# Sagebrush Ecosystem Program Strategic Action Plan

For Implementation of the Nevada Greater Sage-grouse Conservation Plan 2025

# FOR INFORMATION AND QUESTIONS ABOUT THE NEVADA CONSERVATION CREDIT SYSTEM, PLEASE CONTACT:

Kathleen Steele Program Manager Nevada Sagebrush Ecosystem Program (775) 687-2000 <u>ksteele@sagebrusheco.nv.gov</u>

#### **SUGGESTED CITATION:**

State of Nevada Department of Conservation and Natural Resources. Sagebrush Ecosystem Program. 2025. Nevada Strategic Action Plan.

#### **ACKNOWLEDGMENTS:**

This document is to provide guidance for the following:

#### Nevada Sagebrush Ecosystem Technical Team

Kathleen Steele – Program Manager Cheyenne Acevedo – Nevada Department of Wildlife Casey Adkins – Nevada Division of Forestry Sarah Hale – Nevada Division of State Lands Skyler Monaghan – Nevada Department of Agriculture

# **TABLE OF CONTENTS**

Introduction	4
Vision	4
Mission Statement	4
Sagebrush Ecosystem and Sage-Grouse Threats	6
Goals and Objectives	8
Goal 1	8
Goal 2	9
Goal 3	10
Goal 4	10
Areas of Conservation Importance Map	11
Resources	16
Current Policies	16
Funding	16
Tools	18
References	21

# **FIGURES**

Figure 1. Areas of Conservation Importance in Greater Sage-Grouse Habitat Across Nevada.	12
Figure 2. Northwest Nevada – Core Habitat and Connectivity Focus.	13
Figure 3. Northeastern Nevada – High-Density Populations and Threat Reduction	14
Figure 4. Central Nevada – Population Recovery and Emerging Threats.	15

# INTRODUCTION

The Nevada Sagebrush Ecosystem Program (SEP) was established by the Sagebrush Ecosystem Council (SEC) and is managed by the Sagebrush Ecosystem Technical Team (SETT) to address conservation challenges in Nevada's sagebrush ecosystems. Created by Executive Order 2012-19 from Governor Brian Sandoval in 2012 and authorized by legislation in 2013, the SEC serves as a collaborative body representing conservation and environmental interests and energy, agriculture, ranching, mining, local government, and Native American Tribes. In coordination with state and federal natural resource agencies, the SEC oversees policy decisions, operations of the SETT, and the Nevada Conservation Credit System (CCS).

To ensure consistent and resilient mitigation practices, the SEC, and subsequently the Legislative Commission, adopted permanent mitigation regulations (NAC 232.400 – 232.480) in 2019. These regulations mandate compensatory mitigation for Greater Sage-grouse (*Centrocercus urophasianus*; GRSG) through the CCS, requiring mitigation for specific man-made disturbances on public lands as outlined in the Nevada Greater Sage-grouse Conservation Plan (State Plan). By leveraging scientifically quantified mitigation credits, the SEC continues to offset sagebrush ecosystem disturbances and enhance GRSG habitat in key areas.

The SETT is a multidisciplinary team composed of staff from the Nevada Department of Wildlife (NDOW), Nevada Department of Agriculture (NDA), Nevada Department of Conservation and Natural Resources (NDCNR), Nevada Division of Forestry (NDF; NDCNR), and Nevada Division of State Lands (NDSL; NDCNR). Working closely with state and federal partners, the team leads mapping, restoration, and management strategies to support sagebrush conservation. Under SEC guidance, the SETT developed the State Plan in 2014, with an update in 2019. The plan provides a balanced, science-based framework for coordinated conservation and management efforts.

The SEP Strategic Action Plan (SAP) builds on the 2019 State Plan by outlining implementation strategies for the next 5–10 years. Using the best available science and established conservation tools, the SETT will guide efforts to mitigate key threats identified in NDOW's GRSG Planning Areas. The SAP provides a framework for setting priorities, guiding best management practices, and supporting rehabilitation, restoration, and conservation initiatives. Because many sensitive wildlife species, including GRSG, use both private and public lands to complete their lifecycles, successful conservation depends on collaboration across jurisdictions. The SEP is committed to using the best available science, adaptive management, and stakeholder engagement to address complex conservation challenges and promote stable GRSG populations in the future.

# VISION

The Sagebrush Ecosystem Program envisions resilient, healthy, and intact sagebrush ecosystems that thrive alongside industry and resource management practices important to Nevada's economy.

### MISSION STATEMENT

The Sagebrush Ecosystem Program's mission is to sustain and enhance Nevada's sagebrush ecosystems and the species that depend on them while supporting the State's economy through responsible land stewardship and resource management.

The SAP provides tools and guidance to achieve the SEP's four long-term strategic goals:

1. **Restore sagebrush ecosystems** by addressing threats to Nevada's landscapes and Greater Sagegrouse populations.

- 2. Enhance the Nevada Conservation Credit System to mitigate impacts and ensure a net conservation gain for Greater Sage-grouse habitat.
- 3. Strengthen collaboration and outreach to address ecosystem threats and engage stakeholders in conservation efforts.
- 4. Advance scientific knowledge of sagebrush ecosystems to reduce management uncertainty and improve conservation outcomes.

