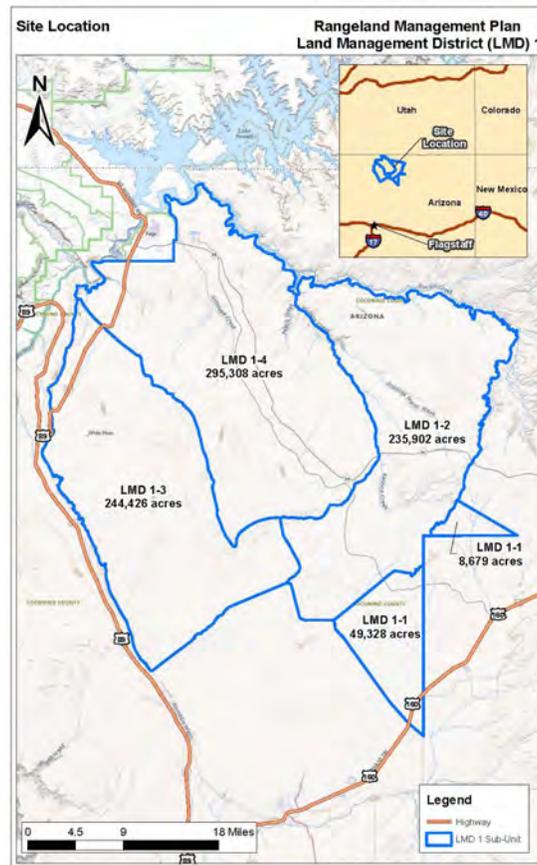


Programmatic Environmental Assessment

Adopt and Implement Proposed Rangeland Management Plan

Land Management District 1 (LMD-1) Navajo Nation, Coconino County, Arizona



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List of Acronyms

Acronym	Definition
°F	degrees Fahrenheit
AIARMA	American Indian Agriculture Resource Management Act
ALUP	Agricultural Land Use Permit
ATC	Agricultural Technical Center
AUM	abandoned uranium mine
AUYL	Animal Unit Year Long
AZ	Arizona
AZDWR	Arizona Department of Water Resources
BE	Biological Evaluation
BIA	Bureau of Indian Affairs
BMP	best management practice
BNR	Branch of Natural Resources
BRLC	Biological Resource Land Clearance Policies
CAA	Clean Air Act
CCT	Climate Change Team
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO ₂ e	carbon dioxide equivalent
CUA	Customary Use Area
CVI	Climate Vulnerability Index
CWA	Clean Water Act
EA	Environmental Assessment
US EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FBFA	Former Bennett Freeze Area
FONSI	Finding of No Significant Impact
ft	feet
GHG	Greenhouse Gas
IAM	Indian Affairs Manual
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IRMP	Integrated Resource Management Plan
IWM	Integrated Weed Management
LMD	Land Management District
LMD-1	Land Management District-1

Acronym	Definition
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NN	Navajo Nation
NNAPPCA	Navajo Nation Air Pollution Prevention and Control Act
NNC	Navajo Nation Code
NNCRPA	Navajo Nation Cultural Resources Protection Act
NNCWA	Navajo Nation Clean Water Act
NNDA	Navajo Nation Department of Agriculture
NNDFW	Navajo Nation Department of Fish & Wildlife/Heritage
NNDNR	Navajo Nation Division of Natural Resources
NNDWR	Navajo Nation Department of Water Resources
NNEPA	Navajo Nation Environmental Protection Agency
NNHHPD	Navajo Nation Heritage and Historic Preservation Department
NNHP	Navajo Natural Heritage Program
NNIWMP	Navajo Nation Integrated Weed Management Plan
NNPA	Navajo Nation Pesticide Act
NNRMA	Navajo Nation Rangeland Management Act
NNSDWA	Navajo Nation Safe Drinking Water Act
NNWC	Navajo Nation Water Code
NO ₂	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPL	Navajo Partitioned Land
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Properties
NTUA	Navajo Tribal Utility Authority
O ₃	Ozone
PEA	Programmatic Environmental Assessment
PL	Public Law
PM _{2.5}	particulate matter
RCP	Biological Resource Land Use Clearance Policies and Procedures
RDC	Resources and Development Committee
RMP	Rangeland Management Plan
RMU	Range Management Unit
ROW	right-of-way

Acronym	Definition
RU	Range Unit
SMU	Soil Mapping Unit
SO ₂	sulfur dioxide
SOP	Standard Operating Procedure
Sundance	Sundance Consultants, LLC
SUYL	Sheep Units Year Long
TCP	traditional cultural property
USC	U.S. Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WNA	Western Navajo Agency

Executive Summary

The Bureau of Indian Affairs (BIA) Navajo Region, Western Navajo Agency (WNA), Branch of Natural Resources has developed a draft 10-year Rangeland Management Plan (RMP). This plan aims to enhance agricultural resource management practices and facilitate monitoring within Land Management District 1 (LMD-1). Land Management Districts (LMDs) are designated areas across the Navajo Nation managing various land resources, including grazing, croplands, and other agricultural activities. LMD-1 specifically covers the northwestern Arizona section of the Navajo Nation, including the community areas of Tonalea, Kaibeto, Coppermine, and LeChee Chapters.

A Programmatic Environmental Assessment (PEA) has been prepared to assess the potential impacts of adopting and implementing the RMP (Proposed Action/Preferred Alternative) as well as the implications of not taking action (No Action Alternative). This PEA adheres to the National Environmental Policy Act (NEPA) and follows the guidance for programmatic NEPA documents, as specified in 40 Code of Federal Regulations (CFR) § 1501.11. It evaluates the broad environmental issues associated with the RMP's implementation, establishing policies, plans, and programs, while framing the scope for subsequent site- and project-specific federal actions that require NEPA compliance.

Land Management District 1 Overview

LMD-1 encompasses approximately 833,625 acres of the Navajo Nation in northern Arizona, featuring a variety of landscapes from arid plains to upland woodlands and riparian corridors. It stretches from Page, Arizona, at the northwest boundary and extends 50 miles to the south to within 10 miles north of Tuba City. This high desert region is part of the Kaibito Plateau, with average elevations around 6,000 feet (ft), ranging from 5,000 ft at LeChee in the northwest to 5,800 ft at Kaibeto in the southeast, reaching 7,200 ft elevation on White Mesa at the eastern boundary. Of the total area, 818,223 acres are rangelands and 349 acres are dryland croplands, excluding 60% of the Tonalea Chapter area, which is part of the Navajo Partitioned Lands (NPL). The BIA records indicate 535 grazing permits for rangelands and 51 Agriculture Land Use Permits (ALUPs) for the dry farmlands. LMD-1 represents 16% of the 5.21 million-acres WNA and 10.4% of the 1.5 million-acre FBFA land area, particularly in the Coppermine (Subunit 3), Kaibeto (Subunit 2), and Tonalea (Subunit 1) LMD-1 subunits, which require water and fencing improvement to meet the land management and livestock production goals outlined in the FBFA IRMP (BIA, 2021a).

Purpose and Need

This RMP is a comprehensive 10-year plan developed under the American Indian Agriculture Resource Management Act (AIARMA) to fulfill BIA's trust responsibility to conserve land resources while enhancing economic returns and social well-being. The RMP addresses specific challenges faced by LMD-1, particularly those related to the Former Bennett Freeze Area (FBFA). Key challenges include balancing ecological restoration with sustainable agricultural production. The RMP proposes integrated and proactive solutions to focusing on the following areas:

1. Regulation and enforcement:
 - Existing grazing permits are often unenforced or lack clear boundaries, leading to unauthorized grazing and overuse. Approximately 80% of rangelands underutilized, while 20% are overgrazed, resulting in resource degradation. Effective monitoring and

- enforcement are crucial for improving rangeland health and meeting AIARMA requirements.
2. Education, Training, and Assistance:
 - Land users currently lack adequate access to education and training, hindering their ability to implement best management practices (BMPs). Enhanced engagement and capacity-building programs are essential for equipping stakeholders with the necessary tools to achieve conservation goals while preserving traditional Navajo agricultural practices.
 3. Economic and Agricultural Productivity:
 - Agricultural production in LMD-1 is low, with limited diversity and economic opportunities. There is a need to focus on increasing livestock and food production through targeted improvements and innovative grazing practices.
 4. Integrated Infrastructure Development:
 - Insufficient water systems and fencing infrastructure hinder optimal agricultural production. Comprehensive mapping, inventory assessments, and strategic investments in infrastructure are vital to achieving conservation and productivity goals.

The RMP's purpose is to restore degraded lands, protect critical habitats and cultural resources, and ensure the viability of grazing and other traditional practices for future generations. It aligns with the Diné principles of hozho, or harmony and balance, by integrating conservation and productivity goals to support ecological health, agricultural success, and cultural vitality. By addressing the root causes of resource degradation and fostering collaboration among agencies and stakeholders, this plan lays the groundwork for sustainable land use and improved livelihoods for the Navajo Nation.

Need for Enhanced Interagency Collaboration

A major challenge to achieving AIARMA objectives is the lack of interagency coordination. Agencies with distinct roles often operate independently, hindering collaborative solutions:

1. **The BIA** oversees permitting and monitoring but faces challenges in reissuing grazing permits due to unresolved boundary issues within Customary Use Areas (CUAs).
2. **The Navajo Nation Department of Agriculture (NDA)** manages livestock enforcement but lacks sufficient fencing to regulate permitted and feral livestock effectively.
3. **The Navajo Nation Department of Water Resources (NNDWR)** is responsible for water development and maintenance but does not consistently coordinate with BIA or permittees to align efforts with conservation and production goals.

Key Components of the Rangeland Management Plan

The proposed RMP provides a comprehensive strategy to manage and improve agricultural productivity across LMD-1. Key components include:

- **Establishing an Agricultural Technical Center (ATC):** The ATC will function as a central hub for collaboration, education, and technical support. The ATC will foster

interagency partnerships and engage stakeholders in planning, ensuring a holistic approach to addressing LMD-1's challenges.

- **Establishing Range Management Units (RMUs):** Establishing RMUs and adaptive schedules will manage grazing pressure and allow for vegetation recovery.
- **Developing RMU Plans:** RMU Plans provide a pathway to achieving the conservation and production goals outlined in this RMP, fostering sustainable grazing practices that benefit both the land and its users.
- **Carrying Capacity and Stocking Rates Determination:** Information is critical to fairly issuing grazing permits and making informed decisions regarding annual livestock management.
- **Grazing Permit Issuance and Maintenance:** Future grazing permits should be tied to RMUs with defined boundaries to ensure compliance with conservation goals and sustainable rangeland use.
- **Grazing and Farm Association Formation:** Forming this association, which is promoted by range management professionals, involves fostering voluntary grazing associations on fenced RMUs through a collaborative democratic process.
- **Farming Permit ALUP Issuance:** Permits are required for farm plots of one acre or more located outside of 1-acre homesite leases.
- **Explanation of Education and Assistance Provision; Ranchers Roundtable:** Education is essential for building trust, ensuring engagement, and achieving RMP goals. A Ranchers Roundtable should be established to serve as a recurring forum for education, collaboration, and discussion while fostering peer-to-peer learning, providing a platform for addressing concerns and building a sense of community among stakeholders.
- **Monitoring Feedback Loop and Reporting:** By integrating a monitoring feedback loop into the RMP, LMD-1 can adapt to changing conditions, improve resource stewardship, and achieve sustainable production goals.
- **Infrastructure and Restoration:** Addressing critical infrastructure and restoration needs, including water development, fencing for grazing control, livestock handling facilities, road access and controls, and rangeland restoration projects, is fundamental to achieving sustainable land management and production goals.

Proposed Alternatives

- **No Action Alternative:** Continuation current practices is expected to worsen existing issues like overgrazing, soil erosion, wildlife habitat degradation, and threats to cultural resources. Water infrastructure would remain insufficient, and the LMD-1's ecosystems would experience heightened stress from ongoing drought conditions and the encroachment of invasive species.
- **Proposed Action:** Implementation of the RMP would yield substantial benefits, including stabilized soils, improved vegetation cover, better water distribution, and enhanced protection for cultural sites. The adoption of adaptive management strategies would bolster the LMD-1's resilience to climate variability, promoting the sustainable use of resources in the long term.

RMP Anticipated Benefits

The RMP for LMD-1 represents a vital step toward achieving a sustainable balance between resource use, cultural preservation, and ecological restoration. By addressing the district's most pressing challenges, the RMP ensures that the land, water, and the cultural heritage of LMD-1 will continue to sustain the Navajo people and their traditions for generations to come. This PEA provides a comprehensive evaluation of the RMP's potential impacts, laying the groundwork for informed decision-making and effective implementation. The RMP is expected to deliver measurable improvements across ecological, cultural, and economic dimensions:

- **Environmental Restoration:** Reduced soil erosion, improved vegetation health, and enhanced biodiversity.
- **Water Resource Sustainability:** Expanded infrastructure to alleviate pressure on riparian areas and support livestock, wildlife, and human use.
- **Cultural Preservation:** Safeguards for sacred sites and traditional use areas, ensuring their protection for future generations.
- **Economic Resilience:** Improved forage availability and reduced operational costs for grazing permit holders.
- **Climate Resilience:** Strengthened adaptive capacity to address the impacts of prolonged droughts and extreme weather events.

1 Introduction

The Bureau of Indian Affairs (BIA) Navajo Region, specifically the Western Navajo Agency (WNA) Branch of Natural Resources (BNR), has prepared a draft 10-year Rangeland Management Plan (proposed RMP) (see Appendix A) for Land Management District 1 (LMD-1) within the Navajo Nation. This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the potential impacts of adopting the proposed RMP (Proposed Action/Preferred Alternative), and the consequences of taking no action (No Action Alternative), in compliance with the requirements of the National Environmental Policy Act (NEPA).

In light of the proposed federal action, the BIA has prepared this PEA following the guidelines set forth by the Council on Environmental Quality (CEQ) (CEQ, 2014). Programmatic NEPA reviews focus general environmental issues related to broad decisions, such as establishing policies, plans, or programs, and serve as a foundation for analyzing direct, indirect, and cumulative impacts of these decisions. By outlining the scope for future site and project-specific federal actions, the Proposed Action establishes a clear process for approving subsequent federal initiatives related to rangeland management in LMD-1. This PEA evaluates the environmental consequences of implementing actions that promote sustainable land management practices benefiting local communities. The proposed federal actions are tailored to address the specific needs of these areas, incorporating public input and scoping conducted with participation of LMD-1 residents, who have expressed a strong interest to enhancing rangeland conditions and increasing agricultural productivity.

1.1 Land Management District 1

Land Management Districts (LMDs) are designated areas within the Navajo Nation for managing various land resources, including grazing, croplands, and other agricultural activities. These districts were established to ensure sustainable use of natural resources while promoting agricultural productivity and land conservation. LMD-1 spans of approximately 833,625 acres located in northern Arizona, situated within the Navajo Nation, and bordering the southern edge of Utah (Figure 1-1). It encompasses four communities, each with Subunit land management needs:

Community	Size (acres)	Residents	Households
Tonalea (Red Lake)	74,313	2,750	486
Kaibeto	226,018	1,955	750
Coppermine	291,096	583	201
LeChee	242,298	1,647	454

(U.S. Census Bureau, 2009-2023)

These communities overlap with a portion of the Former Bennett Freeze Area (FBFA), a region where development was restricted for 40 years due to a land dispute between the Navajo Nation and the Hopi Tribe. Although the restriction was lifted in 2006, development has progressed slowly, leading to ongoing challenges related to agricultural productivity and infrastructure.

Environmental Setting

Key transportation routes through LMD-1 include U.S. Highways 89, and 160, and Arizona State Highway 98, along with 210 miles of mostly unpaved secondary roads. The primary communities within LMD-1 are LeChee, Kaibito, Coppermine, and Tonalea.

LMD-1 is part of the Colorado Plateau Major Land Resource Area, a region shaped by geological uplift, volcanism, and erosion. The landscape features sandstone uplifts, rolling ridge lines, and swales shaped by wind and water erosion. Elevation and topography vary, contributing to diverse environmental conditions across the district (Figure 1-3).

LMD-1 experiences long-term average rainfall of about 6.3 inches annually, but precipitation varies widely from 5 to 17 inches per year (Figure 1-4). Summer thunderstorms account for about 40% of the annual rainfall, while winter precipitation primarily occurs as snowfall. Years fluctuate from 25% below normal rainfall in dry years to 25% above in wet years. The region has been in prolonged drought for over two decades. Drought conditions are exacerbated by climate change, which is expected to alter precipitation patterns and increase heat in the region. Temperatures in the city of Kaibito range from 93 degrees Fahrenheit (°F) (34 degrees Celsius [°C]) in the summer to 28°F (-2°C) in the winter.

Area Included in the Analysis

LMD-1 encompasses approximately 0.83 million acres along the western edge of the Navajo Reservation in Coconino County, Arizona, on the northern border with Utah (Figure 1-1). The Navajo Nation is divided into administrative boundaries called LMDs. Within LMD-1, there are four chapters (communities): Tonalea (LMD-1-1) with 74,313 acres, Kaibito (LMD-1-2) with 226,018 acres, Coppermine (LMD-1-3) with 291,096 acres, and LeChee (LMD-1-4) with 242,298 acres. Of the total 833,625 acres, 818,223 acres are designated as rangelands, while 349 acres are classified as croplands, all of which are dryland farms. It is important to note that these figures exclude the 60% of the Tonalea Chapter area that falls within the Navajo Partitioned Lands (NPL). The BIA records indicate 535 grazing permits for the rangelands and 51 Agriculture Land Use Permits (ALUPs) for the dry farms. Figure 1-2 is a preliminary map that shows the 20 compartments that have been proposed by BIA (two-digit numbers), six Range Management Units (RMUs) (three-digit numbers) in LMD-1, the location of grazing permit based on annual Tally Count, highways, and communities.

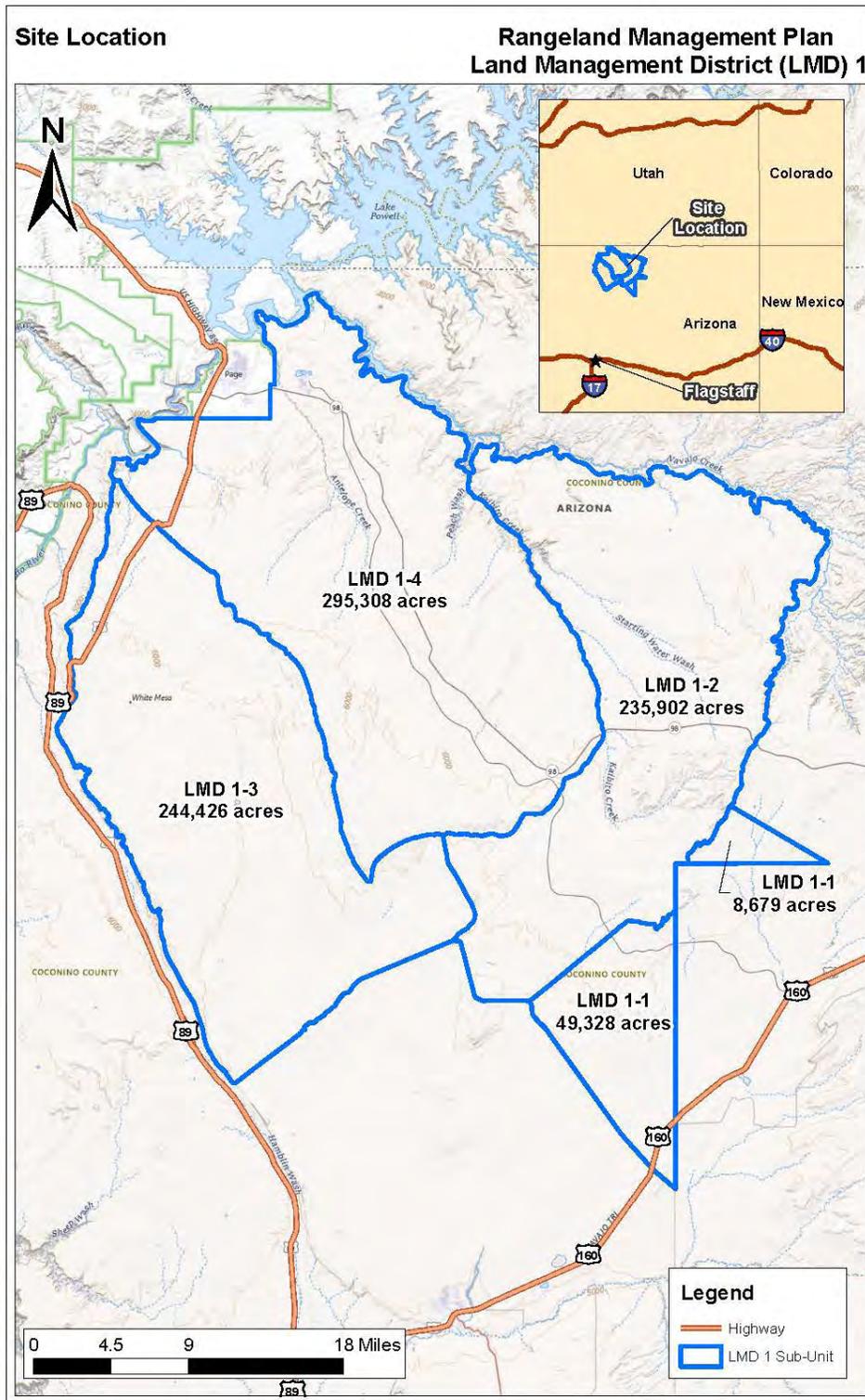


Figure 1-1. Site Location/Map of Roads, LMD-1 Boundaries

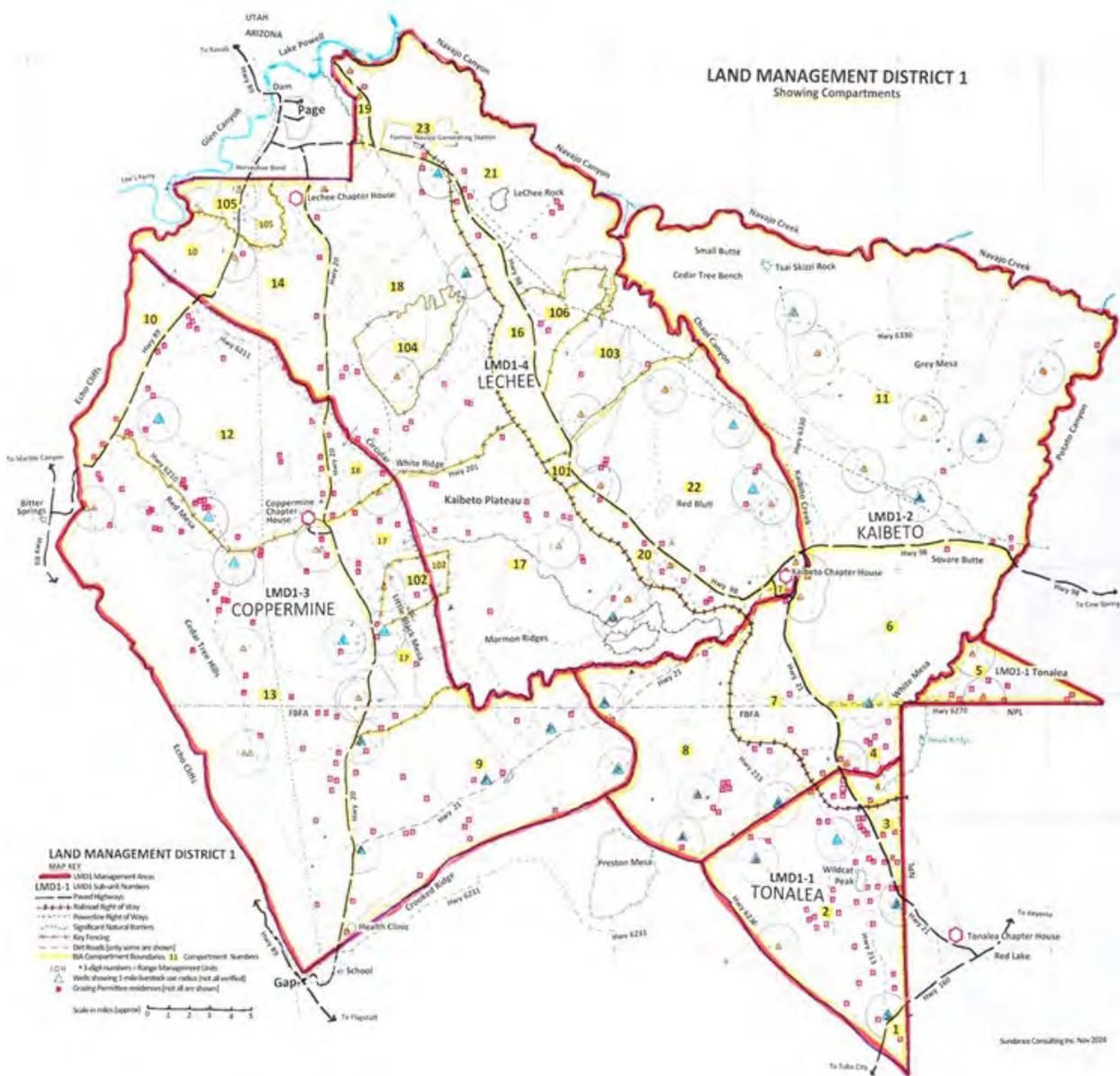


Figure 1-2. Preliminary Map with Compartments and RMUs in LMD-1

1.2 Historical Agricultural Practices

Before the 1930s, the LMD-1 area had very few Navajo residents due to the scarcity of reliable water sources. At that time, grazing was limited to brief seasonal transhumance, primarily involving sheep. A few wells were developed in the early 20th century, but it was not until the late 1930s that the BIA established fenced LMDs across the reservation. The boundary of LMD-1 was fenced, and baseline land inventories were conducted, leading to the adjudication of grazing permits in 1941. These Customary Use Areas (CUAs) were assigned based on identified family heads residing at homes or camps in each area, without specific description of the land area locations, sizes, or boundaries (Bingham and Bingham, 1982; Bailey and Bailey, 1986). Historical

agricultural practices included dryland farming and seasonal livestock rotational grazing of traditional herds of sheep and goats.

1.3 Current Agricultural Practices

Over time, traditional herds of sheep and goats have largely transitioned to cattle herds, as cattle require less constant herding and command higher market prices. This shift has led to a decrease in grass production, as cattle primarily graze on grass and tend to stay near reliable water source year-round. Consequently, there has been an increase in broom snakeweed (*Gutierrezia sarothrae*), Russian thistle (*Salsola tragus*), and rabbitbrush (*Chrysothamnus spp.*) across much of the reservation (Ecosphere, 2012). Extended drought periods and reduction in seasonal livestock rotation have further contributed to declines in rangeland health. Areas of blow sand and sand dunes have emerged where they previously did not exist and deep arroyos have rendered some pastures inaccessible to grazing animals.

According to data published by the BIA WNA on their website (Western Navajo Agency/Indian Affairs), LMD-1 has a capacity of 26,716 Sheep Units Year Long (SUYL), equivalent to 5,343 Animal Unit Year Long (AUYL), which translates to a stocking rate of 4.18 AUYL per section for the 1,278-section area of LMD-1. This rate aligns with the 4.0 AUYL per-section used by the Arizona State Land Department uses for annual precipitation areas in Northern Arizona that are similar to LMD-1. The average size of the 535 grazing permits in LMD-1 is 50 SUYL or 10 AUYL per permittee. The availability of water and type of grazing system determine the amount of forage permitted for grazing. Details regarding the carrying capacity and stocking rates for grazing permit issuance on LMD-1 rangelands are covered in Section 4.5 of Appendix A. Water for LMD-1 is sourced exclusively from wells or transported by hauling, as there are no naturally flowing streams or springs in the area.

1.4 Consistency with Plans, Permits, Authorizations, Directives and Approvals.

The LMD-1 RMP was developed in alignment with various federal and Tribal plans, regulations, and permits to ensure that land-use decisions and agricultural practices are consistent with broader resource management goals. This document works in tandem with the Integrated Resource Management Plan (IRMP), the BIA policies, and the guidance of the Natural Resources Conservation Service (NRCS) to ensure that land management strategies within LMD-1 are sustainable, legally compliant, and supportive of long-term environmental and agricultural goals.

The missions of the BIA and the WNA BNR include the following:

- **Navajo Region Mission:** Enhance the quality of life, facilitate economic opportunities, and protect and improve the trust assets of the Navajo Nation and individual Navajo people.
- **WNA-BNR Mission:** Maintain overall productivity and achieve the highest return from grazing, farming, water, and wildlife resources through sustainable yield management.

By achieving these goals, agricultural resource management would provide a path toward improving agricultural land use and ensuring that LMD-1 remains a vital area for both production and resource sustainability.

1.4.1 Navajo Nation Cultural Resource Protections

The LMD-1 RMP is also consistent with the policies and procedures set forth by the Navajo Nation and federal regulations regarding the identification and protection of cultural resources. In

alignment with the FBFA IRMP, the RMP adheres to the National Historic Preservation Act (NHPA), the Navajo Nation Cultural Resources Protection Act, and the Biological Resource Land Use Clearance Policies and Procedures (RCP).

These regulations ensure that any agricultural management activities within LMD-1 are thoroughly reviewed for potential impacts on traditional cultural properties (TCPs), archaeological sites, and other culturally significant locations. The RMP incorporates a consultation process with the Navajo Nation Heritage and Historic Preservation Department (NNHHPD) to ensure that cultural sites are identified, respected, and preserved. This ensures that agricultural land management decisions support sustainable agricultural development while safeguarding the cultural heritage and traditional values of the Navajo Nation.

1.4.1.1 Navajo Nation Division of Natural Resources Biological Resource Land Clearance Policies

The Resources Committee of the Navajo Nation Council holds legislative oversight over the NNDNR, which includes both the Navajo Nation Department of Fish & Wildlife (NNDFW) and the Navajo Nation Department of Agriculture (NNDA). Together, these departments are responsible for adopting and enforcing policies, procedures, and regulations to protect the biological and agricultural resources of the Navajo Nation. On March 13, 2003, the Resources Committee approved the RCP by Resolution No. RCMA-34-03. The RCP, formerly referred to as the Biological Resource Land Clearance Policies (BRLC), assists the Navajo Nation government and its chapters in ensuring compliance with both federal and Navajo laws that protect wildlife resources, agricultural lands, plants, and their habitats through an expedited land-use clearance process.

The Navajo Nation has been divided into six types of wildlife areas, which also integrate agricultural land considerations, serving as a framework for planning and approving development projects (Figure 1-3). In most cases, site-specific planning is still necessary to address potential impacts on wildlife and agricultural resources. The RCP outlines the restrictions and planning processes that apply to each area, as summarized below:

- **Highly Sensitive Area:** Development is generally discouraged, with few exceptions.
- **Moderately Sensitive Area:** Development is allowed but with moderate restrictions to avoid impacting sensitive species, habitats, or agricultural lands.
- **Less Sensitive Area:** These areas have the fewest restrictions on development.
- **Community Development Area:** Located in and around towns, with few to no restrictions on development.
- **Biological Preserve:** No development is allowed unless it aligns with the specific conservation purpose of the area.
- **Recreation Area:** Development is permitted only if compatible with the recreational use and purpose of the area.

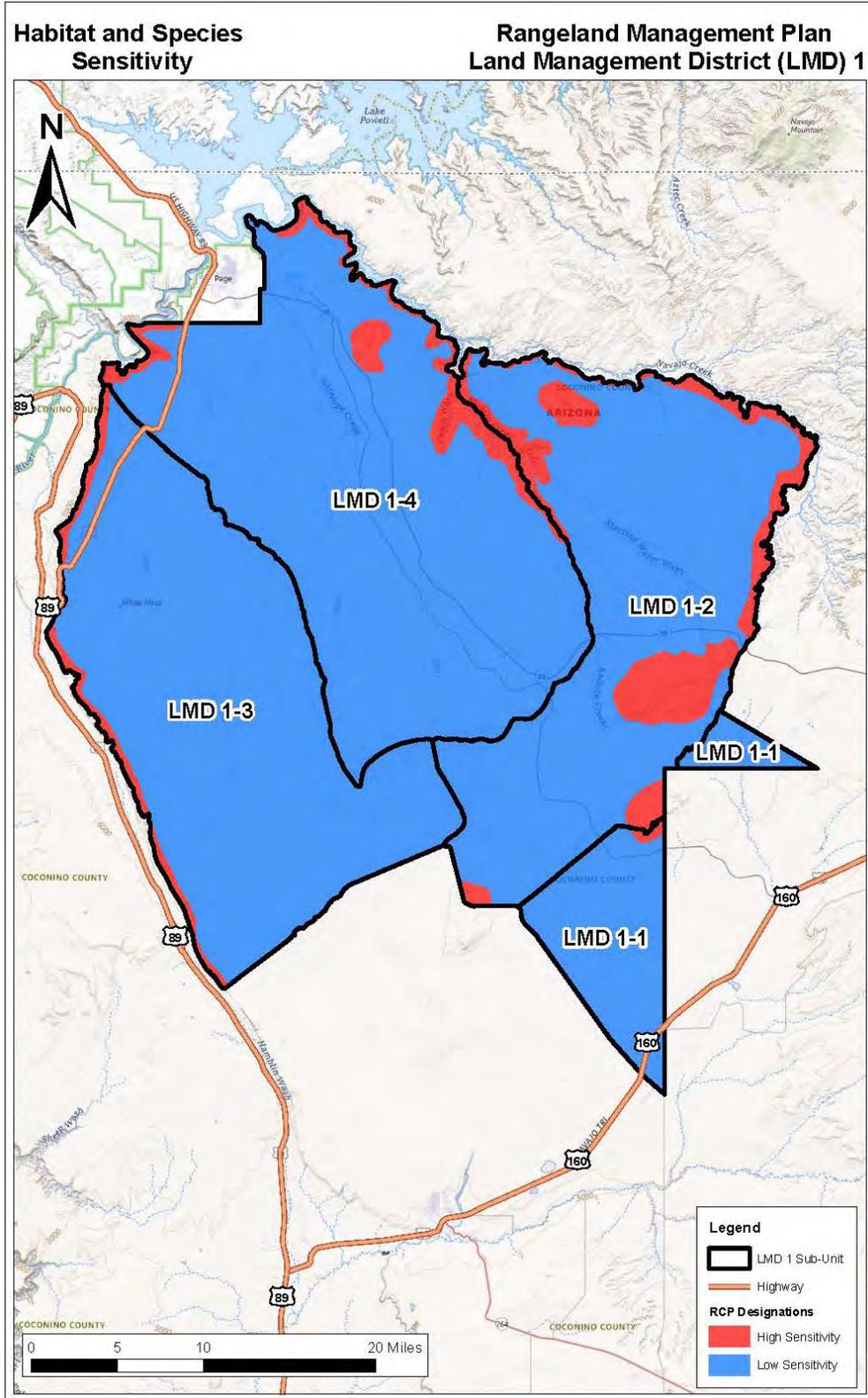


Figure 1-3. Habitat and Species Sensitivity within LMD-1

1.4.1.2 Integrated Resource Management Plan Programmatic Environmental Assessment

The RMP is consistent with the goals outlined in the FBFA IRMP PEA (BIA NRO, 2022), which serves as a comprehensive framework for resource management across the region. The IRMP PEA emphasizes the need for sustainable agriculture, the protection of natural resources, and the revitalization of formerly restricted lands. The LMD-1 RMP specifically addresses the rangeland and cropland components of the IRMP, ensuring that management practices align with the IRMP's objectives of restoring harmony among human, environmental, and cultural resources.

1.4.1.3 National Environmental Policy Act

The BIA is the lead federal agency for this NEPA process. Based on the context of the proposed federal action, which involves the adoption and implementation of the RMP, preparation of a PEA was undertaken. Programmatic NEPA reviews address general environmental issues related to broad decisions, such as establishing policies, plans, programs, or a suite of projects, and can effectively frame the scope of subsequent site- and project-specific federal actions (CEQ, 2014 Memorandum: Effective Use of Programmatic NEPA Reviews). The CEQ Memorandum emphasizes that programmatic reviews provide a framework for agencies to identify geographically bound areas where future activities will take place, and to develop broad mitigation measures that apply to those activities. By establishing this foundation, programmatic reviews allow agencies to avoid repetitive, broad-level analyses in subsequent tiered reviews, which instead can focus on narrower, site-specific issues. This method not only reduces redundancy but also offers a more comprehensive understanding of the cumulative and indirect effects of multiple proposed actions.

The CEQ 2014 Memorandum also highlights the strategic use of programmatic reviews to establish anticipated timing and sequencing of decisions, as well as identifying which decisions are supported by the PEA and which may be deferred for future site-specific analyses. This tiered approach provides a starting point for analyzing direct, indirect, and cumulative impacts, offering a more integrated and efficient process.

The preparation of this PEA is consistent with the purpose and goals of NEPA, 42 U.S. Code (USC) § 4321 et seq.; the requirements of the CEQ implementing NEPA regulations at 40 CFR Parts 1500-1508 (promulgated September 14, 2020); longstanding federal judicial and regulatory interpretations; the Department of the Interior's NEPA regulations (43 CFR Part 46); the Indian Affairs NEPA Guidebook, 59 Indian Affairs Manual [IAM] 3-H (BIA, 2012); and administration priorities and policies, including Secretary's Order No. 3399, which requires bureaus and offices to use "the same application or level of NEPA that would have been applied to a proposed action before the 2020 Rule went into effect."

1.4.2 Endangered Species Act

The Endangered Species Act (ESA) (16 USC § 1531 et seq.) establishes protections for species that are federally listed as threatened or endangered and safeguards the habitats critical to their survival. Endangered species are those at risk of extinction throughout all or a significant portion of their range, while threatened species are likely to become endangered in the near future.

Under Section 7 of the ESA, federal agencies are required to use their authority to conserve these species and their habitats, in consultation with the U.S. Fish and Wildlife Service (USFWS). Section 7(a)(1) mandates proactive conservation efforts, while Section 7(a)(2) ensures that

agencies do not authorize, fund, or carry out actions that jeopardize the existence of listed species or adversely modify critical habitats. To comply with Section 7(a)(2), agencies must assess whether their proposed actions affect endangered or threatened species or their critical habitat. If any listed species or habitats are present, agencies must evaluate the potential effects of their actions through a Biological Evaluation (BE) or Biological Assessment, which may require formal consultation with the USFWS. Formal consultation concludes when USFWS provides a Biological Opinion on the action's potential impacts.

Additionally, agencies must confer with the USFWS under Section 7(a)(4) if a proposed action is likely to jeopardize species being considered for listing or adversely affect proposed critical habitats, following a similar evaluation process.

1.4.3 Other Federal Laws and Directives

In addition to the BIA, various other federal agencies have requirements and directives that must be adhered to when implementing the RMP. The U.S. Environmental Protection Agency (US EPA) enforces regulations under the Clean Water Act (CWA) and Clean Air Act (CAA), ensuring that water quality and air quality standards are maintained throughout land development activities. Similarly, the U.S. Department of Agriculture (USDA) provides guidance and funding for conservation practices to ensure sustainable land use, soil conservation, and water management. Any projects involving wetlands or waterways must also comply with the Rivers and Harbors Act and the NHPA, which require assessments to avoid adverse impacts on navigable waters and historical properties. These federal agency requirements, combined with NEPA directives, ensure that all agricultural land management actions within LMD-1 are conducted in compliance with federal environmental protection laws and policies:

- Agricultural Risk Protection Act of 2000 (Public Law [PL] 106-224)
- AIARMA (PL 103-177; 25 USC Chapter 39)
- American Indian Religious Freedom Act (PL 95-341; Stat. 469 42 USC § 1996)
- Archaeological Resources Protection Act (PL 96-95; 16 USC § 470aa et seq.)
- Carlson-Foley Act (PL 90-583)
- CAA (PL 88-206; 42 USC § 7401)
- CWA (Federal Water Pollution Control Act) (PL 92-500; 33 USC §§ 1251-1151)
- Comprehensive Environmental Response, Compensation, and Liability Act (PL 96-510; 42 USC § 9601)
- Emergency Planning and Community Right-to-Know Act (PL 99-499; 42 USC § 11001 et seq.)
- Federal Insecticide, Fungicide, and Rodenticide Act (PL 61-152; 7 USC § 136 et seq.)
- Federal Land Policy and Management Act (PL 94-579; 43 USC Chapter 35)
- Federal Noxious Weed Act (PL 93-629; 7 USC Chapter 61)
- Food, Conservation, and Energy Act (PL 110-234; 7 USC § 1926)
- Golden and Bald Eagle Nest Protection Regulations (RCS-42-08)
- Indian Affairs Manuals
- Navajo Nation Codes Title 3 Agriculture
- 25 CFR Part 166, 167BIA NEPA

1.5 Public Involvement

Active public participation in the NEPA process is critical to making sure that a community's voice is heard. Scoping meetings were held to provide public disclosure of the proposed action and to discuss the critical elements of the NEPA PEA process. Public involvement ensured that the voices of the Navajo Nation's communities and stakeholders were an integral part of the process. Throughout the public involvement process, residents of LMD-1 have stated a desire to improve agricultural land conditions and productivity. The RMP contains information and recommendations to fulfill that desire. These efforts reflect the importance of transparency, inclusivity, and collaboration in addressing the district's environmental, cultural, and socioeconomic challenges.

Scoping is an early and open process to obtain input from affected residents and interested members of the public concerning Proposed and Alternative Actions and environmental issues that might occur because of these actions. BIA-WNA conducted both internal scoping with staff and external scoping with the public and interested and affected groups and agencies. Potential issues, alternatives, resource impacts, and cumulative effects were identified (Appendix B).

Public scoping for this project consisted of community meetings held on

November 15 and 16, 2024, at the Tonalea and Coppermine Chapter houses. February 21 and 22, 2025, at the Kaibeto and LeChee Chapter houses.

Over 237 members of the entire LMD-1 area attended. Meetings provided public disclosure of the proposed action and discussed the critical elements of the NEPA Environmental Assessment (EA) process. The scoping meeting included a presentation of the RMP planning process; the goal of the scoping process; background information on historical ranching on the Navajo Nation; existing conditions; and RMP goals, needs, and BMPs. RMP scoping meetings described the main ranching areas (by BIA-designated compartments), need for grazing permit reissuance, and needed improvement projects. Details of the meeting comments are included in Appendix B.

Residents and stakeholders provided key feedback, emphasizing the need for:

- Lack of stakeholder involvement,
- Lack of enforcement,
- Desertification,
- Overutilization,
- Limited water, and
- Housing development on rangeland.

On **DATE**, 2025, the PEA was posted for review by the general public for 30 days (**DATE to DATE**, 2025). In addition, public meetings were held at the Tonalea Chapter House (9:00 am – 12:00 pm and 1:00 pm – 4:00 pm on November 15, 2024), the Coppermine Chapter House (9:00 am – 12:00 pm and 1:00 pm – 4:00 pm on November 16, 2024), the Kaibeto Chapter House (12:00 pm – 4:00 pm on February 21, 2025), and the LeChee Chapter House (8:00 am – 12:00 pm on February 22, 2025). Comments were invited on the web page to a general email address, as well as in-person. Announcements were published in the Navajo Times and the Hopi-Navajo Observer. Comments on the PEA were collected by BIA and Sundance Consultants, LLC (Sundance), and all comments received were compiled by Sundance. Questions received and responses to them will be included

in the Final PEA. A total of 28 written comments and 64 verbal comments (during public meeting) were received during the PEA review period (Appendix B).

Relevant issues raised include the following:

- Development (DV) — economic developments such as road improvements, range improvements, infrastructure maintenance, etc.
- Education (ED) — educating farmers, providing education materials, etc.
- Enforcement (EN) — permit compliance, oversight, management, etc.
- Feral Horses (FH) — concerns related to feral horse populations
- Homesite Lease (HS) — comments about Homesite Lease, developing subdivisions, etc.
- Other (OT) — comment not tied to a specific category
- Trespassing (TR) — comments about unauthorized access, unauthorized grazing or livestock, vehicle use, etc.
- Water (WA) — to include water development, lack of water, earthen dams, windmills, etc.
- Youth (YO) — involvement of youth

1.6 Resources Excluded from Further Analysis

Twelve resources were eliminated from further analysis because of the low potential for impacts (Table 1).

Table 1. Resources Eliminated from Impacts Analysis

Resource	Rationale for Not Discussing in Detail for this Programmatic Environmental Assessment
Topography	Implementing the Proposed Action does not propose major earth moving activities. Effects on topography or unique topographical features would be evaluated when a project-action is proposed, and design features or other mitigation measures would be implemented to limit or avoid potential impacts.
Geology	Implementing the Proposed Action does not propose major earth moving activities. Effects on geology would be evaluated when a project action is proposed, and design features or other mitigation measures would be implemented to limit or avoid potential impacts.
Minerals	Implementing the Proposed Action does not propose major earth moving activities, nor would it prevent any access to mineral resources. Impacts on mineral features would be evaluated when a project action is proposed, such as fence building or creation of a water source, and design features or other mitigation measures would be implemented to limit or avoid potential impacts.

Resource	Rationale for Not Discussing in Detail for this Programmatic Environmental Assessment
Mineral Extraction	Implementing the Proposed Action does not propose major earth moving activities, nor would it recommend any activities in or nearby abandoned uranium mine (AUM) sites. Effects on mineral resources would be evaluated when a project action is proposed, and design features or other mitigation measures would be implemented to limit or avoid potential impacts to, or from, mineral resources.
Recreation	Navajo Tribal Parks would continue to be managed by the Navajo Nation Parks and Recreation Department. There are plans to develop these parks further; however, the Proposed Action does not include any actions
Transportation Use Network	While the RMP would recommend more fencing as part of the management actions to control livestock, which could include animal crossing guards and gates at some intersections, these are not anticipated to impact the use or access of transportation networks in LMD-1.
Wilderness	There are no wilderness areas in LMD-1. Implementing the Proposed Action would have no effect on wilderness areas.
Noise	The addition of structures such as fences and water sources to manage agricultural lands at the scale proposed in the RMP will contribute very little to noise in LMD-1. No effects are expected.
Visual Resources	The addition of structures such as fences and water sources to manage grazing at the scale proposed in the RMP will do little to change visual resources. No effects are expected.
Public Health and Safety	Implementing the Proposed Action would not impact public health and safety. While recommendations within the RMP are supportive of the BIA goals and objectives for noxious weed management, which include potentially using chemical treatment, no specific actions are authorized in this RMP. These actions would be addressed in the NNIWMP, which is currently in process. No other actions are recommended in the RMP that would impact public health and safety.
Indian Trust Assets	Indian Trust Assets, or resources, are defined as legal interests in assets held in trust by the U.S. Government for Native American Indian Tribes or individual Tribal members. Examples of Indian Trust Assets are lands, minerals, water rights, other natural resources, money, or claims. Indian Trust Asset Reform Act (PL 114-78). Under the Act, the federal government has a unique responsibility to Indian Tribes, including a duty to promote Tribal self-determination regarding governmental authority and economic development. Implementing the Proposed Action would have no impacts on Indian Trust assets.
Hazardous Materials	Implementing the Proposed Action would not involve the use of hazardous chemicals (see Public Health and Safety above). Hazardous materials would continue to be managed pursuant to federal and Tribal regulations

1.7 Decision Framework

The federal action addressed by this PEA is adoption and implementation of the proposed RMP. The BIA Navajo Region's Regional Director is responsible for final approval of the proposed RMP

and, based on the PEA, if a Finding of No Significant Impact (FONSI) is appropriate (BIA, 2012). After considering the findings of the PEA and comments raised during the public scoping process and on site-specific analysis conducted in consultation with resource specialists, the BIA will follow guidance contained in the Indian Affairs NEPA Guidebook (59 IAM 3-H) to make decisions regarding the Proposed Action. BIA decision making is addressed in Section 2 of 59 IAM 3-H.

This PEA complies with BIA's requirements under the NEPA, including guidance specific to programmatic NEPA documents contained in section 40 of the CFR, subsection § 1501.11 (CEQ 2024). Programmatic NEPA reviews address the general environmental issues relating to broad decisions, such as those establishing policies, plans, programs, or suite of projects, and effectively frame the scope of subsequent site- and project-specific federal actions. To this end, the Proposed Action, as well as subsequent sections herein, outline a process for approving future repetitive federal actions. One advantage of preparing a programmatic NEPA review for repetitive agency activities is that the programmatic NEPA review can provide a starting point for analyzing direct, indirect, and cumulative impacts. This document provides an analysis as well as a basis for the federal decision associated with adopting and implementing agricultural management actions that provide a foundation for future federal decisions.

2 Description of Proposed Action and Alternatives

This section outlines the details associated with the proposed federal action as well as alternatives. It describes those actions associated with adopting and implementing the RMP.

2.1 No Action Alternative

The No Action Alternative represents the continuation of existing land management practices within LMD-1 without the implementation of new strategies, policies, or infrastructure improvements. This scenario assumes that current conditions persist, with no additional measures taken to address the pressing challenges of overgrazing, water scarcity, habitat degradation, or cultural resource protection. As such, this alternative serves as a baseline for comparing the potential impacts of the Proposed Action.

2.1.1 Grazing

Under the No Action Alternative, grazing activities would remain unregulated, following existing patterns that have led to significant strain on the district's rangelands. Overgrazing, particularly in areas close to water sources, would continue to degrade vegetation and reduce forage availability. The lack of rotational grazing or designated RMUs would exacerbate these issues, leading to uneven land use where some areas are overused while others are underutilized. This unchecked grazing pressure would accelerate soil erosion, diminishing the fertility of the land, and continue to contribute to sedimentation in nearby water bodies.

2.1.2 Water Resources

The LMD-1's water infrastructure, which is already insufficient and outdated, would remain unaddressed under the No Action Alternative. Groundwater wells, pipelines, and water storage facilities in their current state are inadequate to meet the needs of livestock, wildlife, and human communities across the district. Without improvements, reliance on riparian zones and springs would continue to intensify, further degrading these critical habitats. Water scarcity would persist as a central challenge, with concentrated use of limited resources leading to conflicts among stakeholders and increasing stress on riparian ecosystems.

2.1.3 Vegetation

Vegetation across LMD-1 would remain vulnerable under the No Action Alternative. Native grasses and shrubs, already in decline due to overgrazing and invasive species, would continue to lose ground. Cheatgrass (*Bromus tectorum*) and tamarisk (*Tamarix spp.*) would expand their dominance, outcompeting native species and altering the ecological balance of the district. This loss of native vegetation would not only reduce forage availability for livestock but also diminish habitat quality for wildlife, including federally listed species such as the southwestern willow flycatcher (*Empidonax traillii extimus*) and the Mexican spotted owl (*Strix occidentalis lucida*).

2.1.4 Biological Resources

Under the No Action Alternative, impacts on wildlife would extend beyond habitat loss. As riparian zones degrade and water availability declines, species dependent on these areas for nesting, foraging, or migration would face increased challenges. Aquatic species like the razorback sucker (*Xyrauchen texanus*) and humpback chub (*Gila cypha*) would be particularly affected by sedimentation and reduced water quality in the district's ephemeral streams and springs.

2.1.5 Cultural Resources

Cultural and historical resources within LMD-1 would remain unprotected under the No Action Alternative. Sacred sites, archaeological landmarks, and traditional use areas would continue to face risks from erosion, unauthorized access, and adjacent land use activities. The absence of protective measures such as fencing or signage would leave these resources vulnerable to further degradation, threatening their cultural and spiritual significance for the Navajo Nation.

2.1.6 Economic Factors

Economically, the No Action Alternative would perpetuate instability for grazing permit holders and local communities. Reduced forage availability and water scarcity would increase the costs of livestock production, undermining the economic viability of grazing operations. These challenges would ripple through the community, affecting families who rely on grazing as a primary source of income and a vital connection to their cultural heritage.

2.1.7 Summary

In summary, the No Action Alternative would maintain the status quo, with no proactive steps taken to address LMD-1's mounting challenges. While this approach avoids the immediate costs and potential short-term disruptions associated with implementing new measures, it also forfeits the opportunity to reverse current trends of degradation and decline. Without intervention, the district's resources will continue to deteriorate, threatening its ecological health, cultural legacy, and economic stability.

Furthermore, without changes to the management framework, the Navajo Nation's vision of creating a sustainable agricultural community as outlined in the FBFA IRMP would not be advanced. The current agricultural management system, which lacks a comprehensive strategy for addressing modern challenges, would not be able to fully meet the nutritional, economic, and cultural needs of the LMD-1 community.

2.2 Proposed Action

The Proposed Action is to adopt and implement the proposed RMP for LMD-1. It outlines an administrative process that directs the use of optimal agricultural practices based on capacity of the land and water supply; implements BMPs to improve and maintain rangeland productivity; and brings rangeland management into compliance with the current federal and Navajo Nation laws, regulations, policies, and agreements. It emphasizes sustainable grazing practices, water infrastructure improvements, vegetation restoration, and cultural resource protection. The RMP integrates adaptive management strategies and community engagement to address the district's ecological, cultural, and socioeconomic challenges, ensuring long-term sustainability and resilience. It includes:

- BMPs that reflect a holistic approach, addressing immediate challenges and long-term goals through adaptive management and targeted interventions.
- Monitoring programs that track key indicators such as soil health, vegetation recovery, forage availability, water availability, and cultural resource conditions.
- Feedback loops that enable timely adjustments to grazing schedules, reseeding efforts, and invasive species management based on monitoring data.

- Community involvement in monitoring efforts that enhance transparency, build local capacity, and ensure alignment with Navajo Nation priorities.

2.2.1 Need for Action

Significant challenges remain in meeting the comprehensive objectives of AIARMA in LMD-1, particularly in balancing ecological restoration with sustainable agricultural production. Challenges persist in the following key areas:

- **Regulation and Enforcement:** While grazing permits exist, the permits are often unenforced or lack clear boundaries, leading to unauthorized grazing and overuse of some areas. Approximately 20% of rangelands are overgrazed, while 80% remain underutilized, contributing to resource degradation, including water, soils, vegetation, and wildlife. Additionally, unregulated housing construction within the rangeland undermines grazing and conservation effects, contravening established government policies. Effective monitoring systems and enforcement mechanisms are essential for improving range health and aligning with AIARMA requirements.
- **Education, Training, and Assistance:** Land users currently lack access to sufficient education and training, limiting their ability to implement BMPs. Enhanced engagement opportunities and capacity-building programs are critical to equipping stakeholders with the tools needed to achieve conservation goals while preserving traditional Navajo agricultural practices.
- **Economic and Agricultural Productivity:** Agricultural production in LMD-1 remains low, with limited diversity, income, and employment opportunities. Emphasis on increasing livestock and food production through targeted improvements and innovative grazing practices is necessary.
- **Integrated Infrastructure Development:** Water systems and fencing infrastructure are insufficient to support optimal agricultural production. Comprehensive mapping, inventory assessments, and strategic investments in infrastructure are essential to meeting conservation and productivity goals.

2.2.2 Purpose of Action

The purpose of the Proposed Action (i.e., proposed RMP) is to provide strategic guidance to correct the factors that contributed to decline in rangeland productivity and sustainability and resulted in resource degradation in the Navajo Nation's LMD-1. The RMP establishes guidelines for managing rangeland resources through sustainable practices, balancing ecological health with cultural preservation and economic development. This purpose is consistent with PL 103-177; AIARMA. Ultimately, adopting and implementing the proposed RMP establishes a foundation for sustainable land use, balancing ecological health with cultural preservation and economic development, while improving livelihoods for the Navajo Nation.

2.3 Description of the Proposed Action

The Proposed Action is to adopt and implement the RMP for LMD-1. This plan establishes a comprehensive administrative framework that guides the sustainable use of agricultural resources within the district. The RMP aims to optimize agricultural management practices by aligning them with the capacity of the land and available water resources. It also introduces BMPs to enhance and maintain agricultural productivity while ensuring the responsible use of natural resources.

Furthermore, the proposed action will bring agricultural management in LMD-1 into compliance with all applicable federal and Navajo Nation laws, regulations, policies, and agreements. By implementing these changes, the RMP supports long-term agricultural sustainability, promotes community-based initiatives, and helps restore the productivity and economic value of the rangelands in the region.

2.3.1 Establishing an Agricultural Technical Center (ATC)

The RMP calls for establishing an Agricultural Technical Center (ATC) to address the complex and persistent management challenges in LMD-1. The ATC would serve as a centralized hub for collaborative planning, education, and implementation of range management practices, effectively bridging gaps between stakeholders and agencies (Figure 2-1). The ATC would foster interagency partnerships and engage stakeholders in planning, ensuring a holistic approach to addressing LMD-1's challenges.

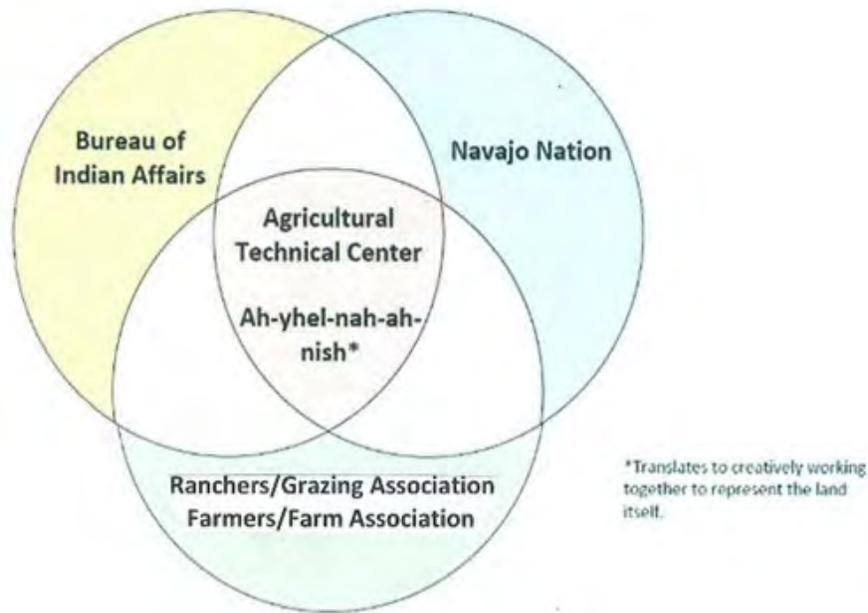


Figure 2-1. Navajo Nation ATC Collaborative Governance Model

To promote self-sufficiency, education, and economic diversification within LMD-1, establishment of ATC would include:

- **Community-Based Training Programs:** ATCs will offer workshops and hands-on training in sustainable grazing, water conservation, soil management, and invasive species control. Training will integrate traditional Navajo agricultural knowledge with modern techniques, empowering participants to implement best practices.
- **Demonstration Plots:** ATCs will host demonstration plots showcasing techniques such as rotational grazing, drought-resistant crop cultivation, and advanced irrigation systems. These plots will serve as living laboratories for community learning and experimentation.
- **Support for Home-Scale Agriculture:** The ATCs will provide resources, such as seed banks and tools, to encourage the development of home gardens and small-scale agricultural

enterprises. These initiatives will diversify income streams, improve food security, and strengthen community resilience.

- **Economic Development Opportunities:** By connecting participants with local markets and value-added processing facilities, ATCs will create pathways for economic growth while fostering greater engagement in sustainable land use practices.

2.3.2 Establishing Range Management Units (RMUs)

The RMP establishes RMUs to implement rotational grazing schedules that reduce overuse of rangelands. Establishing RMUs allows for better control and monitoring of livestock, ensuring that only authorized animals are present while fostering sustainable land use. By transitioning from the fragmented and overlapping CUA system to well-defined RMUs, LMD-1 can achieve the dual goals of sustainable land conservation and increased agricultural productivity, aligning with AIARMA's objectives, and supporting the long-term well-being of the community. Rotational grazing schedules would distribute grazing pressure, which would allow for vegetation recovery, soil stabilization, improved forage availability, and enhancement of the overall health of rangelands.

- Grazing schedules will be adapted based on seasonal variations, forage availability, and rangeland health assessments.
- Areas with severe degradation will be designated as no-grazing zones to facilitate natural recovery and targeted restoration efforts.
- Promotes efficiency in resource use and facilitates the development of shared infrastructure, such as fencing and water systems.

Developing RMU Plans offers multiple benefits, including:

- Enhanced collaboration among permit holders and agencies,
- Improved management of carrying capacity and livestock rotation,
- Sustainable use of rangeland resources through BMP implementation, and
- A structured framework for adaptive management and continuous improvement.

By integrating these planning processes and tools, RMU Plans provide a pathway to achieving the conservation and production goals outlined in the RMP, fostering sustainable grazing practices that benefit both the land and its users.

2.3.3 Carrying Capacity and Stocking Rates Determination

Information is critical to fairly issuing grazing permits and making informed decisions regarding annual livestock management. 25 CFR 167 grazing regulations need to be followed, which specify reliance on traditional stocking then monitoring localized forage utilization, localized precipitation, and site-specific (or at least grazing compartment-specific) condition and trend studies.

2.3.4 Grazing Permit Issuance and Maintenance

Effective grazing management requires permits to be issued based on accurately defined RMUs rather than undefined CUAs, which lack the specificity needed to calculate carrying capacity. Future grazing permits should be tied to RMUs with defined boundaries to ensure compliance with conservation goals and sustainable rangeland use.

To align with BMPs and conservation objectives, grazing permits must adhere to the following guidelines:

1. **Defined RMU Areas:** Permits will be issued based on RMU acreage, ensuring accurate carrying capacity calculations. This approach provides a foundation for monitoring and maintaining sustainable forage utilization.
2. **Minimum Stocking Base:** A baseline SUYL number will be established for each permit, with a minimum of 30 SUYL. This equates to approximately seven cattle, representing an academically determined forage equivalent to maintain rangeland health under average conditions.
3. **Rotational Grazing Integration:** Permittees will receive a percentage of the total RMU stocking rate, adjusted based on the type of rotational grazing system in place. This ensures equitable distribution of forage resources while optimizing land use efficiency.
4. **Collaborative Management:** Permittees will be required to participate in RMU Plans that involve cooperative herding and shared responsibilities for implementing BMPs. Group-based rotational grazing allows for efficient forage use and extended periods of pasture rest.

The BIA Standard Operating Procedures (SOP) manual details specific requirements for maintaining and transferring permits, including the following:

- **Compliance with Conservation Plans:** Permittees must adhere to conservation guidelines outlined in RMU management plans, including stocking rates, rotational grazing schedules, and infrastructure maintenance.
- **Monitoring and Adjustments:** Stocking rates and grazing practices will be periodically reviewed based on forage availability, precipitation patterns, and utilization data to ensure compliance with conservation goals.
- **Transfer Protocols:** Permit transfers will be contingent on adherence to established conservation practices, ensuring that new permit holders continue to uphold RMU management objectives.

By transitioning to a system of permit issuance based on RMUs with defined boundaries and robust management plans, this approach ensures sustainable rangeland use, enhances forage availability, and promotes collaborative stewardship among permit holders.

2.3.5 Grazing and Farm Association Formation

The FBFA IRMP states in Goal #2 the importance of “encouraging grazing permit holders within Land Management Districts/Units to establish livestock associations or cooperatives to manage livestock.” Similarly, Goal #4 emphasizes the need to “ensure that all range unit (RU) fencing complies with Navajo grazing regulations.” These goals, alongside the objective of forming a FBFA District Grazing Committee (BIA, 2021a), underscore the necessity of establishing collaborative structures to enhance grazing and farming practices within LMD-1.

This way forward involves fostering voluntary grazing associations on fenced RMUs through a collaborative democratic process. This model, promoted by range management professionals, is designed to align LMD-1 operations with the objectives of this RMP. The process is detailed in the BIA 54 IAM 1-H, Agricultural and Rangeland Handbook (BIA, 2021b) and includes the following:

- Consolidation of resources,

- Enhanced enforcement and regulation,
- Fair distribution of responsibilities,
- Improved livestock and land management, and
- Harmonized leadership and community benefits.

2.3.6 Farming Permit Agricultural Land Use Permits (ALUP) Issuance

Permits are required for farm plots of 1 acre or more located outside of 1-acre homesite leases. ALUPs authorize either dry farming plots or irrigated farm plots. Refer to Chapter 9 of the BIA SOP for procedures in obtaining ALUPs (BIA SOP, 2024).

2.3.7 Explanation of Education and Assistance Provision; Ranchers Roundtable

Education is essential for building trust, ensuring engagement, and achieving RMP goals. A structured approach to education will empower grazing permit holders and residents to implement BMPs effectively and education initiatives should align with the RMP objectives and include training.

A Ranchers Roundtable should be established to serve as a recurring forum for education, collaboration, and discussion. The roundtable would foster peer-to-peer learning, provide a platform for addressing concerns, and build a sense of community among stakeholders.

2.3.8 Monitoring Feedback Loop and Reporting

Effective production and conservation planning require an integrated monitoring feedback loop to ensure the success of land management efforts. By integrating this monitoring feedback loop into the RMP, LMD-1 can adapt to changing conditions, improve resource stewardship, and achieve sustainable production goals. This process ensures that stakeholders remain informed, engaged, and empowered to collaborate in the management of shared resources.

2.3.9 Infrastructure and Restoration

The successful implementation of the RMP depends on addressing critical infrastructure and restoration needs, including water development, fencing for grazing control, livestock handling facilities, road access and controls, and rangeland restoration projects. These efforts are fundamental to achieving sustainable land management and production goals.

2.4 Best Management Practices and Conservation Measures

In the RMP for LMD-1, BMPs would be implemented throughout the life of the RMP to ensure sustainable and productive agricultural practices. BMPs will be introduced during the initial stages of the RMP, beginning with the assessment of existing conditions on rangelands and water systems. BMPs will be applied to address key challenges such as soil erosion, vegetation, water management, and grazing rotation. The use of BMPs will also be ongoing, with regular monitoring and adjustments to land management and agricultural techniques to adapt to changing environmental conditions, resource availability, and technological advances. Overall, BMPs will be a core component of the RMP, guiding land use decisions and ensuring that agricultural practices in LMD-1 align with both short-term productivity goals and long-term sustainability.

During development of the RMP, rangeland experts coordinated with BIA and staff from multiple agencies to develop BMPs for inclusion in the 10-year plan. BMPs result from an approach to agriculture that honors the three-part holistic goal of enhancing Quality of Life of food producers

and consumers through sustainable production methods, which build a productive and stable landscape resource base. BMPs for LMD-1, detailed in Chapter 6 of Appendix A, include detailed actions for the following areas:

- Land management,
- Monitoring,
- Range improvement,
- Education, and
- Farming.

Integrating BMPs and mitigation measures would benefit LMD-1's ecosystems, cultural resources, and socioeconomic systems. The RMP enhances resilience while supporting livelihoods and preserving heritage by promoting sustainably practices, ecological restoration, and infrastructure improvements. The RMP seeks to create a balanced approach where traditional and modern practices coexist, providing opportunities for future generations.

2.5 RMP Programmatic Environmental Compliance

The RMP has been developed in full compliance with NEPA and other applicable environmental regulations. This PEA evaluates the potential effects of the Proposed Action, adopting the RMP, and ensures that all activities and initiatives under the RMP align with federal and Tribal environmental standards. Since the grazing permit and ALUP issuance is a repetitive process, actions that meet NEPA and RCP species clearance policies will fall under existing compliance, with no further environmental review needed (Appendix C and D). For actions with environmental impacts, additional compliance will be required (Appendix D).

2.6 Endangered Species Act

An analysis was conducted to assess any potential impacts of the Proposed Action on threatened or endangered species and their habitats within LMD-1. Based on this analysis, it was determined that there would be no effect on any species considered under the ESA. All species and habitats were thoroughly reviewed, and no adverse impacts were identified.

2.7 Potential NRCS Assistance and Projects

The NRCS plays a key role in supporting agricultural sustainability through technical assistance and project funding for water resource development. While these projects would have interrelated, interdependent features associated with providing water to ranchers and farmers, they are outside of the scope of this analysis. As such, environmental compliance for these projects would adhere to NRCS requirements for NEPA compliance.

2.8 Comparison of Alternatives

Table 2. Comparison of Alternatives

Alternative	No Action	Proposed Action
Description	Continues current practices without implementing the RMP. No new initiatives or improvements are undertaken.	Implements the RMP, introducing BMPs, compliance measures, and sustainable resource management strategies.
Key Benefits	Avoids implementation costs.	Supports long-term sustainability, economic growth, and resource conservation. Ensures compliance with laws and regulations.
Key Drawbacks	Risks continued resource degradation, reduced productivity, and non-compliance with regulations.	Requires moderate investment and changes to current practices.
Overall Feasibility	Low	High

3 Affected Environment and Environmental Impacts

This section describes the environment that would be affected by implementing the alternatives described in Section 2, as well as the potential impacts expected to result from implementing those alternatives. The affected environment addressed in this PEA focuses on resources that have the potential to be affected by actions recommended in the RMP. The purpose of the RMP is to utilize, maintain, preserve, and protect the highest productive potential of the land; increase production and expand diversity of agricultural products for subsistence, income, and employment through developing agricultural resources; manage agricultural resources consistent with IRMP to protect soil, water, wildlife, recreation and cultural resources; enable Navajo farmers and gardeners to maximize potential benefits by providing technical assistance, training and education in conservation practices, management, and economics of agribusiness, credit, and marketing of agricultural products; and develop agricultural lands associated value-added industries to promote self-sustaining communities. The actions recommended in the RMP are intended to have beneficial effects for natural resources with no significant impacts anticipated from the project.

Methodology for Analyzing Affected Environment and Environmental Impacts

The analysis conducted for this PEA follows a structured methodology aligned with the goals and framework of the IRMP for the FBFA. The IRMP is designed to guide sustainable agricultural development while balancing the protection of natural resources such as water, soil, and wildlife.

The methodology for assessing the affected environment included:

1. **Data Collection and Baseline Assessment:** Baseline environmental conditions were determined by consulting existing natural resource inventories and previous studies conducted for the FBFA IRMP. These assessments included land and soil quality surveys, water availability studies, and wildlife habitat mapping, as specified in the IRMP framework.
2. **Field Surveys and Stakeholder Consultation:** Stakeholders, including local farmers, community leaders, and technical experts, were consulted to assess current land management practices. BMPs, as outlined in the IRMP and tailored to local conditions, were evaluated for effectiveness and adaptability to the current cropland situation. Specific attention was given to water use efficiency, erosion control, and wildlife habitat preservation.
3. **Impact Assessment Criteria:** The environmental impacts were assessed by determining the potential direct, indirect, and cumulative effects of the proposed action (i.e., adopting the RMP). Key criteria included effects on soil quality, water resources, endangered species, and habitats. For wildlife and sensitive ecosystems, the methodology followed the IRMP guidelines, which require buffer zones and species-specific management practices to minimize impacts.
4. **Categorical Exclusions for Certain Activities:** Consistent with the IRMP, activities falling under established categorical exclusions—those that do not individually or cumulatively have a significant environmental impact—were identified.
5. **Compliance with Regulatory Frameworks:** The PEA ensured that proposed actions were consistent with all relevant Navajo Nation and federal environmental laws, including the NEPA, the ESA, and the CWA.

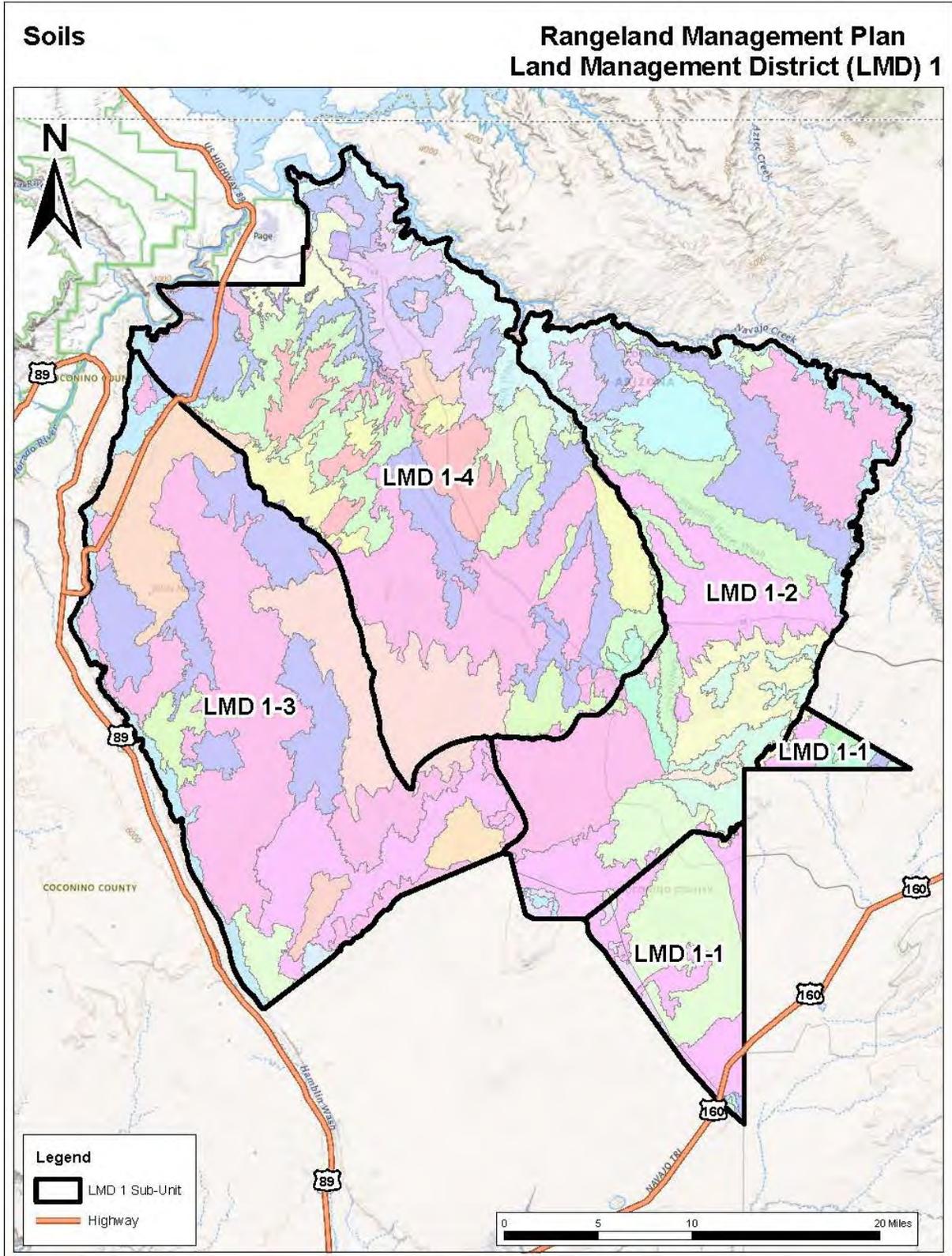
3.1 Soils

3.1.1 Affected Environment

Soil management in LMD-1 utilizes the USDA/NRCS Soil Surveys and Ecological Site Descriptions as resources to guide decision making. Soils in LMD-1 have formed from several different types of parent material (including sandstone and limestone) and from alluvial, residual, and eolian sources. Thirty-nine types of soil (known as soil map units [SMUs]) occur in LMD-1, but four encompass half of the district (USDA, 2025; Figure 3-1).

Soils are predominantly sandy, with high infiltration and low runoff potential. Soils contain low amounts of organic matter and do not support abundant vegetation which makes them highly susceptible to erosion (Appendix F).

Rangeland overuse by both authorized and unauthorized livestock, wildlife, and Navajo free-ranging horses can diminish vegetation cover, exposing soils to erosive forces. Drought and climate change may also contribute to soil erosion and loss as vegetation cover and water availability are diminished.



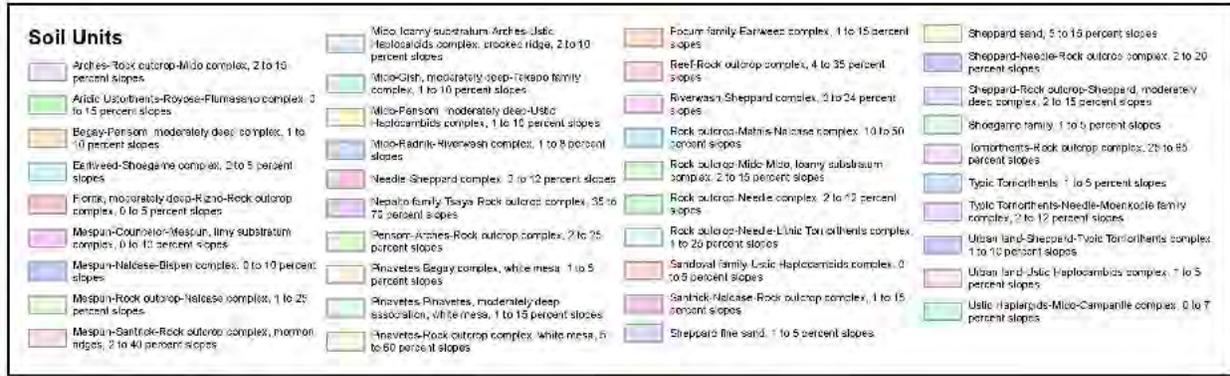


Figure 3-1. NRCS Soil Map Units Comprising the LMD-1 Area

3.1.2 Environmental Impacts on Soils

3.1.2.1 No Action Alternative

Under the No Action Alternative, impacts would be adverse, direct, cumulative, local, long-term, and minor. Establishment of the RMP management actions, including BMPs that would beneficially affect soil stability and reduce runoff and erosion, would not be implemented. Therefore, soils and the entire cropland ecosystem would continue to degrade. Desired future conditions, including those described in the FBFA IRMP, would not be achieved. Some degree of soil degradation would likely continue from drought, wind, and water soil erosion; however, the magnitude of degradation is difficult to assess as it depends on a variety of unknown factors such as droughts, the implementation or lack of implementation of an RMP, and whether the transition from native to invasive plant species continues or has reached some homeostatic balance (see plant resources for further review) (Mullin et al., 2000).

3.1.2.2 Proposed Action

The Proposed Action would implement RMUs across selected areas within LMD-1 to address the pressing issue of soil erosion. RMUs are designed to facilitate the removal of unauthorized livestock, support large-scale water and rangeland improvement projects, enable accurate carrying capacity assessment and conservation planning, and enhance share labor and infrastructure, improving livestock management and quality of life. The Proposed Action would be beneficial with direct, cumulative, and long-term positive effects on soil stability within LMD-1. Through the implementation of RMUs, livestock grazing rotation systems, fencing installation, new infrastructure, noxious weed control, and reseeded would enhance land conservation by resting pastures to allow for vegetation recovery, reducing soil erosion, and increasing ecological resilience. Any adverse impacts to soils would be short-term in nature and limited to fencing and infrastructure improvements. No significant adverse effects on soils are anticipated as a result of implementing the Proposed Action.

3.2 Water Resources

3.2.1 Affected Environment

All water resources on the Navajo Nation are managed by the Navajo Nation Department of Water Resources (NNDWR) and are subject to the NNWC. The Navajo Nation has enacted the Navajo Nation Clean Water Act (NNCWA) and Water Quality Standards and the NNSDWA.

Watersheds within LMD-1 include the Lower Colorado-Marble Canyon, Moenkopi Wash, and Lower Lake Powell. Surface water resources consist of perennial streams, intermittent streams and drainages, vernal pools, ephemeral streams, springs, and wetlands. The major surface water features within LMD-1 are the Colorado River and Lake Powell.

Water availability in streams like Kaibito Creek and smaller surface water sources is crucial for the surrounding communities, agriculture, and wildlife, but these intermittent water sources are becoming even more unreliable due to the effects of climate change. The LeChee Chapter obtains their domestic water supply from nearby Lake Powell through facilities built in 1957. The water is allocated from the Colorado River Upper Basin and is shared with the neighboring, off reservation, City of Page. The current raw water supply facilities barely meet peak summer demands for both communities (Arizona Department of Water Resources [AZDWR], 2009).

However, phase 1 of the LeChee Water project is currently underway to provide a more reliable supply of domestic water to LeChee and the entire Antelope Canyon area.

Groundwater is more plentiful in LMD-1 than surface water and has served as the primary source of drinking water supply for many years. Two aquifers underlay LMD-1. The Navajo (N) aquifer is an important groundwater source in LMD-1, and water quality is considered relatively good except in areas where past uranium mining and milling occurred (AZDWR, 2009). The aquifer consists of three rock formations—the Navajo Sandstone, Kayenta Formation, and Wingate Sandstone, which are hydraulically connected and function as a single aquifer (USGS, 2017).

The Coconino (C) aquifer underlies the N aquifer and is an important groundwater source for communities south of the Little Colorado River. North of the river, the C aquifer is too deep to access and the high level of salinity (total dissolved solids) makes it undesirable to use for a drinking water source (Ingram et al., 2020).

LMD-1 contains 75 groundwater wells that vary in depth from 180 feet (ft) to 1,577 ft deep. The average well depth is 973 ft deep. Water quality (lead and copper, microbial contaminants, nitrates, and radiological contaminants) of regulated residential sources is evaluated periodically by the Navajo Tribal Utility Authority (NTUA, 2022). Sources for Coppermine, Kaibeto, Tonalea, and LeChee communities currently meet quality standards for all tests (NTUA, 2022).

Currently, water systems are insufficient to support optimal agricultural production. Raising livestock often requires living in areas where public water supplies are not available. On the Navajo Nation, 30% of homes lack access to municipal water supplies (Ingram et al., 2020). Further, there are very few permanent watering sources for livestock. As a result, people rely heavily on hauling water from many miles away, or from unregulated, shallow, windmill-powered wells originally installed for livestock use. Private wells, which are not regulated by a government agency, typically have more contamination issues due to poorer construction, placement, and depth compared to municipal wells. This creates serious concerns for public health, especially across the Navajo Nation where over 500 AUMs exist. There are 22 unregulated wells known to occur in LMD-1 (Ingram et al., 2020). Additionally, the lack of permanent water sources for livestock results in grazing pressures that are not distributed evenly across the landscape with some areas being overutilized while other areas remain unutilized. Overall, there is a critical need for improvements in water infrastructure including the development of water distribution systems to homes and livestock.

Riparian areas make up a very small proportion of the landscape in LMD-1. Based on data from the Landfire vegetation GAP analysis project, there are 156 acres (0.02%) of riparian vegetation communities mapped in LMD-1 (USGS, 2019). Riparian areas that do exist in LMD-1 are primarily intermittent, containing water only part of the year.

3.2.2 Environmental Impacts on Water Resources

3.2.2.1 No Action Alternative

Impacts of the No Action Alternative would be adverse, direct, widespread, long-term, and moderate-to-minor. Riparian areas are sparse in LMD-1, and very little surface water exists for livestock use. These areas are already overburdened and would continue to degrade as livestock and wildlife concentrate around these limited water sources. Soil compaction and sedimentation would increase, reducing water quality and the ecological functions of these habitats. Permanent source of livestock is also limited in LMD-1, concentrating the effects of overuse to localized areas

and leaving other areas underutilized. These areas that are overused would continue to degrade. Under the No Action Alternative, the current conditions would remain. People would be forced to continue hauling water for domestic and livestock use. Reliance on unregulated wells would persist and potentially increase, posing increased health risks. The lack of water infrastructure would continue to limit agricultural production, adversely impacting the livelihoods of the communities in LMD-1.

3.2.2.2 Proposed Action Alternative

Under the Proposed Action, the LMD-1 RMP would be implemented, providing the framework for long-term, positive impacts to water resources. The Proposed Action would increase collaboration, education, and technical support while fostering interagency partnerships and stakeholder engagement through the formation of RMUs. This would lead to more informed decision-making and strategizing when planning and implementing water infrastructure as it relates to livestock grazing and wildlife. The Proposed Action discourages unauthorized and unprofitable grazing use within LMD-1, and RMUs further prevent unauthorized use as pasture lands would be fenced and controlled for rest-rotation grazing by authorized stakeholders.

The implementation of RMUs supports large-scale water and rangeland improvement projects through rest-rotation grazing and infrastructure development, including wells and pipelines, to provide evenly distributed, permanent water sources for livestock and wildlife. Natural surface waters are scarce in LMD-1, and those that exist would improve from reduced utilization and degradation from livestock through RMUs. Riparian vegetation would recover, providing increased stabilization, reducing soil erosion and sediment delivery to streams. In addition to riparian areas, RMUs and rotational grazing would lead to improved terrestrial ecosystems. This would have positive effects on groundwater recharge because improved vegetation cover and soil health allows for better water penetration. Any adverse impacts to water resources would be short-term in nature and limited to fencing and infrastructure improvements. No adverse effects on water resources are anticipated as a result of implementing the Proposed Action.

Project-level planning will require site-specific NEPA analysis, including the evaluation of effects from potential water depletion or withdrawals. This RMP is broad and programmatic in nature and thus does not identify specific projects that would require water depletion or withdrawals. The Proposed Action is not expected to result in significant effects on water quantity.

3.3 Air Quality

3.3.1 Affected Environment

The Navajo Nation Environmental Protection Agency (NNEPA) has the authority to regulate sources of air pollution in the Navajo Nation through its Navajo Air Quality Control Program. The NNEPA regulates criteria pollutants using the National Ambient Air Quality Standards (NAAQS), which establish ambient levels for each criteria pollutant using health and welfare-based criteria. The NAAQS are regulated to protect human health and the environment. Air quality is managed under the regulations of the Navajo Nation Air Pollution Prevention and Control Act of 2004 (Navajo Nation Council, 2004).

The Navajo Nation monitors four criteria air pollutants: particulate matter (PM_{2.5}), ozone (O₃), sulfur dioxide (SO₂), and nitrogen dioxide (NO₂). Two monitoring sites are operational on the Navajo Nation (Shiprock, New Mexico, and Nazlini, Arizona). While neither of these monitoring

sites are in LMD-1, they still represent air quality on the Navajo Nation. Air quality monitoring sites are classified as Class I status, which allows significantly less air quality deterioration, and Class II status, which allows some deterioration of air quality. The Navajo Nation is designated as Class II status and as “unclassifiable/attainment” for NAAQS for criteria air pollutants in Arizona, New Mexico, and Utah (Navajo Nation EPA, 2025).

Sources of dust and particulate matter that contribute to poor air quality in LMD-1 include construction activities, emissions from vehicles and equipment, fugitive dust (particulate matter) from unpaved roads, open burning, wildfires, and wind-blown sand. Air quality has been impacted in the district by more frequent sand and dust storms, which carry particulate matter over long distances. The impacts of these sand and dust storms are exacerbated by increased erosion due to a reduction of vegetation cover caused by drought and land management practices.

3.3.2 Environmental Impacts on Air Quality

3.3.2.1 No Action Alternative

Impacts of the No Action Alternative would be adverse, indirect, local, long term, and minor. In addition, under the No Action Alternative, the RMP would not be implemented. Rangeland ecological health would continue to decline with degradation of soils and decrease vegetative cover within the LMD-1. The decline in vegetative cover and soil health would continue to exacerbate sand and dust storms.

3.3.2.2 Proposed Action Alternative

Under the Proposed Action alternative, the LMD-1 RMP would be implemented, providing beneficial, indirect, local, long term, and minor impacts on air quality. RMUs such as grazing rotation systems, fencing installation, new infrastructure, and improved livestock management, would allow for vegetation recovery and reduce soil erosion. These benefits contribute to the reduction of particulate matter and fugitive dust from bare soil and decreases the negative health effects associated with increasing dust storms. No significant adverse impacts to air quality are expected from the Proposed Action.

3.4 Vegetation

3.4.1 Affected Environment

Vegetation in LMD-1 is a cornerstone of the district’s ecological health and economic productivity, serving as the primary source of forage for livestock and providing critical habitat for wildlife. The district’s vegetation is shaped by its semi-arid climate, diverse topography, and centuries of traditional land use. However, overgrazing, invasive species, and climate variability have significantly altered plant communities in LMD-1, threatening the balance between land use and ecological sustainability. The GAP/LANDFIRE National Terrestrial Ecosystems data set includes detailed vegetation and land cover patterns for the continental United States. The data set incorporates the Ecological System classification system developed by NatureServe.

3.4.1.1 Native Vegetation Communities

Land cover types for LMD-1 are comprised of 18 landcover types, which are mapped across the district (Utah State University, 2025) (Figure 3-2). Shrub and woodland type covers over 70% of the district; sand sagebrush, blackbrush, and pinyon-juniper cover 22, 27, and 21%, respectively. Additional dune, juniper savanna, and semi-desert shrub, including non-native species, vegetative

communities occur within LMD-1. Vegetation mapped for LMD-1 are divided into the following categories:

- **Shrublands** have greater than 50% vegetative cover of shrubs and are comprised of common shrub species such as sagebrush (*Artemisia spp.*), rabbitbrush (*Chrysothamnus spp.*), fourwing saltbrush (*Atriplex canescens*), Mormon tea (*Ephedra spp.*), sand sagebrush (*Artemisia fillifolia*), blackbrush (*Coleogyne ramosissima*), and winterfat (*Kraschennikovia lanata*). Shrublands are interspersed with perennial bunchgrasses such as Indian ricegrass (*Achnatherum hymenoides*), needle and thread (*Hesperostipa comata*), squirreltail (*Elymus elymoides*), grama (*Bouteloua spp.*), and alkali sacaton (*Sporobolus airoides*).
- **Woodlands** have greater than 20% coverage of scattered juniper, including juniper (*Juniperus sp.*) and pinyon pine (*Pinus edulis*). Pinyon-juniper woodlands occur in dry mountains and foothills, such as the Kaibito Plateau, offering important ecological functions, including wildlife habitat and soil stabilization. In addition to ecological functions, these woodlands hold cultural significance for the Navajo people, providing materials for traditional practices and serving as sacred spaces.
- **Dunes** are composed of unvegetated and moderately vegetated (generally <10% plant cover, but up to 30%), active and stabilized dunes, and sandsheets. Species occupying these environments are often adapted to the shifting, coarse-textured substrate (usually quartz sand) and form patchy or open grasslands, shrublands or steppe composed of *Achnatherum hymenoides*, *Artemisia filifolia*, *Artemisia tridentata ssp. tridentata*, *Atriplex canescens*, *Ephedra spp.*, *Coleogyne ramosissima*, *Ericameria nauseosa*, *Leymus flavescens*, *Prunus virginiana*, *Psoralidium lanceolatum*, *Purshia tridentata*, *Sporobolus airoides*, *Tetradymia tetrameres*, or *Tiquilia spp.* This system is distinguished by its generally low vegetative cover and distinct eolian geomorphic features.
- **Savannas** include sagebrush communities occurring at montane and subalpine elevations. It is composed primarily of mountain sagebrush (*Artemisia tridentata ssp. vaseyana*) and related taxa such as *Artemisia tridentata ssp. spiciformis* (*Artemisia spiciformis*), non-riparian *Artemisia cana ssp. viscidula*, and *Artemisia arbuscula ssp. arbuscula*.
- **Semi-Desert Shrub Aquatic and Riparian** zones in LMD-1 are typically located along intermittent streams. These areas support dense vegetation that is crucial for both livestock and wildlife. Species such as willows (*Salix spp.*), cottonwoods (*Populus spp.*), and sedges (*Carex spp.*) thrive in these areas, providing shade, stabilizing streambanks, and enhancing water retention. However, these zones are particularly vulnerable to overuse, with concentrated grazing often leading to vegetation loss and increased erosion.

Table 3. Dominant Vegetation Classifications mapped across the LMD-1 Area

Percent of area	Vegetation Classification
1.25%	Inter-Mountain Basins Active and Stabilized Dune
3.44%	Inter-Mountain Basins Juniper Savanna
9.76%	Inter-Mountain Basins Semi-Desert Shrub Steppe
11.87%	Colorado Plateau Mixed Bedrock Canyon and Tableland
21.15%	Colorado Plateau Pinyon-Juniper Woodland
22.73%	Colorado Plateau Blackbrush-Mormon-tea Shrubland
27.24%	Southern Colorado Plateau Sand Shrubland

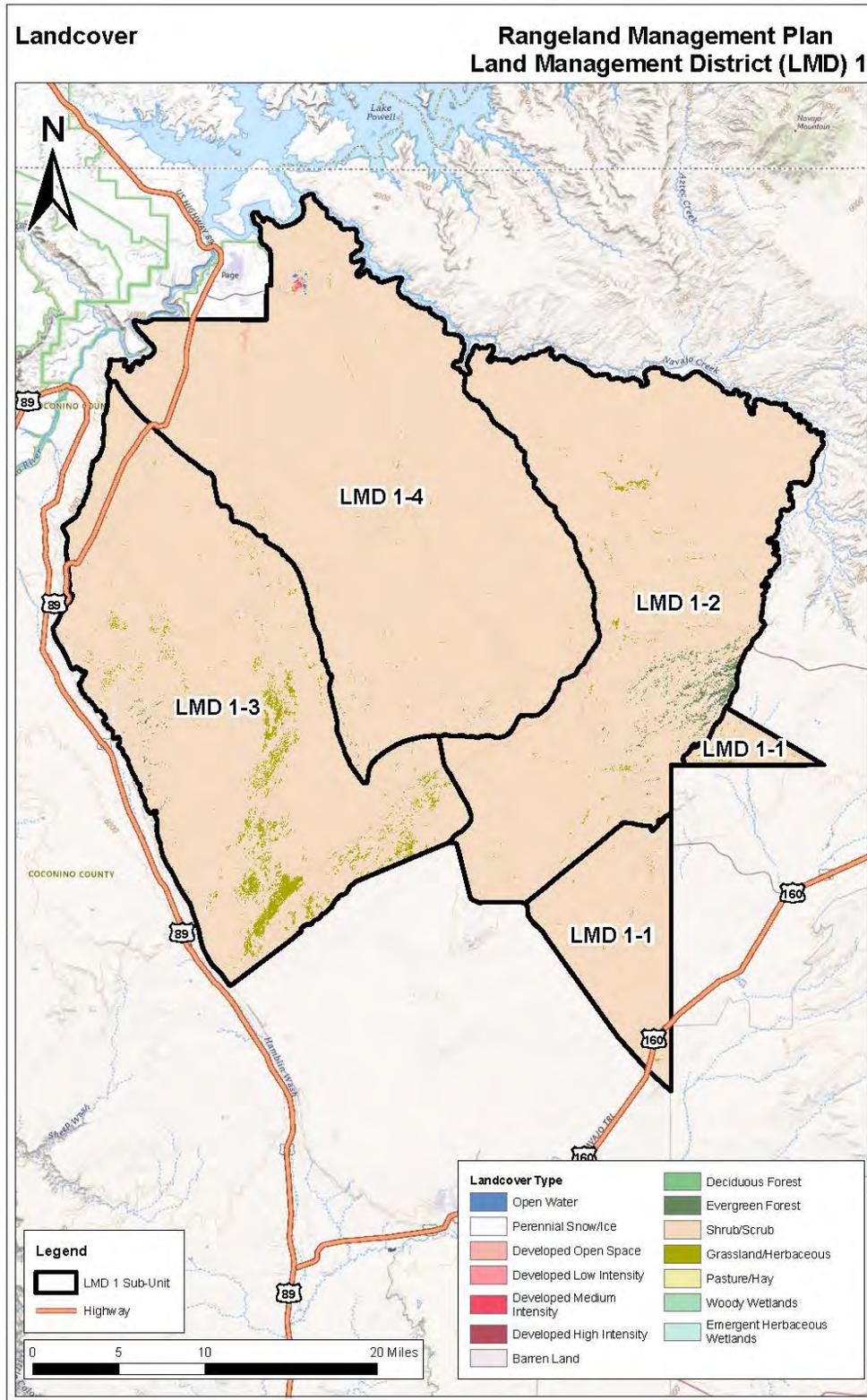


Figure 3-2. Landcover Types within LMD-1

3.4.1.2 Non-Native Vegetation and Noxious Weeds

Noxious weeds pose a serious threat to biological diversity, livestock production, wildlife habitat, and the overall ecological health of the region, which, in turn, impacts the environmental, economic, historical, and cultural resources of the Navajo people. Native communities of rangelands that have been highly disturbed because of overuse have been impacted by noxious weeds, especially invasive annuals such as cheatgrass (*Bromus tectorum*). Riparian areas have been impacted by introduced tree species, including Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix spp.*) (BIA, 2022). Areas in LMD-1 that are hotspots for weeds include development areas, roads and rights-of-way (ROWs), and designated livestock grazing areas. The Navajo Nation is currently addressing the issue of noxious weed. The BIA aims to treat 50,000 acres a year using an integrated weed management strategy (BIA, 2022). This strategy includes coordination between agencies and stakeholders, mapping and inventory, developing site and species-specific treatment plans, native plant revegetation, and project maintenance and monitoring (BIA, 2022).

3.4.2 Environmental Impacts on Vegetation Resources

3.4.2.1 No Action Alternative

Impacts of the No Action Alternative would be adverse, direct, and cumulative, local, long term, and minor. In addition, under the No Action Alternative, the RMP would not be implemented, and cattle overgrazing, native vegetation degradation, and invasive species establishment would continue. However, integrated weed management would continue on the Navajo Nation.

3.4.2.2 Proposed Action Alternative

The Proposed Action would be beneficial with direct, cumulative, and long-term positive effects on vegetation resources within LMD-1. The implementation of RMUs across selected areas within LMD-1 to address the overuse of the land due to cattle grazing and impacts of non-native vegetation and noxious weeds. Through the implementation of RMUs, authorized livestock grazing rotation systems, fencing installation, new infrastructure, noxious weed control, and reseeded would enhance land conservation by resting pastures to allow for vegetation recovery and reducing soil erosion. Improved vegetation and soil conditions would reduce the spread and establishment of exotic species, increasing ecological resilience. Any adverse impacts to vegetation resources would be short-term in nature and limited to fencing and infrastructure improvements. No significant adverse effects on vegetation resources are anticipated as a result of implementing the Proposed Action.

3.5 Biological Resources

3.5.1 Affected Environment

LMD-1 is a vital ecological region within the Navajo Nation, encompassing diverse ecosystems from arid plains to riparian corridors and upland woodlands, which provide critical habitats for numerous wildlife species, including federally listed species, migratory birds, and native plants.

3.5.1.1 Navajo Nation Special Status

The Navajo Natural Heritage Program (NNHP), a division of the NNDFW, has implemented management plans to protect nesting ferruginous hawk, bald and golden eagles, and Mexican spotted owl populations on the Navajo Nation (NNHP, 2021; NNHP, 2008; NNHP, 2000). These species have cultural significance for the Navajo Nation. The guidelines limit the level of human

activity and development near occupied and unoccupied nests, as well as survey and management guidelines for occupied habitat (NNHP, 2021; NNHP, 2008; NNHP, 2000).

The NNDFW has also prepared a development planning tool to avoid biologically sensitive areas throughout the Navajo Nation. The RCPs were created by the NNDFW and approved in 2003 by the Resources Committee of the Navajo Nation Council. RCP provides guidance for complying with federal and Navajo Nation laws that protect plants, animals, and their habitats. Areas in the Navajo Nation are categorized according to the potential impact of development on wildlife and their habitats in those areas. NNDFW has identified and mapped wildlife habitat and sensitive areas that cover the entire Navajo Nation (Figure 3-3). Six types of wildlife areas are described below as part of the Biological Resource Land Use Clearance Policies and Procedures, however, only two (less and highly sensitive types) occur in LMD-1 (NNDFW, 2008).

1. **Highly Sensitive:** This area contains the best habitat for endangered and rare plants, animal and game species, and the highest concentration of these species on the Navajo Nation. The purpose of this area is to protect these valuable and sensitive biological resources to the maximum extent practical. No activity or development that is going to result in significant impact on wildlife resources.
2. **Moderately Sensitive:** This area has a high concentration of rare, endangered, sensitive, and game species occurrences or has a high potential for these species to occur throughout the landscape. The purpose of this area is to minimize impacts on these species and their habitats, and to ensure the habitats do not become fragmented. All activity or development should avoid species and their habitat, with adequate buffers.
3. **Less Sensitive:** This area has a low, fragmented concentration of species of concern. Species in this area may be locally abundant on 'islands' of habitat, but islands are relatively small, limited in number and well-spaced across the landscape. These may not be completely surveyed for the potential occurrence of sensitive species or habitats. Generally, the need to avoid sensitive habitats should be less frequent in this area; therefore, development in these areas is more likely to proceed as planned with proper and timely planning.
4. **Community Development:** Areas around certain communities that do not support the habitat for species of concern and therefore development can proceed without further biological evaluation.
5. **Biological Preserve:** These areas contain excellent, or potentially excellent, wildlife habitat and are recommended by the NNDFW for protection from most human-related activities, and in some cases are recommended for enhancement. No development unless compatible with the purpose of the area.
6. **Recreation Area:** These areas are used for recreation that involves wildlife or have potential for development for this purpose. Recreation can involve consumptive and/or non-consumptive uses of wildlife resources and is often a part of a broader outdoor experience. No new development is allowed within Recreation Areas unless it is compatible with management goals for the area.

BEs are required for three of six categories: Biological Preserve, High Sensitivity, and Moderate Sensitivity.

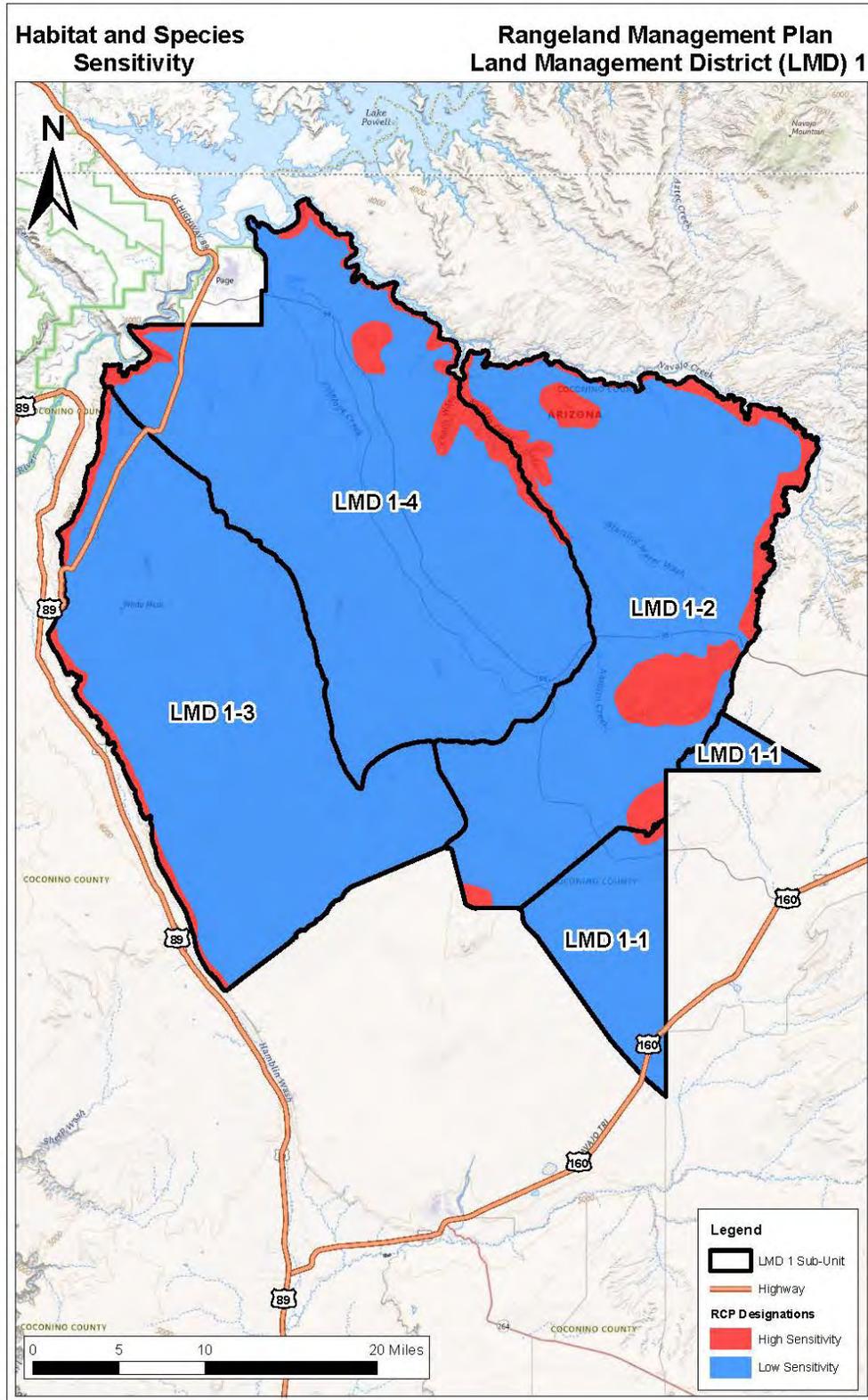


Figure 3-3. Habitat and species sensitivity ratings of LMD-1

3.5.1.2 Federally Listed Species

Table 4. Federally listed species with the potential to occur in LMD-1

Category	Species	Status	Habitat Description	Potential to Occur	Potential to Impact	Determination
Mammals	Mexican Wolf (<i>Canis lupus baileyi</i>)	Endangered	Uses LMD-1 as a migration corridor; relies on remote areas for connectivity.	Moderate	Low	No Effect
Birds	California Condor (<i>Gymnogyps californianus</i>)	Experimental Population, Nonessential	Traverses LMD-1 for foraging and migration.	High	Low	No Effect
Birds	Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	Threatened	Found in forested canyons; critical habitat overlaps parts of LMD-1.	High	Low	No Effect
Birds	Southwestern Willow Flycatcher (<i>Empidonax traillii extimus</i>)	Endangered	Relies on riparian zones for nesting.	High	Low	No Effect
Birds	Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	Threatened	Prefers dense riparian forests present in LMD-1.	Moderate	Low	No Effect
Fish	Humpback Chub (<i>Gila cypha</i>)	Threatened	Inhabits specific reaches of the Colorado River; critical habitat overlaps LMD-1.	High	Low	No Effect
Fish	Razorback Sucker (<i>Xyrauchen texanus</i>)	Endangered	Requires large aquatic systems.	Moderate	Low	No Effect
Plants	Brady Pincushion Cactus (<i>Pediocactus bradyi</i>)	Endangered	Thrives in sandy soils on slopes.	Low	Low	No Effect

Category	Species	Status	Habitat Description	Potential to Occur	Potential to Impact	Determination
Plants	Fickeisen Plains Cactus (<i>Pediocactus peeblesianus</i> ssp. <i>fickeiseniae</i>)	Endangered	Found in limestone outcrops; critical habitat overlaps LMD-1.	Moderate	Low	No Effect
Plants	Navajo Sedge (<i>Carex specuicola</i>)	Threatened	Occupies wet meadows along sandstone seeps.	Moderate	Low	No Effect

3.5.2 Environmental Impacts on Biological Resources

3.5.2.1 No Action Alternative

Impacts of the No Action Alternative would be negligible, indirect, widespread, long term, and minor. Under the No Action Alternative, no change in the Biological Resource Land Use Clearance Policies and Procedures or how it is implemented in LMD-1 would occur. Continued management under this policy would serve to avoid or mitigate impacts on biological resources. There would be no change to existing regulations to protect species of cultural significance. Additionally, under the No Action Alternative the RMP would not be implemented and there would be no changes in current management practices. The continuation of unmanaged grazing practices, increased coverage of invasive species, and soil erosion would continue to threaten special status species habitats.

3.5.2.2 Proposed Action Alternative

Impacts of the Proposed Action Alternative on biological resources could be negligible to beneficial. Under the Proposed Action, there would be no change in the Biological Resource Land Use Clearance Policies and Procedures and how it is implemented in LMD-1. Continued management under this policy would serve to avoid or mitigate impacts on wildlife. There would be no change to existing regulations to protect species of cultural significance. Additionally, under the Proposed Action, the RMP would be implemented, which provides a comprehensive framework to protect and restore biological resources. Rotational grazing within RMUs would distribute grazing pressure more evenly, allowing overused areas to recover. Any proposed projects tiered to the RMP would be reviewed as part of the planning process, and any potential effects to special status species would be analyzed, mitigated, and disclosed as required under all federal regulations and consistent with the FBFA IRMP (NNDNR/BIA, 2022) and BIA procedures for NEPA (BIA, 2012). No significant adverse effects to wildlife are expected as a result of the Proposed Action.

3.6 Cultural Resources

Cultural resources represent the collective heritage of a people and are defined as physical evidence or place of past human activity such as a site, object, landscape, structure, or natural feature significant to a group of people traditionally associated with it. Cultural resources are managed by the NNHHPD, whose responsibilities include protection, preservation, and management planning for historic, archaeological, and cultural resources on the lands of the Navajo Nation or on lands

in which the Navajo people have a traditional interest. The NNHHPD manages those resources in LMD-1.

The TCP division of NNHHPD maintains a database of known TCPs on the Navajo Nation. A TCP is property that is eligible for inclusion in the National Register of Historic Properties (NRHP) based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. The cultural practices or beliefs that give a TCP its significance are, in many cases, still observed at the time a TCP is considered for inclusion in the NRHP. As a result, it is sometimes perceived that the practices or beliefs themselves, not the property, make up the TCP. While the beliefs or practices associated with a TCP are of vital importance, the NRHP does not include intangible resources. The TCP must be a physical property or place—that is, a district, site, building, structure, or object (NPS, 2012).

3.6.1 Affected Environment

3.6.1.1 Archeological Resources, Historic, and Traditional Cultural Properties

Archaeological and historical sites that may be within LMD-1 include the following:

1. Agricultural Sites: sites comprised of agricultural fields and/or agriculture-related features such as canals, rock piles, and rock alignments.
2. Artifact Scatters: sites composed entirely of artifacts and lacking associated features; some artifact scatters may be comprised of a single material, such as a flaked stone or ceramics, whereas others encompass multiple artifact types.
3. Habitation Sites: habitation sites cover a range of site manifestations, from ephemeral Paleoindian campsites to large villages to historical Navajo homesites.
4. Resource Procurement Sites: resource procurement sites cover a range of site sub-types, all of which focused on the procurement of some type of resource, such as raw tool stone or plants.
5. Rock Art: pictographs or petroglyphs on rock faces and cave walls.
6. Roads and Trails: historical and prehistoric transportation routes.

TCP types that may be within LMD-1 include:

1. plant gathering location,
2. location for gathering contents of sacred bundles,
3. previous ceremony location,
4. former home site location,
5. former sweathouse location,
6. prayer offering place,
7. place associated with general Navajo origin,
8. place associated with origin or home of a clan, and
9. place identified as home of a Holy Being.

Cultural resources are only some of the features of the overall ethnographic landscape of the Diné people. While these discrete features are important, their overall value is only understood within the overarching cultural landscape of Navajo land, which includes not only cultural resources but geography, hydrological features, natural resources, wildlife, and livestock (NPS, 2012). In other words, the Diné sense of place is critical to the expression of Diné culture and interpretation of the

archaeological record. This bond to place is timeless, guiding the Foundation of Diné Law (Diné Bi Beehaz'áanii Bitse Siléf). Examples of the cultural and ethnographic landscape include: the San Francisco Peaks (Dook'o'oolííd)—one of the six sacred mountains (dził naat'ááh) that define the ethnographic landscape; the Little Colorado River (Bits'íís Nínee); natural springs; rock piles; boulders; lightning-struck trees; traditional sites for gathering plants; and game traps. While these examples are distinct features within the ethnographic landscape, Navajo land is not discontinuous, but rather experienced through herding, hunting, farming, and travel amongst these definitive features throughout time immemorial.

NNHHPD ensures Navajo traditional concerns are addressed in undertakings as they pertain to project management, land use planning, and cultural resource management. As such, NNHHPD maintains records of cultural resources investigations and cultural resources properties within lands of the Navajo Nation or on lands in which the Navajo people have a traditional interest.

NHPA sets forth government policy and procedures regarding “historic properties;” this includes districts, sites, buildings, structures, and objects included in or eligible for listing in the NRHP. Existing federal, state, and Tribal laws and rules protect archaeological sites, historic properties, and graves. These laws and rules include the Federal Antiquities Act of 1906; the NHPA; NEPA; “Protection and Enhancement of the Cultural Environment,” May 13, 1971 (36 CFR 8921); the Archaeological Resources Protection Act of 1978; the American Indian Religious Freedom Act of 1978; the Native American Graves Protection and Repatriation Act (NAGPRA); Arizona laws protecting human remains on private lands; the Navajo Nation Policies and Procedures Concerning Protection of Cemeteries, Gravesites, and Human Remains of 1986 (ACMA-39–86); and the Navajo Nation Cultural Resources Protection Act (CMY-19–88).

3.6.1.2 Navajo Nation Policy for the Protection of Jishchaa': Gravesites, Human Remains, and Funerary Items

The Jishchaa' policy was implemented pursuant to the Navajo Nation Cultural Resources Protection Act (CMY-19–88). It is intended to complement provisions set forth in NAGPRA, the Archaeological Resources Protection Act of 1979, the NHPA, and others. The Navajo Nation requires those proposing a management action to make a good faith effort to locate gravesites, human remains, and funerary items within the project area prior to initiation of an undertaking. Such efforts shall include:

1. file searches of existing information, including files maintained at NNHHPD, mission records, and other pertinent materials as appropriate;
2. archaeological inventory and ethnographic interviews with residents of the local community and with other knowledgeable individuals; Navajo Nation permitting procedures require that investigators contact local Chapters prior to initiating field activities; and
3. other approaches, such as traditional diagnostic techniques, as necessary or appropriate.

Guidance and management recommendations will be developed in consultation with NNHHPD if Jishchaa' are encountered during a cultural resource inventory.

3.6.2 Impacts to Cultural Resources

3.6.2.1 No Action Alternative

Impacts of the No Action Alternative to cultural resources would be adverse, direct, local, long-term, and minor to major depending on the location of the site. Wide-ranging searches for forage

that occur in the currently managed rangeland make archaeological sites more susceptible to trampling from livestock. These animals can have an adverse effect on cultural resources via breakage, flake displacement (both horizontal and vertical), and the mixing of artifacts (Coddington, 2008; Halford, 1999; Nielson, 1991; Osborn et al., 1987; Roney, 1977). Areas where livestock congregate (water sources and mineral licks) experience the most intensive impacts. Sites also are vulnerable to damage and exposure from soil erosion exacerbated by overgrazing, thunderstorms, and disturbance from range infrastructure such as corrals, water haul roads, pipelines, and fences.

3.6.2.2 Proposed Action Alternative

Impacts of the Proposed Action alternative should be beneficial, cumulative, long-term, widespread, and moderate to major. Under the Proposed Action, the implementation of the RMP would safeguard cultural resources and culturally significant sites through established guidelines and management strategies. Grazing associations would be formed as a practical and equitable solution for modernizing grazing practices and grazing permits would be issued to prevent unauthorized grazing and damage. Additionally, under the Proposed Action, any change to rangelands managed under the RMP would be reviewed as part of the planning process, and any potential effects to cultural resources analyzed, mitigated, and disclosed as required under all federal regulations and consistent with the FBFA IRMP (NNDNRC/BIA, 2022) and BIA procedures for NEPA (BIA, 2012).

Cultural resources are evaluated based on whether they meet the eligibility criteria required for listing in the NRHP (National Register Bulletin #15). Section 106 of the NHPA requires that federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800). The BIA is the lead federal agency for Section 106 review of most undertakings on the Navajo Nation.

3.7 Socioeconomic Conditions

3.7.1 Affected Environment

3.7.1.1 Employment and Income

The economy of LMD-1 predominantly revolves around livestock grazing, a practice that has been integral to Navajo culture and subsistence for generations. Grazing operations provide income through livestock sales and serve as a cultural tradition that reinforces connections to the land. Many Navajo families rely on grazing permits to support their livelihoods, with livestock often representing a significant portion of household income and cultural heritage. However, environmental and logistical factors have increasingly challenged the economic viability of grazing in LMD-1. Overgrazing, coupled with invasive species like tamarisk (*Tamarix spp.*) and cheatgrass (*Bromus tectorum*), has reduced the availability of forage, forcing permit holders to spend more on supplemental feed or reduce herd sizes. Soil erosion and vegetation loss exacerbate these challenges, making rangeland recovery more difficult.

3.7.1.2 Demographic and Population Trends

Demographically, the region is predominantly Navajo, with a strong emphasis on multigenerational households and community-centric living. The area experiences relatively low-income levels, with many residents relying on subsistence-based lifestyles supplemented by seasonal or part-time employment. Limited access to economic opportunities and infrastructure

development has contributed to persistent challenges in improving income levels and overall quality of life.

3.7.1.3 Lifestyles, Cultural Values, Attitudes, and Expectations

The Navajo Nation occupies the largest reservation in the U.S. and is one of the few Tribes that remains on ancestral lands. The Navajo culture has always maintained, and continues to strongly maintain, close connections to the landscape through herding, farming, and religious and cultural traditions.

3.7.1.4 Community Infrastructure

Community infrastructure is limited in LMD-1, with many areas lacking adequate access to healthcare, education, and reliable transportation networks. These limitations contribute to economic constraints and reinforce the importance of community-based initiatives to address shared challenges. Despite these obstacles, the region's residents exhibit strong resilience, drawing on traditional knowledge and cooperative practices to adapt to changing conditions.

Water infrastructure deficiencies also play a significant role in these challenges. Aging wells, limited pipelines, and insufficient watering points hinder the effective distribution of livestock across the district. This reliance on natural water sources, such as springs and riparian zones, often leads to overuse, further straining these fragile ecosystems. Without modernized infrastructure, grazing permit holders face increased costs and logistical difficulties.

3.7.1.5 Environmental Justice

Environmental justice, the process of ensuring actions do not disproportionately impact minority and low-income populations with adverse health and environmental effects, is enforced through Environmental Justice Executive Order 12898 of 1994. Low-income populations are households that live below the subsistence or poverty level as defined by local, state, and federal governments. This process includes the opportunity for minority and low-income populations to (1) provide comments before plans are completed and actions implemented, (2) equitably share in benefits of Proposed Actions, and (3) not be affected in a disproportionately high and adverse manner.

3.7.2 Environmental Impacts to Socioeconomic Resources

3.7.2.1 No Action Alternative

Impacts of the No Action Alternative will be adverse, direct, and cumulative, widespread, long term, and moderate. Under the No Action Alternative, unauthorized and unprofitable grazing would continue within LMD-1 leading to overuse and decreased livestock production.

3.7.2.2 Proposed Action Alternative

Impacts of the Proposed Action alternative would be beneficial, direct, cumulative, widespread, long term, and major. Under the Proposed Action, the implementation of the RMP would regulate effective land use and conservation through RMUs to prevent unauthorized grazing and overuse of rangelands and water resources. Through the RMP, fencing and new infrastructure would create sustainable agricultural practices and enhance productivity within LMD-1. Additionally, the RMP creates the opportunity for the creation of agricultural associations, including grazing associated, to be formed to enhance agricultural product diversity, income, and employment.

3.8 Climate Change and Resilience

3.8.1 Affected Environment

Climate change is human-accelerated warming of the earth due to emissions of carbon dioxide and other gases that trap heat from the sun into the atmosphere (Intergovernmental Panel on Climate Change [IPCC], 2014). Substantial increases in temperature linked to this phenomenon have occurred throughout the Southwest (California, Nevada, Utah, Arizona, New Mexico, and Colorado). In 2016, the NNDFW created a Climate Change Team (CCT) to study the effects of climate change on wildlife and natural resources. Recognizing the broader impacts beyond their own initiatives, the Department began reaching out to community members to understand their awareness of the effects of climate change on the Navajo Nation. In 2019, the Climate Adaptation Plan for the Navajo Nation was adopted by the Resources and Development Committee (NNDFW, 2018). Created with input from community members, experts, and leaders, the RMP outlines six natural resource priorities and provides a foundation for implementing adaptation strategies. The six natural resource priorities include:

1. Water
2. Feral Horses
3. Communication
4. Enforcement/Compliance
5. Pollution, Air Quality, Illegal Dumping
6. Grazing Management

The goals and adaptation strategies outlined in the RMP for priority 6: Grazing Management include increasing education and collaboration; improving vegetation health; improving monitoring; conserving wildlife and endangered species; improving infrastructure; developing a chemical disposal policy; eliminating invasive species; and revisiting the Rangeland Improvement Act of 2014.

3.8.1.1 Greenhouse Gas Emissions

Data on greenhouse gas (GHG) emissions on the Navajo Nation is limited. In 2020, in collaboration with Northern Arizona University's Institute for Tribal Environmental Professions program, data focusing on six emission sources were collected for the Navajo Nation (Figure 3-4; NNDFW, 2024). Out of the six emission sources studied, transportation is the leading source of GHG emissions on the Navajo Nation. Agriculture, which includes contributions from crops and soil, and livestock (enteric fermentation and manure), was also a dominant source of emissions (NNDFW, 2024).

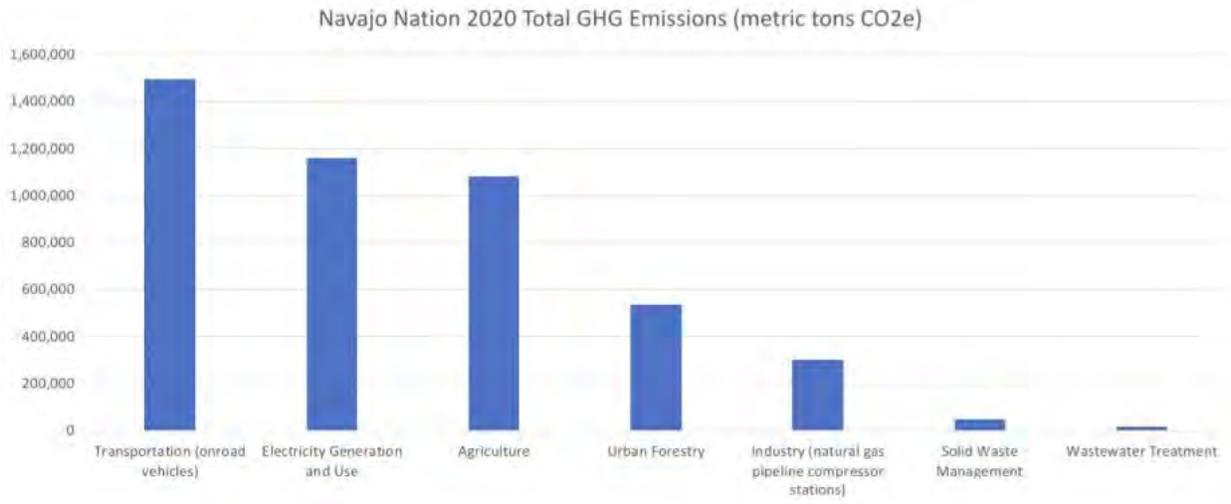


Figure 3-4. 2020 - Total GHG Emissions on the Navajo Nation (metric tons CO2e)¹

Figure from NNDFW, 2024

3.8.1.2 Climate Change Resiliency

Climate change has had significant and widespread impacts on the Navajo Nation. The region has experienced increasingly severe and erratic weather patterns, including more frequent droughts, rising temperatures, and intense storms, which are all linked to climate change.

Temperatures in the Colorado Plateau, where LMD-1 is located, increased an average of 1.8°F from 1901 to 2010 (Hoerling et al., 2013) and temperatures in Navajo National Monument (20 miles east of LMD-1) increased an average of 1.9°F from 1910 to 2010 (Monahan and Fisichelli, 2014). The data presented by Monahan and Fisichelli (2014) indicate extreme changes in climate compared to historical range of variability throughout Arizona (Figure 3-5). Climate models indicate a 6°F increase in average temperature could occur in the Southwest during the next 100 years (D'Antonio and Watkins, 2006).

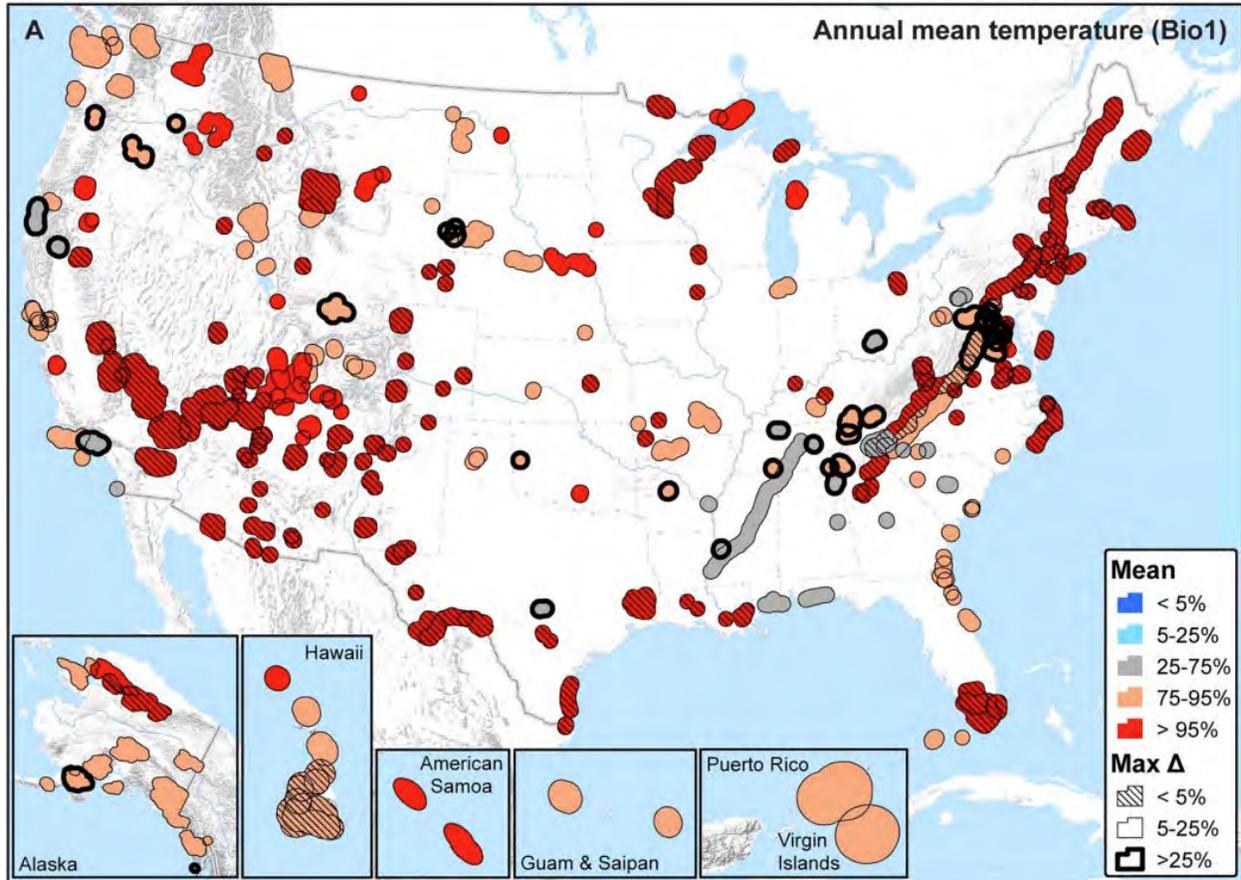


Figure 3-5. Mean and maximum difference of recent percentiles calculated for moving window means of Annual mean temperature¹

¹ The average (Mean) and maximum difference (Max D) of recent percentiles calculated for moving window means of Annual mean temperature (Bio1). Mean values provide an overall measure of recent (past 10-, 20-, and 30-year windows) climate change exposure with respect to 1901–2012 HRV (historical range of variability), while the maximum difference measures sensitivity to moving window size (smaller values are less sensitive). Extreme changes in climate relative to 1901-2012 HRV are considered <5th percentile or >95th percentile.

Navajo elders noted a marked decrease in precipitation beginning in the 1940s, an observation supported by data and one that may be attributable to climate change (Figure 3-6) (Enquist and Gori, 2008; Redsteer et al., 2018). Since the 1940s, the length of the annual monsoon has decreased by 5% to 40% (Hereford and Webb, 1992). Lastly, annual snowfall declined steadily from an average of 10 inches in 1930 to 3 inches in 2010 on and near the Navajo Reservation (Redsteer et al., 2010).

The Navajo Nation is already located in a region that is arid and faces limited water resources. As droughts have become more frequent and prolonged, the availability of water for drinking, agriculture, and livestock has diminished, impacting the community's overall well-being and food security. Between 1999 and 2009, the Navajo Nation endured a severe drought. Many springs have since dried up and many wells and aquifers have become too saline for use, leading to water shortages for wildlife, livestock, and domestic use (Redsteer et al., 2010).

Rising temperatures and drought conditions have increased the frequency and intensity of wildfires, which have destroyed homes, land, and livestock, further exacerbating the community’s vulnerabilities. The U.S. Climate Vulnerability Index (CVI) is a data-driven approach to understanding climate vulnerability across the country mapped at the scale of U.S. Census tracts. LMD-1 overlaps the Kaibito and Page Census tracts. According to CVI, LMD-1 is rated in the 62nd (Kaibito) and 86th (Page) national vulnerability percentile (i.e., higher to highest vulnerability) for extreme events driven largely by extreme temperatures, increased wildfires, and drought (CVI, 2025). LMD-1 is rated in the 67th (Kaibito) and 74th (Page) national vulnerability percentile (i.e., higher vulnerability) for overall climate vulnerability, which takes into account environmental, social, economic, and infrastructure effects on neighborhood-level stability (CVI, 2025).

Arizona, Climate Division 2 Average Temperature
February-January

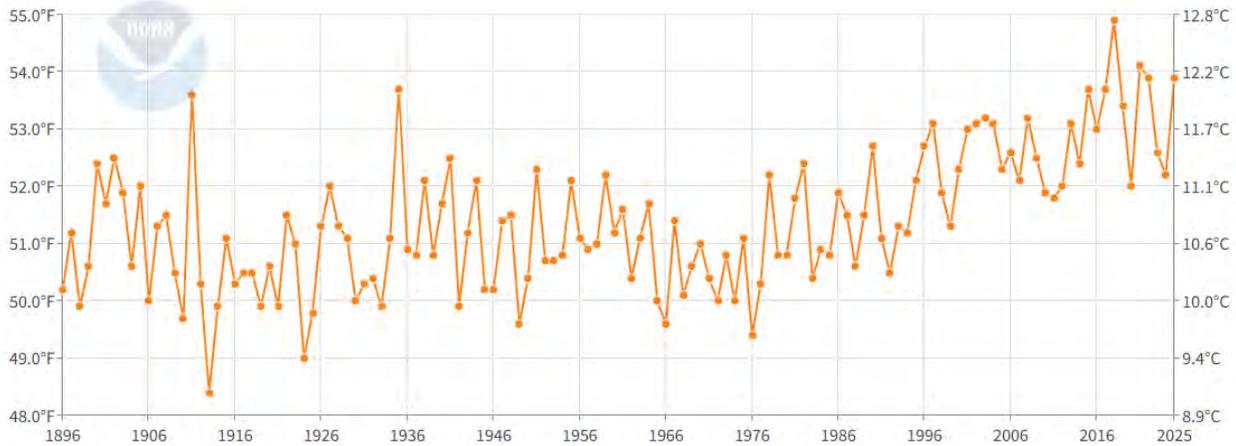


Figure 3-6. Mean annual temperatures NOAA Divisional time series Arizona Division 2. Northeast

3.8.2 Environmental Effects to Climate Change and Resilience

3.8.2.1 No Action Alternative

Impacts of the No Action Alternative would be adverse, indirect, widespread, long term, and moderate. Failure to improve range conditions and manage livestock would worsen the impacts of climate change and resilience by continuing to degrade rangeland resources, including soils, native vegetation, and water resources. Protection of these resources is necessary to mitigate the long-term effects of climate and drought conditions in LMD-1.

3.8.2.2 Proposed Action Alternative

Impacts of the Proposed Action alternative would be beneficial, direct, cumulative, regional, permanent, and major. Under the Proposed Action, implementing the RMP would establish a framework to manage, conserve, and improve rangelands in LMD-1, thereby enhancing their long-term resilience to climate change impacts. The implementation of rotational grazing within RMUs as laid out in the RMP would reduce grazing pressure on vulnerable areas, promote vegetation recovery, stabilize soils, and ultimately enhance the capacity to capture and store carbon. By expanding and modernizing wells, pipelines, and storage systems, the RMP would guide more

reliable water distribution, reducing reliance on water transportation. These measures will also provide critical resources during drought periods, supporting both livestock and wildlife. Invasive species management would further enhance climate resilience by restoring native plant communities that are better adapted to the district's environmental conditions and reducing the potential for extreme wildfire.

4 Individuals, Organizations, Agencies Consulted

Public notification and input for the RMP/PEA consisted of community meetings held on November 15 and 16, 2024, at the Tonalea and Coppermine Chapter houses; and on February 21 and 22, 2025, at the Kaibeto and LeChee Chapter houses. Over 237 members of the entire LMD-1 area attended. The issues and concerns raised by this process are summarized in the Public Scoping Report (Appendix B).

Endangered Species Act

BIA-WNA contacted and obtained lists of, and information on, threatened and endangered species, as well as those that are candidates for listing from the USFWS (Appendix E).

Section 106 of the National Historic Preservation Act

Section 106 consultation regarding historic properties will be completed with the Navajo Nation Tribal Historic Preservation Officer. This PEA and a determination of “no adverse effect” will be sent to the Tribal Historic Preservation Office for review and comment, which would partially complete Section 106 compliance. Government-to-government consultation with American Indian Tribes will be initiated to ensure no adverse impacts to ethnographic resources and values.

Tribal Contacts

BIA-WNA has contacted the Navajo, Hopi, and Southern Paiute Tribes to determine if any ethnographic resources are located in the project area for which they would want input concerning environmental and cultural compliance. The PEA will be sent to the Tribes during the public review period for their review and comment.

Programmatic Environmental Assessment Review and List of Recipients

The PEA is subject to a 30-day public comment period. BIA-WNA will publish and distribute a letter to relevant agencies, Tribes, and individuals as well as place an ad in the local newspaper to inform the public of the availability of the PEA. Additionally, the document will be available for review at the BIA-WNA office in Tuba City, Arizona, and copies will be provided by BIA-WNA to interested individuals upon request.

During the 30-day period, the public will be encouraged to submit their written comments to BIA-WNA. Following the close of the comment period, all public comments will be reviewed and analyzed prior to the release of a decision document. BIA-WNA will issue responses to substantive comments received during the public comment period and will make appropriate changes to the PEA as needed. BIA-WNA also will decide whether to revise findings in the FONSI or prepare an Environmental Impact Statement.

5 List of Contributors

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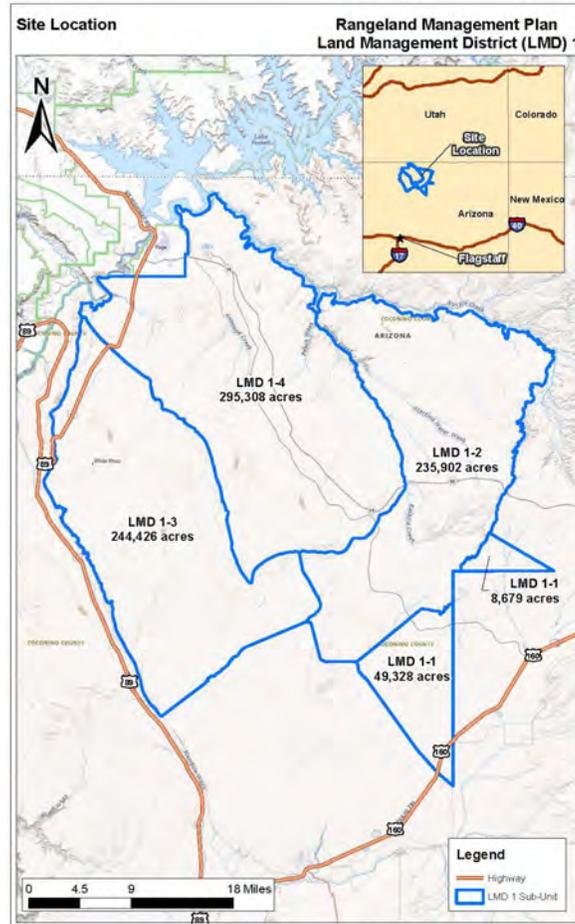
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APPENDIX A. RANGELAND MANAGEMENT PLAN

Proposed Rangeland Management Plan Including Farmland

Land Management District 1 Navajo Nation



May 2025

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ACRONYMS AND ABBREVIATIONS

AIARMA	American Indian Agricultural Resources Management Act
ALUP	Agricultural Land Use Permit
ATC	Agricultural Technical Center
AU	Animal Unit
AUYL	Animal Unit Year Long (one cow unit)
BIA	Bureau of Indian Affairs
BMP	Best Management Practice
CFR	Code of Federal Regulations
CUA	Customary Use Area
EA	Environmental Assessment
ESD	ecological site description
FBFA	Former Bennett Freeze Area
ft	feet
IAM	Indian Affairs Manual
IRMP	Integrated Range Management Plan
LMD-1	Land Management District #1
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NHLC	Navajo Hopi Land Commission
NNDA	Navajo Nation Department of Agriculture
NNDWR	Navajo Nation Department of Water Resources
NNC	Navajo Nation Code
NNL	Navajo New Lands
NPL	Navajo Partitioned Lands
NRCS	Natural Resources Conservation Service
ONHIR	Office of Navajo and Hopi Indian Relocation
PEA	Programmatic Environmental Assessment
PEIS	Programmatic Environmental Impact Statement
RMC	Robert Manufacturing Company
RMP	Range Management Plan
RMU	Range Management Unit
RU	Range Unit
SOP	Standard Operating Procedures
Sundance	Sundance Consultants, LLC
SUYL	Sheep Unit Yearlong
TK	Traditional Knowledge
USC	U.S. Code
USDA	U.S. Department of Agriculture
WNA	Western Navajo Agency

Chapter 1.0 - INTRODUCTION

This Rangeland Management Plan (RMP) is a living 10-year plan authorized under American Indian Agricultural Resources Management Act (AIARMA) for the Bureau of Indian Affairs (BIA). Its purpose is to protect rangelands and farmland operations within the 833,000-acre Land Management District 1 (LMD-1) of the Western Navajo Agency (WNA). LMD-1 represents 16% of the 5.21 million-acre WNA and comprises 10.4% of the 1.5 million-acre Former Bennett Freeze Area (FBFA). It includes parts of Coppermine, Kaibito, LeChee and Tonalea LMD-1 subunits, which currently require improvement in water and fencing to meet the land management and livestock production goals outlined in the FBFA Integrated Resource Management Plan (IRMP) (BIA, 2021a).

Significant challenges persist in achieving the comprehensive objectives of AIARMA in LMD-1, particularly in balancing ecological restoration with sustainable agricultural production. This RMP introduces integrated and proactive solutions to address these challenges by focusing on the following key areas:

- **Regulation and Enforcement:** Although grazing permits are in place, they are often unenforced or lack clear boundaries, resulting in unauthorized grazing and overuse of certain areas. Approximately 20% of rangelands are overgrazed, while 80% remain underutilized, leading to resource degradation, including impacts on water, soils, vegetation, and wildlife. Effective monitoring systems and enforcement mechanisms are crucial for improving rangeland health and aligning with AIARMA objectives.
- **Education, Training, and Assistance:** Land users currently lack adequate access to education and training, which limit their ability to implement best management practices (BMPs). Enhanced engagement and capacity-building programs are essential to equip stakeholders with the necessary tools to achieve conservation goals while preserving traditional Navajo/Diné agricultural practices.
- **Economic and Agricultural Productivity:** Agricultural production in LMD-1 is low, characterized by limited diversity, income, and employment opportunities. There is a need to focus on increasing livestock and food production through targeted improvements and innovative grazing practices.
- **Integrated Infrastructure Development:** The existing water systems and fencing infrastructure are inadequate to support optimal agricultural production. Comprehensive mapping, inventory assessments, and strategic investments in infrastructure are vital for meeting conservation and productivity goals.

A significant barrier to achieving AIARMA objectives is the lack of interagency coordination. Agencies with distinct roles often operate independently, which hinders collaborative solutions:

1. The Bureau of Indian Affairs (BIA) oversees permitting and monitoring but faces challenges in reissuing grazing permits due to unresolved boundary issues within Customary Use Areas (CUAs).
2. The Navajo Nation Department of Agriculture (NNDA) manages livestock enforcement but lacks sufficient fencing to regulate permitted and feral livestock effectively.

3. The Navajo Nation Department of Water Resources (NNDWR) is responsible for water development and maintenance but does not consistently coordinate with BIA or permittees to align efforts with conservation and production goals.

This RMP proposes the establishment of an Agricultural Technical Center (ATC) as a central hub for collaboration, education, and technical support. The ATC will foster interagency partnerships and engage stakeholders in planning, ensuring a holistic approach to addressing the challenges in LMD-1. Through regular meetings with land users and capacity-building programs, the ATC will facilitate the formation of grazing associations and Range Management Units (RMUs) based on well-defined use areas.

The development of RMUs will achieve the following:

- Facilitate the removal of unauthorized livestock.
- Support large-scale water and rangeland improvement projects.
- Enable accurate assessment of carrying capacity and conservation planning.
- Enhance shared labor and infrastructure, improving livestock management and quality of life.

This RMP aligns with the Diné principles of hozho, or harmony and balance, integrating conservation and productivity goals to support ecological health, agricultural success, and cultural vitality. By addressing the root causes of resource degradation and fostering collaboration, this plan lays the groundwork for sustainable land use and improved livelihoods for the Navajo Nation.

Chapter 2.0 - PLAN BACKGROUND and AUTHORITY

2.1 Purpose

This RMP is a comprehensive 10-year plan developed in accordance with AIARMA guidelines to fulfill the BIA's trust responsibility for conserving land resources while enhancing economic returns and social well-being. It serves as a vital tool for addressing the specific challenges faced by LMD-1, particularly those related to the FBFA.

Given that three of the four planning areas within LMD-1 are influenced by the FBFA, this RMP aligns with the FBFA IRMP's goals to realize its vision of "a rehabilitated FBFA with well-managed natural resources and environmental conditions, improved economic conditions and quality of life, and preserved Diné cultural traditions." This alignment includes adherence to the IRMP's goals, objectives, and management actions as detailed in Section 5.7 of the 2021 IRMP (BIA, 2021a).

This RMP provides a framework for agricultural land use policy for both the BIA and the Navajo Nation, serving as a foundational document for securing funding and resources necessary to implement programs and projects aimed at achieving desired outcomes. It establishes guidelines for managing rangeland resources through sustainable practices, balancing ecological health with cultural preservation and economic development.

In its design and purpose, this plan draws significantly from the successful elements of the recently completed Cropland Management Plan (CMP) for LMD-3 (BIA, 2024). By incorporating proven methodologies and adaptive management strategies, this RMP ensures alignment with broader objectives while addressing the unique conditions of LMD-1.

2.2 3-Part Holistic Goal

In accordance with AIARMA Section 4(11), IRMPs evaluate available resources to establish holistic management objectives that encompass quality of life goals, production goals, and landscape descriptions goals for various resources, including agriculture, forestry, water, wildlife, mineral, recreation, and community resources.

Quality of Life Goals

These goals envision health and happiness for agricultural stakeholders and their families engaged in livestock and farm/garden productions within the LMD-1 area. The following outlines Diné Traditional Knowledge (TK) through its balanced 4-Direction Lifeway:

Values/Philosophy (East): Locally produced food and fiber strengthen the sacred connection of the Diné to their lands, fostering deep stories and strong k'è relationships. A revitalized agricultural community thrives over time, where ranchers, farmers, and gardeners collaborate on education, assistance programs, and shared media.

Making a Living (South): Nutritious, locally produced foods become staples, widely cultivated and prepared to promote health and combat diabetes, obesity, and other public health issues. Reliable, clean water sources will be developed to support diverse local employment in agriculture, from RMUs to home gardens and markets.

Social Competence (West): A vibrant rural lifestyle is revitalized for ranchers, farmers, and gardeners fostering a strong connection to land and traditional culture for all family members. This nurtures family purpose, strengthens k'e connections, builds self-esteem, develops leadership skills, and promotes safe homes.

Ecological Regeneration (North): Active stewardship of land resources through regenerative agriculture cultivates a healthy “paired community” of humans and sustaining production while reflecting beauty and health in the natural community shared by families, neighbors, and the larger community.

Production Goals

These goals focus on optimizing livestock production, farming, gardening, and value-added activities as outlined in RMU plans, aiming to achieve the quality-of-life goals articulated by land users.

Landscape Description Goals

These goals emphasize the preservation and restoration of healthy land vegetation, soils, and watershed conditions. They align with environmental assessments and resource management objectives to optimize production while achieving the quality-of-life outcomes prioritized by land users.

The BIA is primarily responsible for the stewardship of Indian Trust Lands, focusing on the conservation and protection of these lands through conservation measures, BMPs, and safeguarding against misuse. The BIA has the exclusive authority to issue grazing and agriculture land-use permits on the Navajo Nation, with input from the Navajo Nation Grazing Committee. This RMP emphasizes the BIA's key responsibilities outlined in the Navajo Grazing Regulations (25 Code of Federal Regulations [CFR] 167) and the Navajo Nation Code (NNC) Title 3: Agriculture and Livestock, particularly the Navajo Grazing Regulation of December 24, 1957. A primary directive is to “protect lands against waste,” highlighting the importance of maintaining healthy vegetative ground cover on rangelands.

The objectives of 25 CFR, Part 167.3 state:

“It is the purpose of the regulations to aid the Navajo Indians in achievement of...

- (a) The preservation of the forage, the land, and the water resources...and the building up of those resources where they have deteriorated.
- (c) The adjustment of livestock numbers to the carrying capacity of the range in such a manner that the livestock economy of the Navajo Tribe will be preserved.
- (d) To secure increased responsibility and participation of Navajo people...in the sound management...of its grazing lands, and to foster a better relationship and a clear understanding between the Navajo people and the Federal Government in carrying out the grazing regulations.”

This planning effort aims to support informed decision-making, including reissuing 535 grazing permits to livestock owners while promoting sound agricultural management and recommending improvements to grazing infrastructure.

This RMP is structured as a 10-year plan under the regulatory authority of the AIARMA, Public Law 103-177. Its purpose is to fulfill the federal trust responsibility by managing Indian agricultural lands to:

- Increase economic returns,
- Enhance Indian self-determination, and
- Improve social and economic well-being.

These objectives are pursued in alignment with conservation, multiple-use, and sustained-yield goals while enhancing educational and training opportunities in practical, technical, and professional agriculture and land management skills [PL103-177 Sec.3 (1)-(4)]. Management plans must encompass holistic objectives, including quality-of-life goals, production goals, and landscape descriptions of resources such as water, agriculture, forestry, wildlife, minerals, recreation, and community [PL103-177 (S.3711) Sec. 4 (11)].

Grazing management across much of LMD-1 aligns with the 2021 FBFA IRMP, which mandates that “all land management activities are conducted in accordance with its goals and objectives,” including improving economic returns and enhancing the well-being of Indian communities (BIA, 2021a). The IRMP vision promotes:

- Rehabilitated natural resources,
- Improved economic conditions, and
- Preserved Diné cultural traditions.

The BIA Indian Affairs Handbook (54 Indian Affairs Manual [IAM] 1-H) for Agriculture and Rangeland Management (July 2021) establishes the standards, requirements, and procedures for administering rangeland programs. Compliance with NEPA is ensured through the Programmatic Environmental Assessment (PEA) accompanying this RMP.

In line with AIARMA directives, this RMP serves as the guideline for grazing and farming activities in LMD-1. The AIARMA requires the Secretary of the Interior to ensure that all land management activities comply with approved agricultural RMPs, Tribal laws, and ordinances. This includes adherence to 25 U.S. Code (USC) 3711, 3712, and 3715; 25 CFR Part 166.311 and Part 167; and NNC Title 3 (Agriculture).

Integrated planning within LMD-1 includes support from the FBFA IRMP (Figure 1), which commits to addressing the adverse legacy effects of the FBFA through initiatives such as the Navajo Thaw. This plan integrates four key management plans:

1. RMP
2. CMP
3. Woodlands Management Plan, and
4. Water Management Plan

These plans coordinate grazing, farming, water needs, and resource restoration across LMD-1, ensuring holistic and sustainable land use.

Figure 1. Integrated Resource Management Plan Process (BIA, 2021a)



2.3 Navajo Fundamental Law and Traditional Knowledge

The Navajo Nation’s authority over natural resources and rangeland use is deeply rooted in Fundamental Law and TK, grounded in the 4-Direction Lifeway, which serves as a guiding framework for reestablishing a thriving agricultural community encompassing ranches, large farms, and home gardens. These authorities include all Diné people, traditional leaders, traditional law, customary law, natural law, and common law, forming a holistic and interconnected governance system.

In 1999, the Navajo Nation adopted the Local Governance Act so local citizens can re-establish authority over local matters. Thus, this RMP complies with the Navajo Common Law Project and Navajo Nation Council Resolution CN-69-02 (NNC Sec 201-206), which includes *The Foundation of the Diné, Diné Law, and Diné Government*. The Navajo Nation Council declared that all elements of the government must learn, practice, and educate the Diné on the values and principles of the Fundamental Laws of the Diné which provide sanctuary and guidance for the Diné Way of Life to give balance and harmony with self, family, neighbors, animals, and universe. Authorities to be respected include The People, Traditional leaders, Traditional Law, Customary Law, Natural Law, and Common Law. Key elements, as adopted by NNC 102 in 2002, related to agriculture include:

- Ch. 1 Sec 2: These laws provide sanctuary for the Diné life and culture... and the balance we maintain with the natural world. These include individual rights and freedoms, the collective rights and freedoms, and self-governance.
- Ch. 1 Sec 4: Diné Customary Law declares: *“It is the right and freedom of the people that there always be holistic education of the values and principles underlying the purpose of living in harmony and balance (hozho) with all creation, walking in beauty and making a living... and that the sacred system of k’è be taught and preserved; and that ...the sacred Diné language be taught and preserved; and that the sacred bonding in marriage and the unity of each family be protected; and... every child and every elder be respected, honored and protected with a healthy physical and mental environment, free from abuse.”*
- Ch. 1 Sec 5: Natural Law declares: *The Four Sacred Elements of life: Air, Light/fire, Water and Earth/earth-pollen in all their forms must be respected, honored and protected for they sustain life; and ... All creation, from Mother Earth and Father Sky to the animals, those who live in water, those who fly and plant life have their own laws, and have rights and freedom to exist; The Diné have a sacred obligation and duty to respect, preserve and protect all that was provided for we were designated as the steward of these relatives through our use of the sacred gifts of language and thinking; It is the duty and responsibility of the Diné to protect and preserve the beauty of the natural world for future generations.*
- Ch. 1 Sec 6: Common Law declares: *The values of the Diné Common Law must be recognized, respected, honored and trusted as the motivational guidance for the people and their leaders in order to cope with the complexities of the changing world, the need to compete in business to make a living and the establishment and maintenance of decent standards of living; the values and principles of Diné Common Law must be used to harness and utilize the unlimited Diné knowledge [Traditional Knowledge (TK)], with our absorbed knowledge from other peoples. This knowledge is our tool in exercising and exhibiting self-assurance and self-reliance in enjoying the beauty of happiness and harmony.*

Adopted by Navajo Nation Council Resolution 102 in 2002, these principles are essential to sustaining agriculture within the Navajo Nation. The 4-Direction Lifeway model defines a modern agricultural community as one capable of fostering a healthy and beautiful way of living in harmony with nature, promoting balance between people and the environment (Navajo Division of Education, 1990).

Key elements of Navajo Fundamental Law and TK, as they relate to agriculture, include the following:

- **Democratic Participation:** Authority stems from the interconnected web of local people, traditional leaders, and common law, all contributing to agricultural stories rooted in Diné values.
- **Access to Land:** Residents of LMD-1 should have the freedom and opportunity to access land for grazing and farming, ensuring agricultural practices remain integral to Diné identity and livelihoods.

- Collaborative Agency Support: Agencies are encouraged to collaborate closely with residents to ensure land is used in its most beneficial way by willing and capable ranchers, farmers, and gardeners.
- Policy Alignment: Policies must be aligned to prioritize logical and effective land use, ensuring that willing and able individuals receive land use rights.
- Land Preservation: Ranchlands and farmlands should be protected from fragmentation, ensuring they remain intact and viable for future agricultural use.

2.4 Public Scoping and Stakeholder Meetings

Public scoping for this project consisted of community meetings held on November 15 and 16, 2024, at the Tonalea and Coppermine Chapter houses; and on February 21 and 22, 2025, at the Kaibeto and LeChee Chapter houses. Approximately 192 members of the LMD-1 area attended. Meetings provided public disclosure of the proposed action and discussed the critical elements of the National Environmental Policy Act (NEPA) Environmental Assessment (EA) process. The scoping meeting included a presentation of the RMP planning process; the goal of the scoping process; background information on historical ranching on the Navajo Nation; existing conditions; and RMP goals, needs, and BMPs. RMP scoping meetings described the main ranching areas (by BIA-designated compartments), need for grazing permit reissuance, and needed improvement projects. Comments from community members provided rich context for the economic, social, and cultural complexity of these issues. Details of the meeting's comments are included in the PEA.

2.4.1 Resources Issues of Concern

Key Resource Issues of Concern: This section outlines the strategies for achieving the stated goals and deliverables by addressing key grazing management challenges, including concerns raised during the PEA scoping process. It also provides recommended BMPs to effectively resolve these issues.

- 1) **Lack of stakeholder involvement**: Over 95% of the stakeholders to this RMP are currently not involved with any planning process. In addition, few of the government agency staff responsible for implementing the RMP are part of the LMD-1 open-range pastoral community. Furthermore, typical local land management planning on LMD-1 includes the 70%+ of LMD-1 residents who are urban, with their needs addressed under Chapter Land Use Plans (such as for LeChee and Kaibito), with limited discussion on management of the 98% open rangeland.

BMP: It is essential that socio-economic analysis in the LMD-1 PEA deal with the ranchers and those living on the rangelands, and not solely the urban population. Plan Actions and BMPs must incorporate ranchers who are in active stakeholder roles, as directed by regulation (25 CFR 167.3 (d)).

- 2) **Lack of enforcement**: This was the biggest issue voiced at public meetings held for the PEA. Most livestock use in LMD-1 is unauthorized. It is uncertain how many unauthorized livestock graze in LMD-1; however, it is likely similar to that occurring in LMD-3 to the south. In LMD-3, surveys showed 3,740 mostly feral horses grazing 18,700 Sheep Unit Yearlong (SUYL), or 46% of total SUYL permitted for LMD-3 (Eagle

Environmental, Inc, 2021). Add to this approximately 20% more non-permitted cattle and sheep (3,700 SUYL), or 9% of LMD-3 capacity, which means that while 101% of carrying capacity is being used, only 45% of the livestock on the range may be authorized under permits. Similarly, the 2020 helicopter livestock count found 7,730 cattle, 4,957 horses, and 3,393 sheep—or the equivalent of 73,023 SUYL. When the unauthorized use is factored in, the SUYL is 179% of the total authorized carrying capacity for LMD-3. As similar issues affect LMD-1, without greater enforcement it is difficult to conduct conservation planning and management. Additionally, off-road use of all-terrain vehicles (ATVs) and trucks, many used for herding livestock, cause damage to soils and vegetation. Without proper enforcement, the erosion and damage caused by unauthorized off-road use will continue. During public meetings, community members expressed the difficulty of reporting for trespassing due to the threat of retaliation or social repercussions.

BMP: Unauthorized and unprofitable grazing use is discouraged when RMUs are formed over larger land areas. The collaborative formation of RMPs between local ranchers further prevents unauthorized use since pasture lands are fenced and controlled for rest-rotation grazing by authorized stakeholders.

- 3) **Infrastructure development**: A lack of access roads for grazing areas causes unauthorized off-road use that damages sensitive soils and vegetation. Fences are damaged and in need of repair across LMD-1. Without key infrastructure such as access roads, fencing, cattle guards, and corrals, permit holders cannot effectively practice rest-rotational grazing and must choose between damaging land by driving off-road, or a lack of access to key grazing areas.

BMP: Stakeholders collect and share infrastructure information and collaborate on solutions through regular permit holder meetings or a grazing association. Stakeholders survey existing infrastructure and identify areas that require repairs as a part of a regular monitoring plan.

- 4) **Desertification**: LMD-1 is an arid desert country with some of the lowest annual rainfall in the Navajo Nation. Yearlong continuous grazing by livestock and unauthorized, free-ranging livestock, even where it is at low stocking rates, is gradually degrading large areas of land. There is increasing national and Tribal support in addressing climate change and improving vegetative cover through initiative-taking regenerative land management. Many permit holders stated that rest-rotation grazing has not been feasible because unauthorized users trespassing on land designated for rest depleted resources and made the practice impossible.

BMP: Proper rest-rotation grazing systems on RMUs, with fenced pastures and forage utilization monitoring as a requirement to eliminate unauthorized animals and keep livestock at proper stocking rates that match forage availability to reverse range degradation.

- 5) **Overutilization**: The lack of reliable water sources results in severe overgrazing around watering areas. However, at the same time, due to the lack of sufficient reliable watering locations, up to 65% of the rangelands are underutilized. This inconsistency complicates the discussion on whether the range is overgrazed or underutilized, as it is both.

BMP: Rest-rotation grazing systems involving RMUs to create more water sources and result in livestock being more evenly distributed across the landscape, with timed grazing and rest for vegetation recovery. This will create a better balance of healthy land with desired livestock production.

- 6) **Limited water:** There are few permanent livestock watering sources. Existing infrastructure such as earthen dams, windmills, and wells are in disrepair and in need of maintenance, some due to damage from feral horses. Many livestock owners haul water at great expense, including time, money for gas, and wear and tear on vehicles. BIA's extensive range water projects inventory shows facilities are in poor condition; thus, it will be a slow and costly process to build water and fencing infrastructure to conduct the rest-rotation grazing on RMUs needed to accomplish the conservation and production goals of this RMP.

Going forward, government funding for water infrastructure development must target authorized users to build a situation for fair and balanced social, economic, and ecological well-being.

BMP: Additional permanent water sources for livestock and wildlife. These would be best installed under a RMU structure with pasture systems to distribute these water sources evenly across the landscape, under control of livestock associations, to ensure many grazing permit holders are able to use each water source and rotate its use to rest vegetation on a planned schedule.

- 7) **Housing development on rangeland:** Unregulated housing construction on rangeland undermines grazing and conservation efforts, contravening established government policies.

Homesite lease planning does not consider traditional grazing practices and water access issues, often fragmenting resources and creating conflict between ranchers and homeowners. Homeowners do not understand traditional grazing practices and submit trespass complaints for ranchers using traditional grazing corridors near homesite leases.

BMP: Collaborate with local chapters and regulatory agencies to enforce land use policies, ensure proper land designation, and balance housing development with rangeland preservation by involving stakeholder input from ranchers during planning processes to avoid resource fragmentation and water access issues.

- 8) **Education:** There is general confusion about grazing regulations, permit boundaries, and compliance requirements. There is a strong desire for educational opportunities to effectively implement this RMP.

BMP: Establish an ATC as a central hub for collaboration, education, and technical support. Regular meetings and training programs will allow for distribution of maps, permit rules, and BMPs for livestock management. Stakeholders can collaborate on solutions, sharing expertise, time, and equipment on projects that benefit multiple permit holders.

- 9) **Preserving Heritage Through Youth Involvement:** There is a strong desire to bridge cultural transmission gaps between elders and youth. This vital intergenerational

connection provides sharing both cultural and technical aspects of livestock grazing, as it is a central part of local identity and history.

BMP: Establish an ATC to provide mentorships programs that facilitate connections between community elders and youth. This center provides outreach to schools to introduce livestock grazing practices to younger generations and connect young community members with paid work opportunities on range improvement projects.

2.5 RMP Goals

This RMP for LMD-1 identifies nine primary goals based on the AIARMA and the FBFA IRMP. These goals focus on effective utilization, conservation, and sustainable development of rangeland resources. Section 4: Rangeland Management and Permit Issuance provides detailed objectives and action steps to achieve these goals.

1. Adjust Outdated Grazing Permits

Objective:

- a. Adjust outdated grazing permits to reflect current stocking rates.

Management Action:

- a. Follow the recommendations from University of Arizona range management professors and 25 CFR Part 167 to adjust stocking rates based on traditional stocking methods, monitoring localized forage utilization, localized precipitation, and site-specific (or at least grazing compartment-specific) condition and trend studies.

2. Develop Management Plans at the Compartment Level

Objective:

- a. In line with EAs that apply to LMD-1, develop compartment-specific management plans that address local environmental concerns.

Management Action:

- a. Address environmental concerns specific to each compartment through individual management plans to optimize production while achieving the quality-of-life outcomes prioritized by land users.

3. Regulate Effective Land Use and Conservation

Objective:

- a. Manage land use sustainably to protect natural resources for future generations.

Management Actions:

- a. Implement assessments, permitting, monitoring, and enforcement strategies to ensure sustainable use of lands and natural resources.
- b. Focus conservation efforts on reducing degradation and promoting resource recovery.

4. Maintain High Agricultural Production

Objective:

- a. Ensure that management decisions maximize land use and efficiency.

Management Action:

- a. Align RMP and compartment-level EAs with the FBFA IRMP's goal to maximize land development, productivity, and economic utilization while ensuring the principles of protection, conservation, and sustainability are upheld.

5. Enhance Agricultural Product Diversity, Income, and Employment

Objectives:

- a. Create opportunities for agricultural producers.
- b. Facilitate comprehensive management of land resources and optimize their potential.

Management Actions:

- a. Encourage diverse land use practices.
- b. Support the establishment of agricultural associations.

6. Develop Value-Added Industries

Objective:

- a. Strengthen local economies, foster self-sustaining communities, and enhance economic resilience.

Management Action:

- a. Promote the creation of industries such as food processing, branding, packaging, and marketing.

7. Provide Education, Training, and Technical Assistance

Objective:

- a. Provide hands-on training and support for adopting BMPs.

Management Action:

- a. Offer resources such as training programs and facilities to agricultural producers, including access to demonstration ranches and farms.

8. Increase Water Availability and Infrastructure

Objective:

- a. Provide the infrastructure that is essential to sustainable agricultural practices and improved productivity of ranching, farming, and gardening activities.

Management Actions:

- a. Create reliable water resources by expanding and modernizing water infrastructure.

9. Protect Multiple Resource Values

Objective:

- a. Safeguard important natural and cultural resources, including plants, soils, water, wildlife, recreation areas, and culturally significant sites.

Management Action:

- a. Ensure that management practices will integrate resource protection with land use to preserve ecological and cultural integrity.

Chapter 3.0 - LMD-1 EXISTING ENVIRONMENT

3.1 Location and Topography

LMD-1 encompasses 833,625-acres and is situated in northern Arizona, bordering Utah (Figure 2, Appendix E). It stretches from Page, Arizona, at the northwest boundary extending 50 miles southward to within 10 miles north of Tuba City. This high desert region is part of the Kaibito Plateau, with average elevations around 6,000 feet (ft) ranging from 5,000 ft at LeChee in the northwest to 5,800 ft at Kaibito in the southeast, reaching 7,200 ft on White Mesa at the eastern boundary. The soils are predominantly sandy, and the primary vegetation consists of sagebrush, interspersed with scattered juniper trees (Figure 3, Appendix E).

- 1) **Western Boundary:** The western edge of LMD-1 is defined by the Echo Cliffs, with US Highway 89 running parallel along the western base of the cliffs for most of this border.
- 2) **Northwest Boundary:** The short northwest boundary is marked by the southern edge of Page, Arizona's city limits, along with the western bank of the Colorado River's Glenn Canyon, which includes Horseshoe Bend on the southwest and Lake Powell on the northeast.
- 3) **Northeastern Boundary:** The northeastern boundary follows the deep Navajo Canyon southeast from Lake Powell for 13 miles, then continues east along Navajo Creek for 21 miles.
- 4) **Eastern Boundary:** The eastern boundary tracks Potato Canyon south from Navajo Creek for 12 miles and then parallels paved highway 98 a few miles to the south for 16 miles until it meets US Highway 160.
- 5) **Southeast Boundary:** This boundary follows irregular canyons southwest of Highway 160, passing Tonalea, then proceeds northwest to north of Preston Mesa, and finally southwest to terminate at the Echo Cliffs just east of the Gap, Arizona.

Of the total 833,625 acres, 818,223 acres are designated as rangelands, while 349 acres are classified as croplands, all of which are dryland farms. It is important to note that these figures exclude the 60% of the Tonalea Chapter area that falls within the Navajo Partitioned Lands (NPL). The BIA records indicate 535 grazing permits for the rangelands and 51 Agriculture Land Use Permits (ALUPs) for the dry farms.

Figure 2. LMD-1 Site Location Map

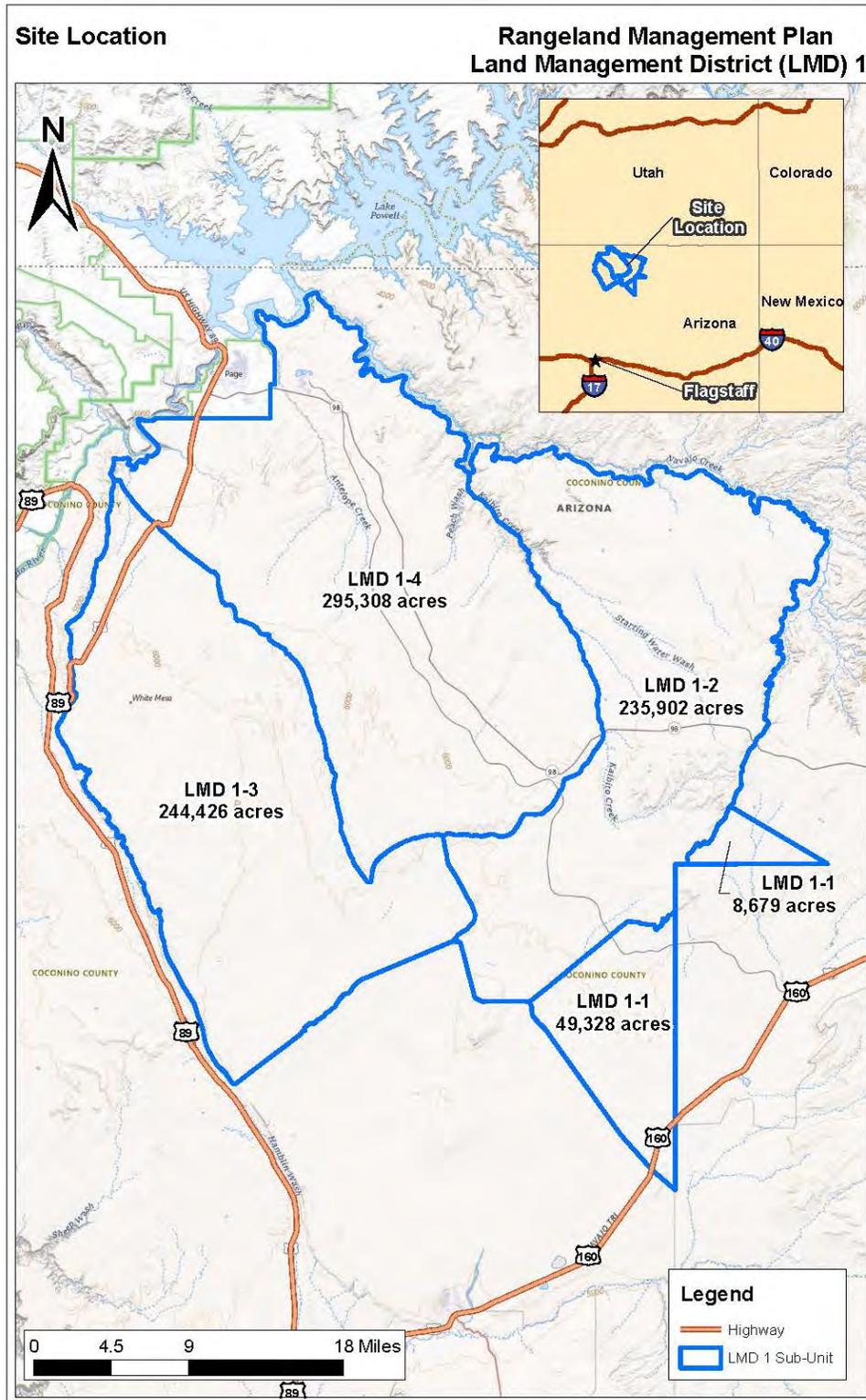
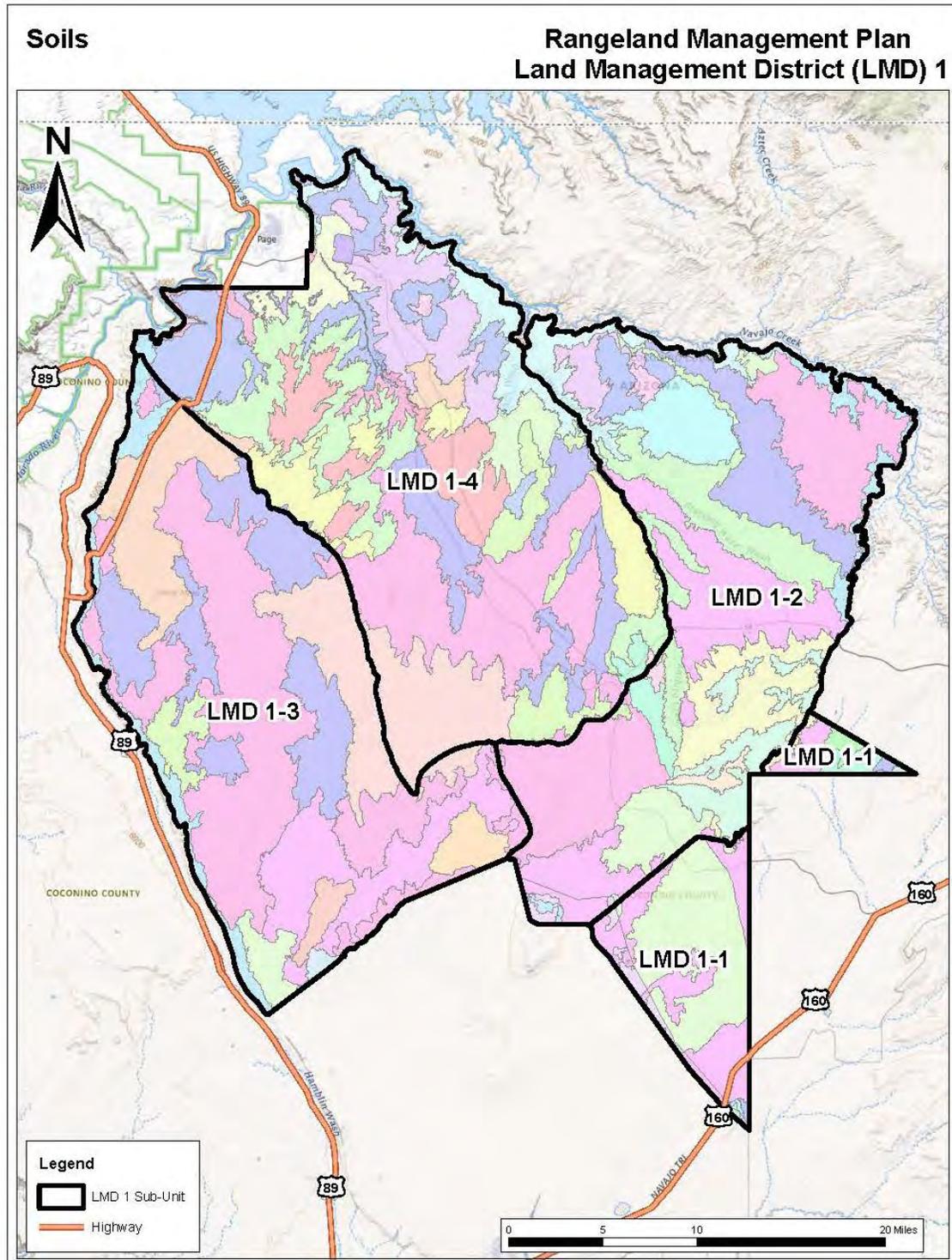


Figure 3. NRCS Soil Map Units Comprising the LMD-1 Area





3.2 Climate

LMD-1 is characterized as a semiarid desert, with a long-term average annual rainfall of approximately 6.3 inches. Data from the National Weather Service, collected over more than 105 years at Tuba City, indicates an average precipitation is 6.5 inches, with Page, Arizona, recording nearly identical figures. According to Navajo Nation Water Resources, the long-term average precipitation for the western Navajo Nation region is about 7.85 inches, with variations ranging from 5 to 17 inches. Annual rainfall can fluctuate significantly, with some years experiencing up to 25% below normal levels during dry spells and others exceeding normal levels by 25% in wetter years. The region has been experiencing prolonged drought conditions for over two decades.

Average minimum temperature typically drop below freezing from November through March. The growing season in LMD-1 spans from early February to the end of November (NNDWR, 2000).

3.3 Demographics

As of 2022, the population of LMD-1 was 6,755, distributed across four Chapters. The population has significantly increased due to demographic shifts and growth since boundary fencing and grazing adjudication in 1941. Approximately 55% of residents live in homes near the communities of LeChee, Kaibito, and Tonalea, while the remaining population reside in scattered housing throughout the landscape, typically centered on grazing CUAs that lack defined boundaries.

LMD-1 is divided into four subunits:

- **LMD 1-1 and Tonalea/Red Lake Chapter:** Located in the southeast corner, this area covers 74,313 acres and supports a population of 2,570 for the entire Chapter. (Note: Approximately 40% of Tonalea Chapter lies within LMD-1, while the remaining 60% falls under the NPL, managed by its BIA NPL Plan.)
- **LMD 1-2 and Kaibeto Chapter:** Situated in the northeast, this area spans 226,018 acres and has a population of 1,955.
- **LMD 1-3 and Coppermine Chapter:** Occupying the southwest portion, this area covers 291,096 acres and is home to 583 residents.
- **LMD 1-4 and LeChee Chapter:** Located in the north-central area, this area encompasses 242,298 acres and supports a population of 1,647.

3.4 LMD-1 Grazing History and Land Conditions

Before the 1930s, the LMD-1 area had very few Navajo residents due to the scarcity of reliable water sources. At that time, grazing was limited to brief seasonal transhumance, primarily involving sheep. A few wells were developed in the early 20th century, but it was not until the late 1930s that the BIA established fenced Land Management Districts across the reservation. The boundary of LMD-1 was fenced and baseline land inventories were conducted. The Soil Conservation Service, which later became the NRCS, expanded their workforce and conducted vegetation monitoring and livestock counts on the Navajo Nation for the BIA. Examples of these

foundational reports from 1937 (Range Management Branch Report and Land Management Survey) are available in Appendices F and G, respectively. Livestock counts were conducted during this time, due to the availability of maps showing scarce water resources used by various families managing livestock (Appendix H). This newly available information on livestock and rangeland resources lead to the adjudication of grazing permits for CUAs in 1941. These CUAs were assigned based on identified family heads residing at homes or camps in each area, without specific description of the land area locations, sizes, or boundaries (Bingham and Bingham, 1982; Bailey and Bailey, 1986). As of 2024, BIA records indicate there are 535 valid grazing permits and 51 ALUPs for LMD-1.

Over time, traditional herds of sheep and goats have largely transitioned to cattle herds, as cattle require less constant herding and command higher market prices. However, this shift has led to a decrease in grass production, as cattle primarily graze on grass and tend to stay near reliable water source year-round. Consequently, there has been an increase in broom snakeweed, Russian thistle, and rabbitbrush across much of the reservation (Ecosphere, 2012). Extended drought periods and reduced seasonal livestock rotation have further contributed to declines in rangeland health. Areas of blow sand and sand dunes have emerged where they previously did not exist, and deep arroyos have rendered some pastures inaccessible to grazing animals.

According to data published by the BIA Western Navajo Agency on their website (Western Navajo Agency/Indian Affairs), LMD-1 has a capacity of 26,716 Sheep Units Year Long (SUYL), equivalent to 5,343 Animal Unit Year Long (AUYL), which translates to a stocking rate of 4.18 AUYL per section for the 1,278-section area of LMD-1. This rate aligns with the 4.0 AUYL per section rate used by the Arizona State Land Department uses for annual precipitation areas in Northern Arizona that are similar to LMD-1. The average size of the 535 grazing permits in LMD-1 is 50 SUYL or 10 AUYL per permittee. The availability of water and type of grazing system determine the amount of forage permitted for grazing. Details regarding the determination of carrying capacity and stocking rates for grazing permit issuance on LMD-1 rangelands are covered in Section 4.5. Water for LMD-1 is sourced exclusively from wells or transported by hauling, as there are no naturally flowing streams or springs in the area.

Chapter 4.0 - RANGELAND MANAGEMENT and PERMIT ISSUANCE

The following subsections explain how AIARMA guidelines are followed by range management professionals to effectively accomplish the seven key objectives of the AIARMA for good rangeland management outcomes, as well as issuing grazing and land use permits over the 10-year period of this RMP.

4.1 Standards, Policy, and Planning Framework

This section outlines the strategy for achieving the objectives of the AIARMA in LMD-1 through effective rangeland management practices and the issuance of grazing and agricultural land use permits over the 10-year period of this RMP. The planning framework addresses significant challenges and proposes best practices informed by past successes and research.

4.1.1 Challenges to Effective Management

LMD-1 encounters several challenges typical of Navajo rangelands, including:

- **Dispersed Land Use:** The thin distribution of land users leads to inefficiencies in rangeland management, contributing to excessive road development and soil erosion.
- **Outdated Grazing Permits:** Permits most often lack designated land base areas, complicating the definition of carrying capacity and the resolution of overlapping claims.
- **Unauthorized Grazing:** Unregulated livestock grazing, including feral horses (estimated at 20% of range use), complicates management efforts.
- **Degraded Rangelands:** Year-round grazing near watering points has resulted in overgrazing, soil erosion, and reduced livestock health, with calf crop rates often below 50%.
- **Resistance to Change:** Limited access to education, training, and technical assistance hinders the adoption of modern practices among land users.
- **Economic Barriers:** High costs, distant markets, and a lack of leadership or skilled labor contribute to ongoing economic stagnation.

These challenges have been well-documented, including in studies like Lowe's (1994) research on desertification, underscoring the urgent need for innovative solutions.

4.1.2 Holistic Solutions: Lessons from the Navajo New Lands

A successful model for addressing these challenges is found in the Navajo New Lands (NNL) program, which effectively implemented integrated rangeland management across 352,000 acres. Key components of this success included:

1. **ATC:** A centralized resource center staffed by qualified range conservationists to provide oversight, technical support, and coordination.
2. **Regulation and Policy Development:** Establishment of RMUs with localized plans developed in collaboration with permittees to achieve conservation and production goals.
3. **Education and Training:** Comprehensive outreach to enhance the capacity of grazing permittees and their families, fostering shared knowledge and practices.

4. **Infrastructure Development:** Investments in water pipelines, troughs, and fencing to support effective rotational grazing systems.
5. **Monitoring and Feedback:** Continuous data collection and analysis, including vegetation assessments, precipitation tracking, forage utilization studies, and livestock counts, to inform adaptive management.

4.1.3 Key RMU Planning Considerations

Figure 4 (Appendix E) is a preliminary map that shows the 20 compartments that have been proposed by BIA (two-digit numbers), six RMUs (three-digit numbers) in LMD-1, the location of grazing permit based on annual Tally Count, highways, and communities. The following points should be considered in the planning stage of RMUs for conservation management:

- **Size:** RMUs should encompass a minimum of 15,000 acres to meet economic and ecological objectives, supporting approximately 100 cattle and justifying infrastructure investments.
- **Stocking Rates:** Stocking rates will comply with federal regulations (25 CFR Part 167), utilizing rest-rotation grazing principles and periodic monitoring to ensure alignment with forage availability and climatic conditions.
- **Governance:** The formation of grazing associations will be essential for RMUs, enabling permittees to collaborate with the BIA, Navajo Nation, and the ATC to achieve shared goals.

4.1.4 Moving Forward

To fulfill AIARMA's objectives, this RMP emphasizes a "bottom-up" approach, engaging land users and agencies in collaborative planning and decision-making. By drawing on lessons learned from the NNL program and applying modern best practices, this plan establishes a framework for sustainable and productive rangeland management that benefits both the community and the environment.

4.2 Establishing an Agricultural Technical Center (ATC) to Achieve AIARMA Objectives

The creation of an ATC is essential for tackling the complex and ongoing management challenges in LMD-1. This RMP includes details on the establishment of the ATC (Appendix A). The ATC will function as a centralized hub for collaborative planning, education, and implementation of rangeland management practices, effectively bridging the gaps between stakeholders and agencies. This section outlines how the ATC will address key issues identified during the scoping process and fulfill the primary objectives of AIARMA.

4.2.1 Regulation and Enforcement to Protect Rangeland Values

Key Issue:

A significant concern raised during the scoping process was the inadequate enforcement of grazing and land use regulations, which has allowed unauthorized activities and resource misuse to continue.

Challenge A: Lack of Stakeholder Engagement

Over 95% of LMD-1 stakeholders, including many of the 535 historical grazing permit holders and their families, are not actively involved in planning processes. Additionally, many younger residents interested in agriculture lack opportunities for participation.

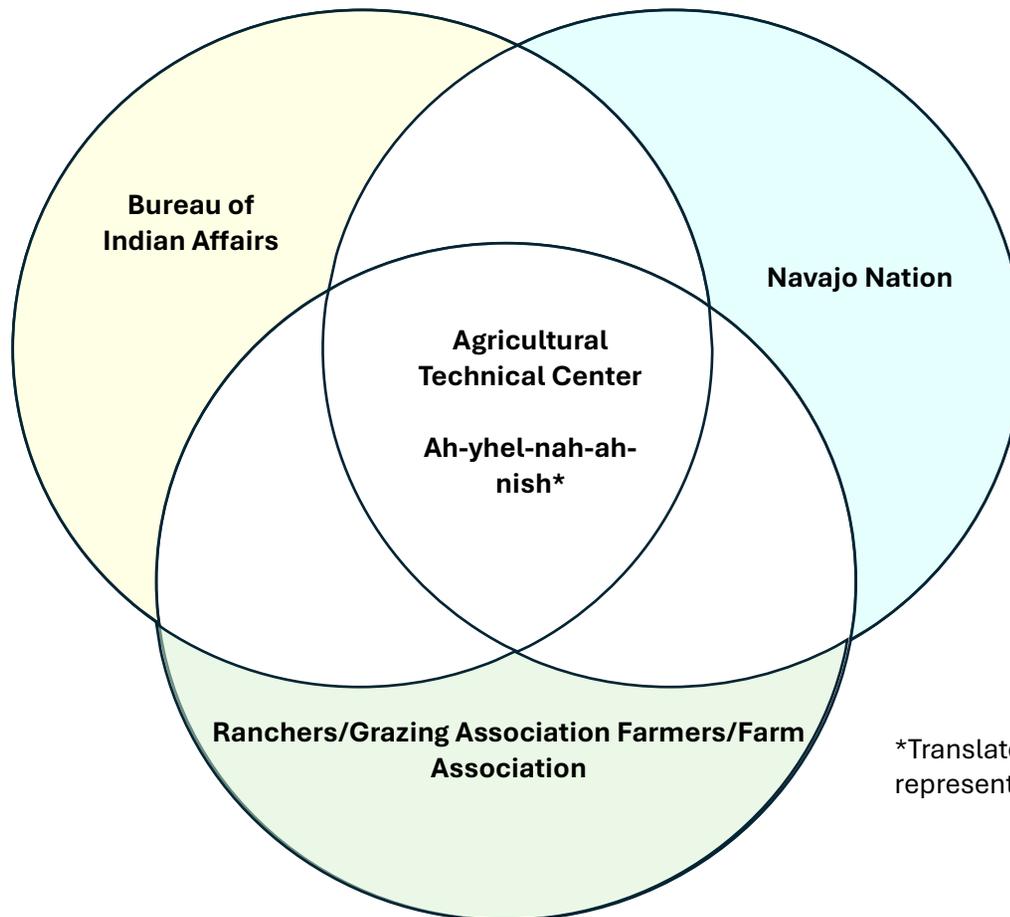
- **Objective A: Increase Stakeholder Engagement**

Increase stakeholder participation through engagement efforts to effectively manage grazing permits and avoid unauthorized use.

Management Actions:

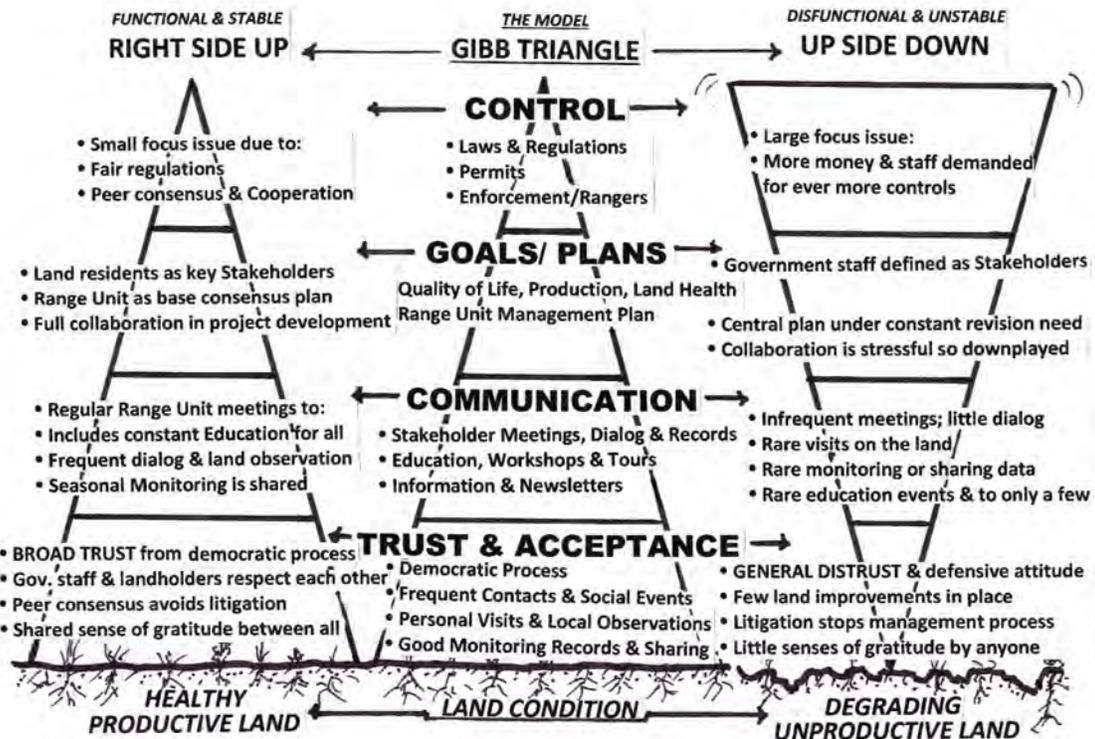
- Leverage AIARMA's holistic management objectives to engage stakeholders in defining their quality of life, production, and landscape goals.
- Establish the ATC as a collaborative action center, ensuring effective cooperation among federal, Tribal, and local stakeholders (Figure 5).
- Implement people-oriented approaches, such as the Gibb Triangle Model, to build trust, enhance communication, and align goals (Figure 6).

Figure 5. Venn Diagram for 3-Party Collaboration



*Translates to creatively working together to represent the land itself.

Figure 6. Gibb Triangle Model for Applied Management



Challenge B: Lack of RMUs

LMD-1 currently lacks the structured RMUs essential for effective rangeland management. Without clearly defined units, it becomes challenging to calculate carrying capacity or ensure continuity in stewardship.

- **Objective B: Establish RMUs**
Establish clearly defined RMUs for more effective rangeland management.

Management Actions:

- The ATC will facilitate mapping and land surveys to identify suitable areas for RMUs, ensuring they are appropriately sized and structured to meet conservation and production goals.
- Provide technical assistance to permit holders in forming grazing associations and implementing BMPs within RMUs.

4.2.2 Achieving Full Production Potential and Diverse Income Streams

Key Issue:

LMD-1 faces challenges with outdated grazing permits, unauthorized livestock proliferation, and limited water infrastructure, all of which hinder optimal production and income diversification.

- **Objective A: Outdated Permits**

Many grazing permits are inaccurate or inactive, making it difficult to assess production potential.

Management Action:

- The ATC will assist in updating permits and forming RMUs with defined stocking rates to maximize production.

- **Objective B: Trespass Livestock**

Unpermitted livestock, including feral horses, degrade rangeland without contributing to income.

Management Action:

- Promote fencing and cooperative grazing within RMUs to manage unauthorized livestock and optimize forage utilization.

- **Objective C: Uneven Grazing Patterns**

Overgrazing near water points and underutilization of distant rangelands limit productivity.

Management Action:

- Develop new water sources and implement rotational grazing systems to balance land use and promote vegetation recovery.

- **Objective D: Limited Water Infrastructure**

Insufficient and poorly maintained water systems restrict livestock production.

Management Action:

- The ATC will collaborate with agencies to develop reliable water infrastructure, including wells and pipelines, to support both livestock and wildlife.

- **Objective E: Lack of Farming Education and Assistance**

Farming and gardening opportunities are underutilized due to insufficient training and resources.

Management Action:

- The ATC will provide education and technical assistance for both outdoor and indoor farming initiatives, as detailed in Section 5 of this RMP.

- **Objective F: Absence of Value-Added Enterprises**

Limited opportunities for value-added processing and marketing restrict income potential.

Management Action:

- Establish a Food Hub at the ATC to support training, processing, and marketing of agricultural products, creating new revenue streams for LMD-1 producers.

4.2.3 Providing Education, Training, and Technical Assistance

Key Issue:

Many residents of LMD-1 lack the knowledge and resources to fully engage in ranching, farming, or gardening.

- **Objective: Establish an ATC**

Establish an ATC to serve as a central hub for collaboration, education, and technical support.

Management Actions:

- The ATC will serve as a dedicated facility for livestock and farming education, hosting workshops, demonstrations, and community roundtables.
- Experts from regional programs will provide ongoing training to enhance capacity and confidence among residents.
- The ATC will act as a liaison, streamlining interactions between ranchers, farmers, and various federal, Tribal, and non-governmental organization (NGO) programs.

4.2.4 Protecting Multiple Resource Values

Key Issue:

Rural housing sprawl and fragmented land use hinder effective rangeland management and conservation efforts.

- **Objective: Coordinate Development**

Coordinate efficient infrastructure planning for residential and agricultural land uses.

Management Actions:

- The ATC will maintain comprehensive maps of rangeland developments to guide housing and infrastructure planning.
- Encourage housing near existing utilities and highways to minimize road construction and preserve open rangelands for agricultural use.
- Promote large-scale RMUs to consolidate land use and facilitate the efficient implementation of BMPs.

4.3 Establishing Range Management Units (RMUs)

Effective range management begins with the establishment of defined RMUs to replace the current overlapping CUAs, which lack the structural integrity necessary for sustainable grazing (see Appendix A for details on establishment of RMUs). According to the guidelines contained within BIA's Standard Operations Procedures (SOP) manual, RMUs must have fenced boundaries and be sized to support at least 200 SUYL, equivalent to approximately 50 cows. This structure enables systematic management of livestock grazing through rest-rotation practices, either by controlling access to water sources or by rotating livestock between fenced pastures.

4.3.1 The Importance of RMUs

The absence of defined boundaries in CUAs poses significant challenges for calculating carrying capacity and implementing effective rangeland management practices. Overlapping land claims

and unrestricted grazing lead to uneven forage utilization, soil erosion, and degraded rangelands. Establishing RMUs allows for improved control and monitoring of livestock, ensuring that only authorized animals are present while promoting sustainable land use.

4.3.2 Collaboration for RMU Formation

To establish RMUs, neighboring permit holders must work together to consolidate land use and create contiguous areas that can be managed collectively. This collaborative approach enhances resource efficiency and facilitates the development of shared infrastructure, such as fencing and water systems.

4.3.3 Grazing Systems for RMUs

A basic RMU setup consists of three use pastures, each grazed for six months. This rotation allows each pasture to rest for one year out of every 18 months, promoting vegetation recovery and soil conservation. More advanced systems may include additional pastures, enabling longer rest periods and more flexible grazing schedules, which enhance both land conservation and livestock production.

An example of a six-pasture grazing rotation system used in the NNL is illustrated in the conceptual diagram below (Figure 7). This system includes:

- Four main pastures for rotational grazing by cattle,
- A smaller seasonal pasture for bull use, and
- A housing area pasture where small bands of sheep are herded daily.

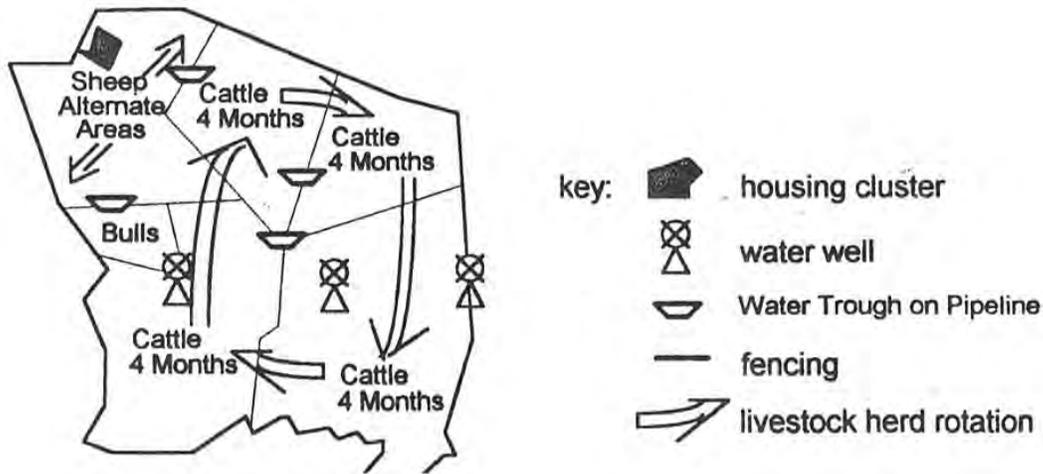
4.3.4 Benefits of RMUs

Establishing RMUs provides several key advantages:

- **Improved Forage Utilization:** Rest-rotation grazing ensures even use of available forage and prevents overgrazing around water sources.
- **Land Conservation:** Resting pastures allows vegetation to recover, reducing soil erosion and increasing ecological resilience.
- **Efficient Resource Use:** Shared water and fencing infrastructure enable cost-effective management and reduce labor demands.
- **Enhanced Livestock Production:** Healthier pastures lead to improved livestock weight gains and overall productivity.

By transitioning from the fragmented and overlapping CUA system to well-defined RMUs, LMD-1 can achieve the dual goals of sustainable land conservation and increased agricultural productivity. This alignment with AIARMA's objectives supports the long-term well-being of the community.

Figure 7. Example of a Six-Pasture Rotation Grazing System



Refer to **Appendix A** for an explanation of proposed steps for establishing RMUs on LMD-1 areas.

4.4 Developing Range Management Unit (RMU) Plans

This section outlines the policy and process for creating RMU Plans, in alignment with the guidelines in the SOP manual issued by the BIA Navajo Regional Office Division of Natural Resources (BIA SOP, 2024). This RMP includes both a list of details on establishing RMU Plans (Appendix A) and an RMP Plan Template (Appendix B). Rangeland resources within the Navajo Nation are managed through a hierarchy of units, including districts, subunits or grazing communities, CUAs, and RMUs.

All grazing permits are linked to a Conservation Plan as mandated by SOP Section 7.1. Permit holders initiate the process by completing a Permit Holder Questionnaire, which provides essential data about their operations. Agency staff then utilize this information to develop a more comprehensive Conservation Plan for BIA approval.

4.4.1 Options for Grazing Management

Permit holders can choose from two primary options for grazing management:

- 1. Customary Use Areas (CUAs):** CUAs are defined based on general geographic descriptions, landmarks, and neighboring CUAs. RMPs for CUAs include:
 - o Allowable SUYL (Sheep Units Yearlong) capacity as specified on permits;
 - o Tally counts, vegetation surveys, and grazing management practices;
 - o Descriptions of water lotting and herding strategies to manage livestock and provide rest for specific areas.
- 2. Range Management Units (RMUs):** RMUs are established through a fencing Navajo Nation application process, with boundaries determining acreage and carrying capacity. Rangeland Management plans for RMUs include:
 - o Permit-based SUYL capacity, tally counts, and vegetation surveys;

- Grazing management strategies for conservation rotation grazing;
- Collaborative management among permit holders, often through livestock associations, to implement BMPs such as water lotting and rotational grazing.

Existing fenced compartments within LMD-1 can serve as foundational areas for RMU development. Permit holders within these compartments are encouraged to form associations to facilitate shared conservation management.

4.4.2 Planning Resources and Templates

The **RMU Plan Template** provides a structured framework for comprehensive RMU management, integrating conservation and production goals (Appendix B). Additional resources include:

- *Living From Livestock* (Bingham, 1984), a Navajo-based book and workbook;
- *Holistic Resource Management Workbook* (Bingham and Savory, 1990), a practical guide for planning.

4.4.3 NRCS Nine-Step Planning Process

The U.S. Department of Agriculture’s Natural Resources Conservation Service (USDA NRCS) **Nine-Step Planning Process** is integral to professional range management planning for RMUs. This approach can be implemented for LMD-1 and will help ensure a systematic, stakeholder-driven process for sustainable rangeland management:

1. **Identify Problems and Opportunities:** Utilize issues identified in this RMP and through local stakeholder meetings.
2. **Determine Objectives:** Align objectives from this RMP with those of permit holders.
3. **Inventory Resources:** Collect and analyze information on the localized land base and permit holder operations, referencing the NRCS National Range and Pasture Handbook (2003).
4. **Analyze Resource Data:** Create user-friendly maps and data tables for collaborative planning.
5. **Formulate Alternatives:** Develop multiple approaches, prioritizing the establishment of RMUs to achieve conservation and production goals.
6. **Evaluate Alternatives:** Facilitate meetings with stakeholders to refine commitments and clarify roles.
7. **Make Decisions:** Identify leadership roles, finalize plan documents, and secure funding for infrastructure like water systems and fencing.
8. **Implement the Plan:** Engage stakeholders through ongoing meetings to prioritize BMPs, delegate responsibilities, and ensure timely execution.
9. **Evaluate and Adjust:** Establish a cyclical Feedback Loop—Plan, Act, Monitor, Control, and Replan. This includes monitoring livestock rotation, precipitation, forage growth, and utilization, as well as producing annual progress reports.

4.4.4 Benefits of RMU Planning

Developing RMU plans offers multiple benefits, including:

- Enhanced collaboration among permit holders and agencies,
- Improved management of carrying capacity and livestock rotation,
- Sustainable use of rangeland resources through BMP implementation, and
- A structured framework for adaptive management and continuous improvement.

By integrating these planning processes and tools, RMUs provide a pathway to achieving the conservation and production goals outlined in this RMP, fostering sustainable grazing practices that benefit both the land and its users.

4.5 Carrying Capacity and Stocking Rates Determination

Accurate information is critical to fairly issuing grazing permits and making informed decisions regarding annual livestock management. According to BIA's livestock permitting data, stocking rate for the 535 grazing permits for LMD-1 is 26,716 SUYL, or 5,343 AUYL cattle forage equivalent, which translate to 20.9 SUYL per section or 4.18 AUYL per section (Western Navajo Agency/Indian Affairs). This figure aligns with the conservative estimate of 20 SUYL per section or 4 AUYL per section expected in a 4–6-inch rainfall area, which is the guideline used by the Arizona State Land Department for ranch valuation purposes. It is important to note universities and agencies outside of the BIA Navajo Region use a conversion rate of one cow-calf AUYL equals four sheep-lamb SUYL.

Two vegetation surveys conducted in 2006 and 2012 cover the entire LMD-1 area (BIA Range Inventory Reports prepared by EcoSphere, 2012). These surveys reported a total carrying capacity of 6,503 SUYL, or 1.0 AU per section, which was subsequently adjusted down by 53% to 3,465 SUYL (0.54 AU per section) due to limitations such as lack of water and rough topography. This represents only 14% of the rainfall guideline and 30% of the 26,716 SUYL reported stocking rate by the BIA. A 2016 vegetation survey for the 138,000 acre/215-section Unit #2 around Tuba City faced similar challenges, showing 2.9 SUYL per section or 0.46 AU per section (with rainfall 117% of normal), which is only 16% of the 1941 adjudicated carrying capacity (Fred Phillips, 2016). A 2008 survey of a 202,000-acre area of LMD-3 Unit #2 around Tuba City and the southern portion of LMD-1 noted an average of 1.85 AUYL per section before adjustment for distance to water and topography (BIA Range Inventory Reports, prepared by Ecosphere, 2008; Fred Phillips, 2016).

At the current BIA-posted stocking rate of 26,716 SUYL, or 5,343 AUYL, each of the 535 grazing permits averages 50 SUYL, or 10 cows (at BIA's conversion of four sheep per cow). If the BIA were to reduce this by an average of 75% to align with the stocking rate reductions indicated by vegetation surveys, the average permittee would be allowed to run only 12 sheep or 2.5 cows on the range. The conclusion drawn from the production surveys, which indicates 4 to 10 times less forage production than expected, is that the studies should not be used for determining carrying capacity. This reinforces the recommendation from University of Arizona range management professors to avoid using forage production surveys to set carrying capacity, as annual sampling using small plots significantly underrepresents actual forage production.

Instead, the 25 CFR Part 167 grazing regulation should be followed, which specify reliance on traditional stocking methods, monitoring localized forage utilization, localized precipitation, and site-specific (or at least grazing compartment-specific) condition and trend studies.

4.6 Grazing Permit Issuance and Maintenance in Alignment with Conservation Plans

Effective grazing management requires permits to be issued based on accurately defined RMUs rather than undefined CUAs, which lack the specificity needed to calculate carrying capacity. The Agricultural Land Use Permit Process Flow Chart explains the permit issuance process (Figure 8). Future grazing permits should be tied to RMUs with defined boundaries to ensure compliance with conservation goals and sustainable rangeland use (Figure 4, Appendix E).

4.6.1 Permit Issuance Standards

To align with BMPs and conservation objectives, grazing permits must adhere to the following guidelines:

1. **Defined RMU Areas:** Permits will be issued based on RMU acreage, ensuring accurate carrying capacity calculations. This approach provides a foundation for monitoring and maintaining sustainable forage utilization.
2. **Minimum Stocking Base:** A baseline SUYL number will be established for each permit, with a minimum of 30 SUYL. This equates to approximately seven cattle, representing an academically determined forage equivalent to maintain rangeland health under average conditions.
3. **Rotational Grazing Integration:** Permittees will receive a percentage of the total RMU stocking rate, adjusted based on the type of rotational grazing system in place. This ensures equitable distribution of forage resources while optimizing land use efficiency.
4. **Collaborative Management:** Permittees will be required to participate in RMU management plans that involve cooperative herding and shared responsibilities for implementing BMPs. Group-based rotational grazing allows for efficient forage use and extended periods of pasture rest.

4.6.2 Permit Maintenance and Stipulations

The BIA SOP manual details specific requirements for maintaining and transferring permits, including:

- **Compliance with Conservation Plans:** Permittees must adhere to conservation guidelines outlined in RMU management plans, including stocking rates, rotational grazing schedules, and infrastructure maintenance.
- **Monitoring and Adjustments:** Stocking rates and grazing practices will be periodically reviewed based on forage availability, precipitation patterns, and utilization data to ensure compliance with conservation goals.

- **Transfer Protocols:** Permit transfers will be contingent on adherence to established conservation practices, ensuring that new permit holders continue to uphold RMU management objectives.

By transitioning to a system of permit issuance based on RMUs with defined boundaries and robust management plans, this approach ensures sustainable rangeland use, enhances forage availability, and promotes collaborative stewardship among permit holders (Figure 8).

4.7 Grazing and Farm Association Formation

Goal #2 of the FBFA IRMP states the importance of “encouraging grazing permit holders within Land Management Districts/Units to establish livestock associations or cooperatives to manage livestock.” Similarly, Goal #4 highlights the need to “ensure that all range unit (RU)¹ fencing complies with Navajo Grazing Regulations.” This RMP includes a Grazing and Farming Association Template (Appendix C). These goals, alongside the objective of forming a FBFA District Grazing Committee (BIA, 2021a), underscore the necessity of establishing collaborative structures to enhance grazing and farming practices within LMD-1.

This way forward involves fostering voluntary grazing associations on fenced RMUs through a collaborative democratic process. This model, promoted by range management professionals, is designed to align LMD-1 operations with the objectives of this RMP. The process is detailed in the BIA 54 IAM 1-H, Agricultural and Rangeland Handbook (BIA, 2021b).

4.7.1 Advantages of Grazing Associations

Most Tribal lands in Arizona and New Mexico already utilize grazing associations as a cornerstone of their range management strategies. Establishing such associations on LMD-1 would provide several key benefits:

- **Consolidation of Resources:** Combining multiple small grazing areas into a large RMU facilitates cost-effective implementation of water and fencing projects. These improvements, often supported by government assistance, lead to healthier livestock while reducing the time and effort required to manage animals across open ranges.
- **Enhanced Enforcement and Regulation:** RMU fencing enables clear identification of authorized users, streamlining the elimination of unauthorized or non-productive livestock. This reduces overgrazing and promotes more effective resource use.
- **Fair Distribution of Responsibilities:** Grazing associations allow each permit holder to contribute according to their capabilities. Elders can participate in ways that suit their abilities, while others can focus on hands-on management and operations, ensuring that livestock are well managed and productive.
- **Improved Livestock and Land Management:** Associations promote state-of-the-art livestock practices, including improved breeding programs, veterinary care, nutritional

¹ Historically, terminology used in BIA regulations and policy referred to Range Units (RUs); however, BIA Navajo Regional Office Division of Natural Resources adopted the use of Range Management Unit (RMU) instead (BIA SOP, 2024).

supplementation, and rotational grazing. These practices optimize forage utilization and contribute to healthier livestock while conserving rangeland resources.

- **Harmonized Leadership and Community Benefits:** Coordinated leadership within associations reduces disputes and fosters harmony among members. This collaborative approach increases income opportunities, supports a sustainable rural lifestyle, and provides access to training programs that enhance skills and ensure a brighter future for members and their families.

4.7.2 Structuring and Approval

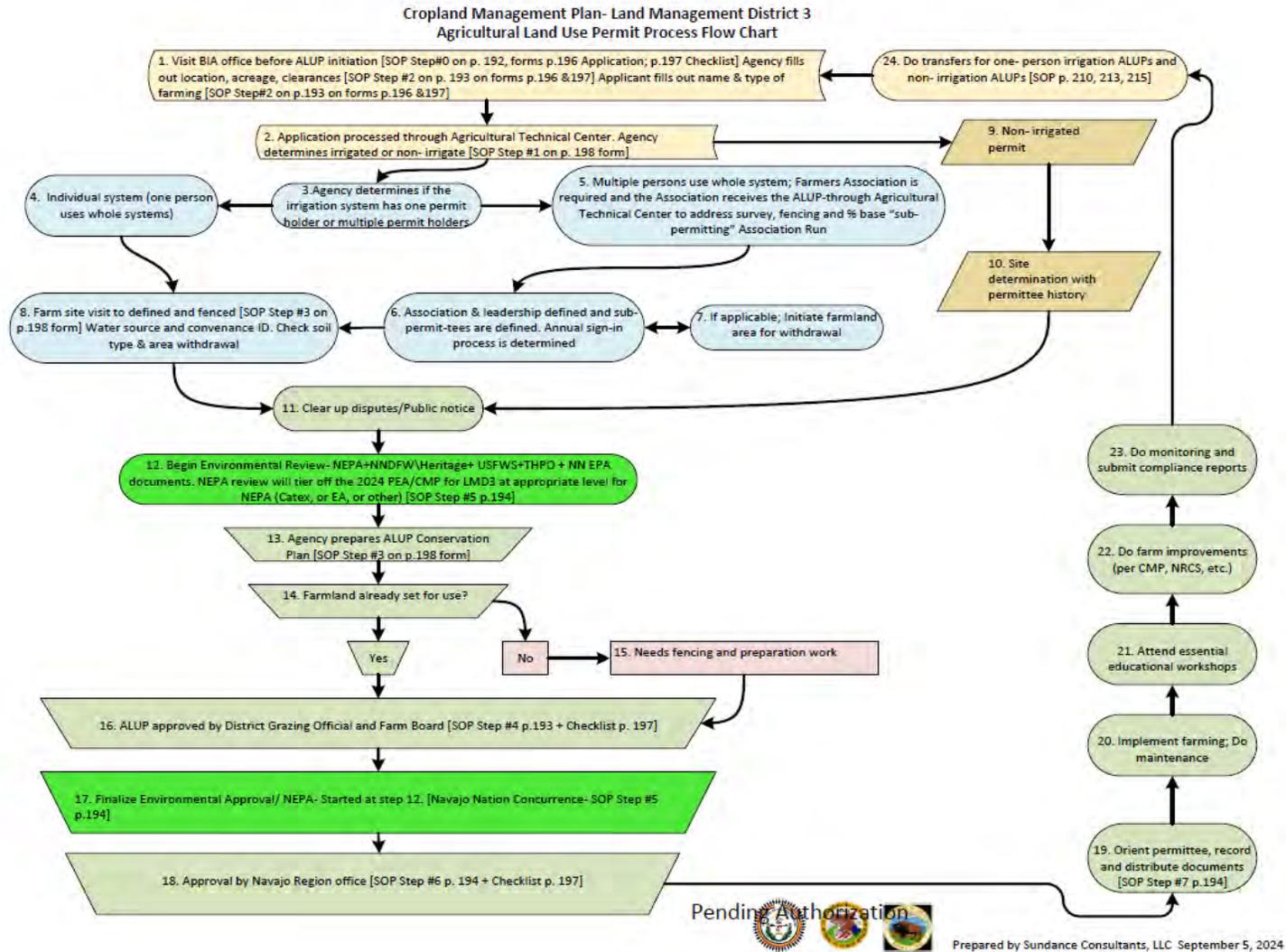
The Grazing Association Template provides a detailed, step-by-step process for structuring grazing associations and obtaining approval through the Navajo Nation Grazing Committee and the BIA (Appendix C). This template outlines governance structures, membership criteria, and operational procedures to ensure successful collaboration and compliance with existing regulations.

By forming grazing associations, stakeholders in LMD-1 can collectively achieve the production, conservation, and economic goals outlined in this RMP. These associations serve as a practical and equitable solution for modernizing grazing practices while preserving the cultural and ecological integrity of the land.

4.8 Farming Permit Agricultural Land Use Permits (ALUP) Issuance

Permits are required for farmland of 1 acre or more located outside of 1-acre homesite leases. ALUPs authorize either dry farmlands or irrigated farmlands. For procedures on obtaining ALUPs, refer to Chapter 9 of the BIA SOP (BIA SOP, 2024). The following flow chart shows how ALUPs will be issued, processed and monitored (Figure 8).

Figure 8. Agricultural Land Use Permit Process Flow Chart



4.9 Explanation of Education and Assistance Provision; Ranchers Roundtable

Adopting new practices necessitates that stakeholders understand the principles behind these changes and how collaborative efforts can facilitate progress. Education is vital for building trust, ensuring engagement, and achieving the goals of the RMP. While the process may be gradual, a structured approach to education will empower grazing permit holders and residents to implement BMPs effectively.

4.9.1 Education and Training Topics

Education initiatives should align with the objectives of the RMP and include training on topics such as:

- **Grazing Practices:** Rotational grazing systems, rangeland conservation, and forage management.
- **Livestock Production:** Best practices for breeding, nutrition, and animal care.
- **Maintenance and Infrastructure:** Water system repairs, fencing maintenance, and pasture improvements.
- **Business Practices:** Recordkeeping, financial planning, and marketing strategies.
- **Climate Change Adaptation:** Strategies for building resilience and mitigating impacts on rangelands.

Agency natural resource staff and invited experts can organize site-specific field training and workshops tailored to address local challenges and provide practical, hands-on solutions that stakeholders can readily apply.

4.9.2 Role of the Agricultural Technical Center (ATC)

The lead professional range conservationist at the ATC will serve as the central coordinator for educational initiatives. Responsibilities include:

- Outlining key educational topics necessary for effective planning and management,
- Collaborating with agency resource experts to provide comprehensive training to stakeholders, and
- Identifying and leveraging free and paid educational resources to maximize learning opportunities.

For example, the veterinary technicians from the Navajo Nation Department of Agriculture can conduct livestock care training, while University of Arizona Extension agents can deliver specialized agricultural education. These partnerships will enhance the quality and breadth of training available to stakeholders in LMD-1.

4.9.3 Ranchers Roundtable

A Ranchers Roundtable should be established to serve as a recurring forum for education, collaboration, and discussion. Meetings can be held monthly or quarterly at the ATC or other locations convenient for ranchers. Drawing inspiration from the successful NNL Roundtable, the agenda may cover a wide range of topics, such as the following:

- Livestock grazing planning and handling techniques.
- Livestock health and selection strategies.
- Marketing and business practices for improved profitability.
- Association formation and leadership development.
- Project design, implementation, and maintenance.
- Rangeland monitoring techniques and conservation strategies.

The roundtable will foster peer-to-peer learning, provide a platform for addressing concerns, and build a sense of community among stakeholders. By encouraging active participation and collaboration, the Ranchers Roundtable will ensure that education efforts translate into actionable outcomes that benefit the land, livestock, and communities of LMD-1.

4.10 Explanation of Monitoring Feedback Loop and Reporting

Effective production and conservation planning require an integrated monitoring feedback loop to ensure the success of land management efforts. This RMP includes a Monitoring Program Template (Appendix D). This cyclical process involves five key stages: Planning, Action, Monitoring, Controlling, and Replanning. Each stage is critical to adapting to dynamic conditions and ensuring the long-term sustainability of rangeland resources. Monitoring strategies will include a mix of existing monitoring techniques, such as exclosures (Figure 9), and innovative methods (Figure D2). Transparent and timely reporting ensures all stakeholders remain informed and engaged throughout the process.

Figure 9. Example of Existing Rangeland Monitoring Cage



4.10.1 Monitoring Feedback Loop

1. **Planning:** Initial planning establishes clear objectives, benchmarks, and actions to achieve production and conservation goals. Plans should be collaboratively developed with input from land users, agency staff, and other stakeholders to reflect shared priorities and realistic implementation strategies.
2. **Action:** Plan elements are implemented through coordinated efforts, including the deployment of BMPs, development of infrastructure, and application of conservation practices. These actions are tailored to address immediate and long-term needs for resource management.
3. **Monitoring:** Regular and systematic assessments of production outcomes and land resources are conducted to evaluate progress. Monitoring focuses on key indicators, such as the following:
 - Forage utilization and rangeland health.
 - Livestock production metrics (e.g., calving rates, herd health).
 - Precipitation levels and soil moisture.
 - Infrastructure performance (e.g., water systems, fencing conditions).
 - Wildlife population dynamics and habitat use.

4. **Controlling:** Immediate corrective actions are taken to address deviations from the plan caused by weather, unforeseen challenges, or other disruptions. This step ensures that efforts remain aligned with established goals, minimizing the impact of adverse events.
5. **Replanning:** At the end of each seasonal or annual cycle, the plan is revisited and adjusted based on monitoring results. This stage incorporates lessons learned, updates resource conditions and refines strategies to enhance future outcomes.

4.10.2 Reporting and Stakeholder Engagement

Transparent reporting is essential for fostering accountability, collaboration, and trust among stakeholders. At least once per year, detailed reports should be prepared and shared with all relevant parties, including land users, agency representatives, and community members. Reports should highlight the following:

- Goal accomplishments and progress metrics.
- