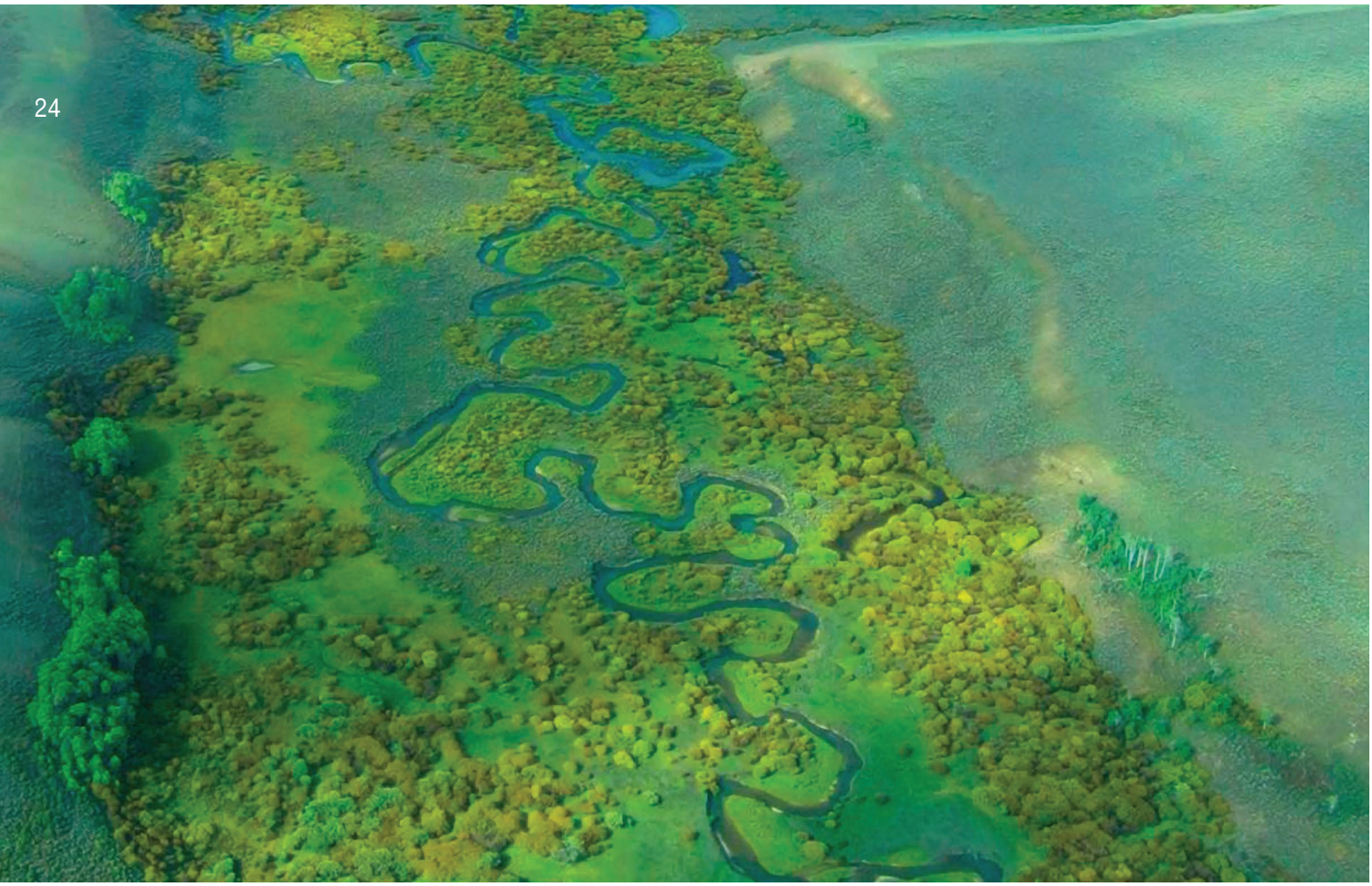


Photo: Patrick Donnelly

Success Spotlight

Keeping Water on the Land



Ranchers in Colorado's Gunnison Basin realized early on that enhancing mesic resources is the key to keeping dry rangeland productive in the face of climate change. Since 2012, partners have built over 1,500 simple, low-tech restoration structures that boost water storage for people and wildlife. These stick-and-stone structures have improved 24 miles of precious stream habitat across public and private lands in the Gunnison Basin.

"These projects are a 'no-lose' strategy. By retaining moisture, we reduce soil loss, build resiliency in plant communities and increase forage for livestock and wildlife. They're bigger than any one species." —**Liz With, NRCS Programs Specialist, Colorado**

Photo: Jeremy Maestas



Photo: Jeremy Roberts/Conservation Media



Photo: Jeremy Roberts/Conservation Media



Photo: Rocky Mountain Elk Foundation



Photo: Rick McEwan



Photo: Jeremy Roberts/Conservation Media

NATURAL RESOURCES CONSERVATION SERVICE

www.nrcs.usda.gov

USDA is an equal opportunity provider, employer, and lender.