To achieve these goals, the 2025 SAP outlines actionable recommendations and provides a clear framework for implementation.

The SAP is organized into the following sections:

- Threats A comprehensive list of perceived threats to GRSG and their habitat, and links to current information and resources.
- Goals and Objectives A detailed outline of strategic actions with measurable outcomes aimed at addressing the four strategic goals identified by the SEP.
- Areas of Conservation Importance Map A detailed map outlining important areas for GRSG habitat conservation and restoration.
- Resources Information on funding opportunities, tools, project assessment resources, and current policies and regulations that affect GRSG management in Nevada. This section provides guidance for local entities and landowners in making informed management decisions to maintain intact, functional sagebrush ecosystems.
- References A compilation of literature, reports, and sources consulted in developing this document, providing a foundation for the SAP's recommendations and ensuring transparency in the decision-making process.

The SAP will be updated as new scientific information emerges and lessons are learned during its implementation. Annual updates on activities will allow the SETT to adjust the SAP based on project progress, the latest research, partner contributions, and public policies. The SETT will work closely with project partners to promote science-based management decisions that benefit Nevada's GRSG and sagebrush ecosystems.

# SAGEBRUSH ECOSYSTEM AND SAGE-GROUSE THREATS

For a comprehensive review of threats to the sagebrush ecosystem, refer to the *Nevada Sagebrush Habitat Plan* and the *2019 Nevada Greater Sage-Grouse Conservation Plan*. These foundational documents outline the broad, interacting pressures that degrade sagebrush ecosystems and affect Nevada's GRSG populations.

The sagebrush ecosystem is one of the most threatened landscapes in the western United States, with more than half of its historical extent degraded, fragmented, or lost entirely due to a combination of human land use and natural stressors (Knick et al. 2003, Chambers et al. 2014a, Mahood and Balch 2019). As a result, populations of GRSG, a sagebrush-obligate species and indicator of ecosystem health, have declined by an estimated 80% across their range since the 1960s (Coates et al. 2021).

The threats to sagebrush ecosystems in Nevada are complex and interacting, often reinforcing one another in feedback loops that accelerate ecosystem loss and species decline. The following section provides a synthesis of the most pressing threats to sagebrush integrity and GRSG conservation across Nevada:

#### **Invasive Annual Grasses**

Invasive annual grasses, particularly cheatgrass (*Bromus tectorum*), are the most pervasive stressor in Nevada's sagebrush biome. These species reduce ecosystem resilience and resistance to disturbance, especially when combined with drought, overgrazing, and frequent fire (Miller et al. 2011, Chambers et al. 2014b). Thatch, or dead vegetation, creates continuous fine fuel beds that promote frequent, high-intensity wildfires, which degrade native perennial plant communities and drive self-reinforcing fire-invasion cycles (D'Antonio and Vitousek 1992, Brooks and Pyke 2001). Even without fire, annual grasses can dominate and transform sagebrush ecosystems, displacing native vegetation in unburned areas (Smith et al. 2023). See the <u>USGS ScienceBase resource on invasive grasses</u> for additional context and resources.

#### Wildfire

Wildfires are the dominant driver of wildlife habitat loss across Nevada, fueled by the expansion of invasive annual grasses. Wildfires can reduce sagebrush cover, reduce native understory vegetation, and contribute to landscape fragmentation (Coates et al. 2016, Dudley et al. 2021). Fire perimeters, frequency, and severity are well-documented through resources like <u>Nevada Fire Info</u> and the <u>USGS Fire Science</u> <u>Portal</u>.

#### **Climate Change**

Climate change compounds ecosystem threats through rising temperatures, altered precipitation patterns, and increased drought frequency. Mismatched timing of winter and spring precipitation further reduces recruitment success of native vegetation (Blomberg et al. 2012, Gibson et al. 2017). Warmer temperatures decrease critical forb availability for GRSG brood-rearing, while wet, cold springs increase chick mortality (Gregg and Crawford 2009, Guttery et al. 2013). Resources include the <u>NatureServe Climate Change Vulnerability Index for Ecosystems and Habitats</u> and <u>the U.S. Gridded Palmer Drought Severity Index (PDSI)</u>.

#### **Conifer Encroachment**

The encroachment of pinyon-juniper (P-J) woodlands into sagebrush ecosystems reduces herbaceous cover, fragments GRSG habitat, and lowers suitability for GRSG and other sagebrush obligate species (Coates et al. 2017). Encounters with P-J communities alter movement speeds and increase daily mortality for GRSG across all life stages (Prochazka et al. 2017). Targeted conifer removal has proven effective for GRSG habitat restoration in areas experiencing early phases of encroachment (Coates et al. 2024). Resources include the <u>Pinyon-Juniper Woodland Climate Response and Species Distribution Models</u>.

#### Habitat Fragmentation & Human Alterations

Infrastructure associated with energy development, roads, fencing, and urban expansion fragments GRSG habitat, reduces patch size, increases edge effects, disrupts connectivity, and provides subsidies for predators. Anthropogenic disturbances, including mining, livestock grazing, and off-highway vehicle use, contribute to localized degradation and functional GRSG habitat loss (Beever and Aldridge 2011, Coates et al. 2021).

#### **Improper Management**

Unsustainable land management practices, including overgrazing, poor development siting, and inadequate fire response, compound the effects of natural stressors. These practices can reduce recovery capacity and lead to lasting ecosystem transitions (Coates et al. 2021, Crist et al. 2023).

#### Wild Horses and Burros

Nevada hosts approximately 60–80% of the wild horses and burros in the United States (Nevada Department of Wildlife 2024), and their populations are often well above the ecological carrying capacity. Overpopulation leads to overgrazing, soil compaction, water resource depletion, and loss of native plant communities, especially in arid and semi-arid landscapes (Beck et al. 2024, Street et al. 2025). For current data, see the <u>BLM Wild Horse and Burro Program</u> website, <u>Nevada Policy 67, and the NDOW Wild Horse and Burro Report</u>.

#### **Predation by Common Ravens**

The populations of common ravens (*Corvus corax*) in the western United States have increased significantly due to human-induced changes such as urbanization, agriculture, and infrastructure development, which provide more food and nesting opportunities (Kristan and Boarman 2007, Bui et al. 2010, Sauer et al. 2013, Howe et al. 2014). In Nevada, ravens have become the primary nest predators of GRSG (Lockyer et al. 2015). The rise in raven populations, driven by human activities, is linked to a decrease in GRSG nest success and has altered their population dynamics, as the availability of natural prey no longer restricts ravens. Research indicates that raven densities exceeding 0.40 ravens per square kilometer are associated with declines in GRSG population numbers (Coates et al. 2020). Raven populations have doubled over the past two decades (Harju et al. 2021), further intensifying these negative effects.

### GOAL 1

# Address threats to Nevada sagebrush ecosystems and Greater Sage-grouse populations through land stewardship and resource management.

Objective 1: Identify and expand funding opportunities for restoration efforts.

Strategy: Identify and pursue grant opportunities to finance restoration projects.

Strategy: Assist partners and stakeholders with grant applications.

Objective 2: Reduce and limit the spread of invasive species.

Strategy: Protect undisturbed and uninvaded areas from invasive species.

Strategy: Prioritize mapping and quantifying invaded areas to guide treatment actions.

Strategy: Facilitate treatment measures in prioritized areas.

Objective 3: Address ecosystem fragmentation.

Strategy: Use integrated approaches to address threats like wildfires, invasive species, conifer encroachment, and human disturbances to minimize fragmentation.

Strategy: Promote avoid, minimize, and mitigate hierarchy during project development.

Objective 4: Ensure proper management of sagebrush and supporting ecosystems.

Strategy: Promote innovative technologies to enhance ecosystem management practices.

Strategy: Limit disturbances in sensitive areas.

Strategy: Provide support for permit renewals and adaptive grazing practices.

Strategy: Assist land managers with riparian restoration techniques to maintain and improve ecosystem function.

Objective 5: Reduce wildfire threats to the sagebrush ecosystem.

Strategy: Prioritize protection of undisturbed and intact areas to reduce fire risk.

Strategy: Map burned areas and prioritize regions requiring post-fire restoration.

Strategy: Support fire suppression efforts in priority GRSG habitat areas.

Objective 6: Address conifer encroachment.

Strategy: Prioritize and map encroached areas to quantify and guide restoration treatments.

Strategy: Apply measures to prevent and reduce further encroachment.

Objective 7: Manage raven populations to reduce predation pressures on GRSG.

Strategy: Support the increased take of ravens where needed to control populations.

Strategy: Reduce food subsidies and perching opportunities that support raven populations.

Strategy: Support the implementation of the NDOW Predator Management Plan to reduce anthropogenic threats to GRSG nests (NDOW 2016b).

### GOAL 2

# Refine the Nevada Conservation Credit System (CCS) to mitigate anthropogenic impacts and ensure net conservation gain for Greater Sage-grouse habitat.

Objective 1: Increase enrollment and use of the Nevada CCS.

- Strategy: Execute and maintain a Memorandum of Understanding (MOU) with the BLM and USFS to enroll public land credits in the Nevada CCS.
- Strategy: Define and implement a process that satisfies all requirements for mitigation on public lands.
- Strategy: Encourage credit developers and public land restoration projects to enroll in the Nevada CCS.
- Strategy: Ensure all anthropogenic disturbances affecting GRSG habitat are enrolled and compliant with the Nevada CCS.
- Objective 2: Update and improve the CCS based on the latest science.
  - Strategy: Update the CCS User's Guide, Manual, and HQT Methods document and tools with the latest available science as needed or every 5 years at a minimum.
  - Strategy: Create a working Literature Review Document that can be updated along with other annual updates and referenced by other program documents to ensure scientific relevance.
  - Strategy: Develop and execute a public lands restoration process for CCS to enhance sagebrush and supporting ecosystems in Nevada.
  - Strategy: Develop and execute CCS Debit Project End of Life policies and procedures.
  - Strategy: Update the SAP objectives and strategies, and the Areas of Conservation Importance Map every 5 to 10 years.
- Objective 3: Enhance CCS outreach, education, and training.
  - Strategy: Host workshops for credit and debit proponents and other stakeholders to ensure effective program implementation and expand stakeholder engagement with the CCS.
  - Strategy: Provide annual formal training and certification for CCS verifiers.
  - Strategy: Develop an online library of training videos for CCS verifiers to enhance understanding of CCS procedures and duties.
  - Strategy: Keep stakeholders and federal agencies updated on state accomplishments and new findings related to the CCS.

Objective 4: Improve the conservation effectiveness of the CCS.

- Strategy: Use the programmatic improvement processes to incorporate new data and scientific findings into the CCS Manual and User's Guide.
- Strategy: Investigate and implement incentives for minimization to adjust disturbance decay curves when minimization actions are applied.

### GOAL 3

# Increase collaboration and outreach to address sagebrush ecosystem threats and support the Programmatic mission.

Objective 1: Foster continuous collaboration with stakeholders and partners.

- Strategy: Facilitate statewide and local area working group meetings to identify causal factors for the GRSG population or habitat triggers and determine adaptive management actions.
- Strategy: Support education on riparian management through partnerships with Nevada Creeks and Communities.
- Strategy: Participate in annual State Mitigation Summits and subsequent technical meetings to remain informed about mitigation strategies and policies beyond Nevada.

Objective 2: Maximize restoration efforts through partnerships.

- Strategy: Collaborate with state and federal agencies, private landowners, and local partners to design and implement restoration treatments.
- Strategy: Promote and support the implementation of the Wild Free-Roaming Horses and Burros Act of 1971 and related BLM/USFS land use plans.
- Strategy: Collaborate with local groups to initiate large-scale restoration efforts and/or conduct field trials evaluating the effectiveness of invasive weed control techniques.
- Strategy: Facilitate the development of locally sourced native seeds for use in restoration projects and enhance the seed market conditions.

### GOAL 4

# Expand scientific knowledge of sagebrush ecosystems, reduce management uncertainty, and strive for successful conservation.

Objective 1: Foster research collaboration to enhance scientific understanding.

- Strategy: Collaborate with research institutions such as the USGS or University of Nevada, Reno to enhance the scientific understanding of GRSG populations and habitat health.
- Strategy: Collaborate with research institutions to create publicly available tools that enhance conservation efforts.
- Strategy: Prioritize research on GRSG population dynamics, habitat use, and landscape connectivity, particularly in under-studied or isolated populations.

Objective 2: Promote ongoing education for staff.

Strategy: Promote participation in workshops and conferences to keep staff updated on the latest tools and scientific advancements.

# AREAS OF CONSERVATION IMPORTANCE MAP

Nevada's vast sagebrush ecosystem presents a significant challenge when prioritizing where to invest in restoration. To address this, the Areas of Conservation Importance map was developed to identify focal regions for public land restoration over the next 5 to 10 years through the CCS. This map is a planning tool to guide the SETT in strategically targeting restoration efforts based on the best available science.

While the map highlights broad areas of ecological significance, all restoration projects will ultimately depend on localized expertise and site-specific knowledge from county, state, and federal partners. This map aims to enable a coordinated, long-term restoration approach where efforts can be built upon one another to create broader landscape-scale benefits over time.

The Areas of Conservation Importance were derived by integrating the following key data layers:

- **Core Sagebrush Areas (CSA):** Regions of intact sagebrush with healthy perennial herbaceous understories and minimal threats from invasive annual grasses, wildfire, and human disturbance (Doherty et al. 2022).
- Lek Connectivity Components: Based on the GRSG Lek Components layer (Knick and Hanser 2011), these spatial units represent interconnected clusters of leks. Connectivity within components suggests areas with higher GRSG abundance and reduced exposure to wildfire and human disturbance.
- Priority+ and Priority Habitat Management Areas (PHMA+/PHMA):
  - *PHMA+:* High-quality GRSG source habitat for any reproductive life stage within highuse areas, with high certainty of current occupancy (Milligan et al. 2024).
  - *PHMA:* GRSG habitat selection areas overlapping with high-use zones, source habitat in low-use areas, and a 500 m buffer around leks to capture satellite sites. These categories guide the conservation of both occupied and restorable areas (Coates et al. 2024, Milligan et al. 2024).

By combining these spatial layers, the map identifies regions where GRSG habitat restoration and protection will yield the greatest ecological benefits for GRSG and the broader sagebrush biome.

#### **SAP Priority Areas**

The SAP Priority Areas (shown in green on the map figures) were identified in collaboration with NDOW. These areas were selected based on:

- Their importance to GRSG population persistence and connectivity;
- Observed population responses to past restoration efforts;
- Ongoing or recent declines in GRSG habitat quality; and
- Opportunities to support areas showing GRSG population recovery due to previous restoration and management efforts.

These focal areas represent where the SETT will prioritize restoration actions over the next decade to maximize long-term conservation outcomes.



Figure 1. Areas of Conservation Importance in Greater Sage-Grouse Habitat Across Nevada.

This statewide map integrates four key data layers—Core Sagebrush Areas, Lek Connectivity Components, and Priority+/Priority Habitat Management Areas (PHMA+/PHMA). Together, they define Areas of Conservation Importance (gray), which inform where restoration would be most beneficial. SAP Priority Areas (green) highlight the locations where the SETT will prioritize restoration and enhancement efforts over the next 5–10 years.



Figure 2. Northwest Nevada – Core Greater Sage-Grouse Habitat and Connectivity Focus.

Most Areas of Conservation Importance in northwest Nevada overlap with SAP Priority Areas. This region supports high-value core GRSG habitat and lek connectivity, critical for sustaining long-term GRSG populations.



Figure 3. Northeastern Nevada – High-Density Populations and Threat Reduction.

Northeastern Nevada supports the majority of the state's GRSG population. SAP Priority Areas in this region emphasize post-wildfire rehabilitation, conifer removal, and mitigation of human disturbance to support continued population stability.



Figure 4. Central Nevada – Population Recovery and Emerging Threats.

GRSG populations in central Nevada have been increasing in recent years. SAP Priority Areas in this region aim to protect and enhance GRSG habitat amid growing development and conifer encroachment. Strategic SETT-led restoration efforts will be crucial for sustaining this momentum.

# RESOURCES

### **CURRENT POLICIES**

#### Nevada State Plan

• <u>2019 Nevada Greater</u> Conservation Plan

#### NRS 232.161-162

- Account to Restore the Sagebrush Ecosystem: Creation; powers and duties of Director; limitations on use of money in Account; claims.
- <u>Sagebrush Ecosystem Council: Creation; members; terms; vacancies; compensation; powers and duties; biannual report to Governor.</u>

#### NRS 321.592-594

- Division authorized to establish and carry out programs to preserve, restore, and enhance sagebrush ecosystems.
- <u>Powers and duties of Administrator and Division regarding programs to improve sagebrush</u> <u>ecosystems; Division authorized to make certain grants and enter into certain contracts and</u> <u>agreements; regulations.</u>

#### NAC232.400-480

• Sagebrush Ecosystem Council: Mitigation of Adverse Impact to Greater Sage-grouse and Habitat

#### Existing Management Plans (RMPs)

The BLM Resource Management Plans (RMPs) provide land use plan guidance specific to GRSG habitat conservation and management for public lands within the GRSG Habitat Management Areas (HMAs) in Nevada. The plans for each region can be found on the <u>BLM Nevada Planning and NEPA</u> website.

#### National Forest Land and Resource Management Plans (LRMPs)

The Land and Resource Management Plans (LRMPs) provide land-use plan guidance specific to GRSG habitat conservation and management for National Forest lands within the GRSG HMAs in Nevada. The Humboldt-Toiyabe National Forest plan can be found on the <u>USFS Plan Documents</u> website.

# FUNDING

The successful implementation of a long-term, sustainable conservation strategy will rely on a combination of state and federal grant programs alongside local funding sources to fulfill matching requirements. Utilizing the Nevada Conservation Credit System (CCS) to mitigate anthropogenic disturbances will support restoration efforts, fostering measurable environmental improvements through private sector investments.

#### **Agricultural Conservation Easement Program (ACEP):**

ACEP assists landowners, land trusts, and other organizations in protecting, restoring, and enhancing wetlands or preserving working farms and ranches through conservation easements. Learn more about ACEP. ALE focuses on helping private and tribal landowners, land trusts, and government agencies conserve cropland and grassland on operational farms and ranches by restricting non-agricultural uses through conservation easements.

Explore ALE opportunities

#### Agricultural Management Assistance (AMA):

AMA supports agricultural producers by assisting with financial risk management through diversification, marketing, and implementing natural resource conservation practices. More on AMA

#### Conservation Reserve Program (CRP):

Administered by the Farm Service Agency (FSA), CRP encourages farmers and landowners to convert highly erodible and environmentally sensitive land into vegetative cover, such as native grasses and riparian buffers. Participants receive rental payments and cost-share assistance to establish long-term conservation practices that enhance water quality, reduce soil erosion, and provide wildlife habitat. <u>Find out more about CRP.</u>

#### **Conservation Stewardship Program (CSP):**

CSP helps landowners strengthen their agricultural operations by building on their existing conservation practices. This program supports improvements in grazing, crop resilience, and wildlife habitat development, offering customized plans and financial assistance to address resource concerns effectively. Details on CSP

#### Environmental Quality Incentives Program – Nevada (EQIP):

EQIP provides technical and financial support to agricultural producers and forest landowners to address natural resource concerns, such as water and air quality, soil health, erosion control, and wildlife habitat improvement, while mitigating drought and extreme weather impacts.

More about EQIP in Nevada

#### Grazing Lands Conservation Initiative (GLCI):

The GLCI works to identify key issues affecting private grazing lands, offer solutions, and enhance existing conservation programs to improve land management. <u>Explore GLCI</u>

#### Landscape Conservation Initiatives:

This initiative accelerates the benefits of voluntary conservation programs to improve environmental outcomes such as cleaner water, healthier soil, and enhanced wildlife habitats. Learn about Landscape Conservation

#### National Water Quality Initiative (NWQI):

NWQI aims to speed up on-farm conservation investments and direct resources to improve water quality where they can have the greatest impact.

Read about NWQI

#### Nevada Division of Forestry Grants:

The Nevada Division of Forestry (NDF) provides funding opportunities for urban and rural natural resource conservation projects, as outlined in Nevada's Forest, Range, and Watershed Action Plan. The NDF collaborates with various partners and receives funding from the State of Nevada, the U.S. Forest Service, and other sources to address conservation issues and support impactful projects. Explore NDF Grants

#### Sage Grouse Initiative:

This initiative targets conservation efforts to improve GRSG habitat through sustainable land

#### management practices. Discover more about the Sage Grouse Initiative

#### Wetland Reserve Easements (WRE):

Through conservation easements, WRE allows landowners to protect, restore, and enhance wetlands degraded due to previous agricultural use. Details on WRE

#### Wetland Reserve Enhancement Partnership (WREP):

WREP is a voluntary program in which NRCS partners with eligible organizations to support highpriority wetland protection, restoration, and enhancement projects that benefit wildlife habitats. <u>More on WREP</u>

#### Working Lands for Wildlife (WLFW):

Through targeted conservation efforts, WLFW focuses on enhancing agricultural and forest productivity while improving wildlife habitats in working landscapes. Learn about WLFW

### TOOLS

The tools and resources below are designed to support project planning, prioritization, and treatment implementation at the site scale. These tools assist landowners, resource managers, and conservation professionals in assessing, managing, and restoring sagebrush ecosystems critical to GRSG populations in Nevada. This updated list ensures stakeholders access the most relevant and effective tools for sagebrush ecosystem conservation and GRSG habitat management in Nevada.

#### Bureau of Land Management (BLM) Geospatial Business Platform Hub

A centralized hub for accessing BLM geospatial data, including maps, datasets, and tools for landscapelevel planning. Users can search for relevant information by keyword, geographic location, or subject category.

**BLM Geospatial GIS Data** 

#### **BLM Field Office Technical Guide (FOTG)**

The FOTG is a primary scientific reference for conservation planning, providing technical information on soil, water, air, plant, and animal resource management. FOTG

#### **BLM Fire and Invasives Assessment Tool (FIAT)**

FIAT is an assessment protocol to evaluate threats to GRSG habitat, such as wildfire, conifer encroachment, and invasive annual grasses. It integrates resistance and resilience concepts to guide land management decisions.

#### BLM FIAT GIS Data

#### **BLM Habitat Assessment Framework (HAF)**

HAF provides a standardized methodology for assessing sagebrush ecosystem quality, including vegetation composition, structure, and anthropogenic impacts. This tool aids in evaluating GRSG habitat availability and suitability across different scales. BLM HAF

#### Integrated Rangeland Fire Management Strategy Actionable Science Plan

This plan provides a science-based adaptive management approach to protect, conserve, and restore the sagebrush ecosystem. It addresses fire regimes, invasive species, restoration strategies, and climate

impacts on sagebrush ecosystems. Plan Document

#### Multi-Resolution Land Characteristic (MRLC) Consortium

The MRLC is a partnership among federal agencies to create consistent, nationwide land cover and condition data to support a broad range of resource management and environmental monitoring needs. MRLC provides access to datasets such as the National Land Cover Database (NLCD) and the Rangeland Condition Monitoring Assessment and Projection (RCMAP) time series. These resources include ecological potential, vegetation fractions, and future condition projections, which are available for download and web-based services.

#### MRLC

#### Nevada Conservation Credit System (CCS)

The CCS is a market-based conservation program that provides a framework for mitigating impacts and enhancing sagebrush ecosystems. It allows landowners and developers to generate or purchase credits to offset disturbances, ensuring net conservation benefits for GRSG. CCS serves as the primary tool for implementing compensatory mitigation in Nevada.

Nevada Conservation Credit System

#### Nevada Connectivity Plan

A planning document aimed at maintaining and improving habitat connectivity for GRSG and other sagebrush-dependent species.

#### Nevada Connectivity Resources

#### Nevada Sagebrush Habitat Plan

A strategic plan outlining management approaches for conserving sagebrush ecosystems and addressing threats.

#### Nevada State Wildlife Action Plan (SWAP)

The SWAP outlines a comprehensive statewide strategy to conserve Nevada's wildlife and habitats, including 367 priority species and 20 key ecotypes (referred to as 'key habitat types'). It highlights the species and ecosystems most needing protection over the next decade to ensure their persistence for future generations.

#### Nevada SWAP

#### Nevada Rangeland Monitoring Handbook (NRMH) and Rancher's Monitoring Guide

Provides short- and long-term rangeland monitoring guidelines to inform adaptive management. <u>NV Rangeland Monitoring Handbook</u>

**Nevada Rancher's Monitoring Guide**: Offers practical monitoring techniques for landowners to track rangeland health and management outcomes.

Nevada Rangeland Research Resources

#### **Proper Functioning Conditions for Lentic and Lotic Sites**

This assessment methodology provides a consistent approach to evaluating the physical functioning of riparian-wetland areas. It helps land managers determine whether these areas are functioning properly, functioning at risk, or non-functional. Properly functioning riparian areas contribute to water quality and ecosystem stability and resilience.

PFC - Lentic Areas

PFC - Lotic Areas

#### **BLM Technical References**

#### **Resistance and Resilience Concepts**

A strategic multi-scale approach to managing invasive annual grasses and altered fire regimes in sagebrush ecosystems. This report outlines conservation strategies based on ecosystem resistance to invasives and resilience to disturbances.

Resistance and Resilience Concepts Document

#### **Sagebrush Conservation Design**

A proactive approach to restoring and conserving sagebrush ecosystems across the western United States. This framework helps land managers identify priority areas for conservation and restoration efforts by integrating ecological resilience, resistance to invasive species, and GRSG habitat needs.

Sagebrush Conservation Design

#### SAGEMAP: GIS Database for Sage-Grouse and Shrub-steppe Management

SAGEMAP provides spatial data to support the management of GRSG and sagebrush steppe ecosystems in the western United States. SAGEMAP

#### **USGS Tools**

The Science-based Management of Ravens Tool (SMaRT) is an online decision-support tool designed to help land and resource managers create adaptive management plans for areas affected by high numbers of common ravens. Based on recent studies and mapping tools, SMaRT identifies where raven densities may impact sensitive wildlife, agricultural resources, or public safety (Dettenmaier et al. 2021). The tool walks users through building site-specific management strategies using a user-friendly web interface.

#### SMaRT Tool

Additional USGS tools coming soon...

**Anthropogenic Disturbance Tool** 

**Conservation Planning Tool** 

Habitat Management Map Tool

#### Web Soil Survey (WSS)

WSS offers detailed soil data and maps to assist land managers in making informed conservation and restoration decisions.

Web Soil Survey

# REFERENCES

- Beck, J. L., M. C. Milligan, K. T. Smith, P. A. Street, A. C. Pratt, C. P. Kirol, C. P. Wanner, J. D. Hennig,
  J. B. Dinkins, J. Derek Scasta, and others. 2024. Free-roaming horses exceeding appropriate
  management levels affect multiple vital rates in greater sage-grouse. The Journal of Wildlife
  Management 88:e22669.
- Beever, E. A., and C. L. Aldridge. 2011. Influences of free-roaming equids on sagebrush ecosystems, with a focus on Greater Sage-Grouse. Studies in Avian Biology 38:273–291.
- Blomberg, E. J., J. S. Sedinger, M. T. Atamian, and D. V. Nonne. 2012. Characteristics of climate and landscape disturbance influence the dynamics of greater sage-grouse populations. Ecosphere 3:55.
- Brooks, M. L., and D. A. Pyke. 2001. Invasive plants and fire in the deserts of North America. Pages 1–14 in K. E. M. Galley and T. P. Wilson, editors. Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species. Tall Timbers Research Station.
- Bui, T.-V., J. Marzluff, and B. Bedrosian. 2010. Common raven activity in relation to land use in westernWyoming: Implications for Greater Sage-Grouse reproductive success. The Condor 112:65–78.
- Chambers, J. C., B. A. Bradley, C. S. Brown, C. D'Antonio, M. J. Germino, J. B. Grace, S. P. Hardegree,
  R. F. Miller, and D. A. Pyke. 2014a. Resilience to Stress and Disturbance, and Resistance to
  Bromus tectorum L. Invasion in Cold Desert Shrublands of Western North America. Ecosystems 17:360–375.
- Chambers, J. C., D. A. Pyke, J. D. Maestas, M. Pellant, C. S. Boyd, S. B. Campbell, S. Espinosa, D. W. Havlina, K. E. Mayer, and A. Wuenschel. 2014b. Using resistance and resilience concepts to reduce impacts of invasive annual grasses and altered fire regimes on the sagebrush ecosystem and greater sage-grouse: A strategic multi-scale approach. Gen. Tech. Rep. RMRS-GTR-326. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 73 p. 326.

- Coates, P. S., M. C. Milligan, B. G. Prochazka, B. E. Brussee, S. T. O'Neil, C. G. Lundblad, S. C. Webster, C. L. Weise, S. R. Mathews, M. P. Chenaille, and others. 2024. Status of greater sage-grouse in the Bi-State Distinct Population Segment—An evaluation of population trends, habitat selection, and efficacy of conservation actions. US Geological Survey.
- Coates, P. S., B. G. Prochazka, M. S. O'Donnell, C. L. Aldridge, D. R. Edmunds, A. P. Monroe, M. A. Ricca, G. T. Wann, S. E. Hanser, L. A. Wiechman, and others. 2021. Range-wide greater sage-grouse hierarchical monitoring framework—Implications for defining population boundaries, trend estimation, and a targeted annual warning system. US Geological Survey.
- Coates, P. S., B. G. Prochazka, M. A. Ricca, K. A. Gustafson, P. Ziegler, M. L. Casazza, and D. J. Delehanty. 2020. Broad-scale occurrence of a subsidized avian predator: Reducing spatial bias in correlative models with multiscale habitat data. Ecological Indicators 111:106020.
- Coates, P. S., B. G. Prochazka, M. A. Ricca, K. B. Gustafson, P. T. Ziegler, and M. L. Casazza. 2017. Pinyon and juniper encroachment into sagebrush ecosystems impacts distribution and survival of greater sage-grouse. Rangeland Ecology and Management 70:25–38.
- Coates, P. S., M. Ricca, B. Prochazka, M. Brooks, K. Doherty, T. Kroger, E. Blomberg, C. Hagen, and M. Casazza. 2016. Wildfire, climate, and invasive grass interactions negatively impact an indicator species of the sagebrush ecosystem. PNAS 113:12745–12750.
- Crist, M. R., R. Belger, K. W. Davies, D. M. Davis, J. R. Meldrum, D. J. Shinneman, T. E. Remington, J. Welty, and K. E. Mayer. 2023. Trends, Impacts, and Cost of Catastrophic and Frequent Wildfires in the Sagebrush Biome. Rangeland Ecology & Management 89:3–19.
- D'Antonio, C. M., and P. M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology, Evolution, and Systematics 23:63–87.
- Doherty, K., D. M. Theobald, M. C. Holdrege, L. A. Wiechman, and J. B. Bradford. 2022. Biome-wide sagebrush core habitat and growth areas estimated from a threat-based conservation design. U.S. Geological Survey.

- Dudley, I. F., P. S. Coates, B. G. Prochazka, S. T. O'Neil, S. Gardner, and D. J. Delehanty. 2021. Largescale wildfire reduces population growth in a peripheral population of sage-grouse. Fire Ecology 17:15.
- Gibson, D., E. J. Blomberg, M. T. Atamian, and J. S. Sedinger. 2017. Weather, habitat composition, and female behavior interact to modify offspring survival in Greater Sage-Grouse. Ecological Applications 27:168–181.
- Gregg, M. A., and J. A. Crawford. 2009. Survival of greater sage-grouse chicks and broods in Oregon. Journal of Wildlife Management 73:904–913.
- Guttery, M. R., D. K. Dahlgren, T. A. Messmer, J. W. Connelly, K. P. Reese, P. A. Terletzky, N. Burkepile, and D. N. Koons. 2013. Effects of landscape-scale environmental variation on greater sagegrouse chick survival. PLoS One 8:e65582.
- Harju, S., C. V. Olson, J. Hess, and S. L. Webb. 2021. Isotopic analysis reveals landscape patterns in the diet of a subsidized predator, the common raven. Ecological Solutions and Evidence 2:e12100.
- Howe, K., P. Coates, and D. Delehanty. 2014. Selection of anthropogenic features and vegetation characteristics by nesting Common Ravens in the sagebrush ecosystem. Ornithological Applications 116:35–49.
- Knick, S. T., D. S. Dobkin, J. T. Rotenberry, M. A. Schroeder, W. M. Vander Haegen, and I. van Riper Charles. 2003. Teetering on the Edge or too Late? Conservation and Research Issues for Avifauna of Sagebrush Habitats. The Condor: Ornithological Applications 105:611–634.
- Knick, S. T., and S. E. Hanser. 2011. Chapter 16: Connecting Pattern and Process in Greater Sage-Grouse Populations and Sagebrush Landscapes. Page Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and Its Habitats. University of California Press.
- Kristan, W. B., and W. I. Boarman. 2007. Effects of anthropogenic developments on common raven nesting biology in the West Mojave Desert. Ecological Applications: A Publication of the Ecological Society of America 17:1703–1713.

- Lockyer, Z. B., P. S. Coates, M. L. Casazza, S. Espinosa, and D. J. Delehanty. 2015. Nest-site selection and reproductive success of greater sage-grouse in a fire-affected habitat of northwestern Nevada. Journal of Wildlife Management 79:785–797.
- Mahood, A. L., and J. K. Balch. 2019. Repeated fires reduce plant diversity in low-elevation Wyoming big sagebrush ecosystems. Fire Ecology 15:1–15.
- Miller, R. F., J. C. Chambers, and M. Pellant. 2011. A science framework for restoring and conserving the Great Basin sagebrush biome. U.S. Forest Service General Technical Report RMRS-GTR-256.
- Milligan, M. C., P. S. Coates, S. T. O'Neil, B. E. Brussee, M. P. Chenaille, D. Friend, K. Steele, J. R. Small, T. S. Bowden, A. D. Kosic, and K. Miller. 2024. Greater sage-grouse habitat of Nevada and northeastern California—Integrating space use, habitat selection, and survival indices to guide areas for habitat management. Page Open-File Report. U.S. Geological Survey.
- Nevada Department of Wildlife. 2024. Policy 67 Feral Horses and Burros. Report to the Nevada Board of Wildlife Commissioners.
- Prochazka, B. G., P. S. Coates, M. A. Ricca, M. L. Casazza, K. B. Gustafson, and J. M. Hull. 2017. Encounters with Pinyon-Juniper Influence Riskier Movements in Greater Sage-Grouse Across the Great Basin. Rangeland Ecology & Management 70:39–49.
- Sauer, J. R., W. A. Link, J. E. Fallon, K. L. Pardieck, and D. J. Ziolkowski Jr. 2013. The North American breeding bird survey 1966–2011: summary analysis and species accounts. North American Fauna:1–32.
- Smith, J. T., M. A. Ricca, P. S. Coates, J. D. Tack, A. Moser, J. D. Maestas, and D. E. Naugle. 2023. Annual grass invasion causes widespread transformation of sagebrush ecosystems. Journal of Applied Ecology 60:1304–1316.
- Street, P. A., L. Jaster, T. E. Dilts, T. L. Behnke, and J. S. Sedinger. 2025. Grazing by non-native ungulates negatively impacts vegetation important to a native species of concern. Ecosphere 16:e4974.



For information and questions about the Nevada Conservation Credit System, please contact:

Sagebrush Ecosystem Technical Team (SETT)

(775) 687-2000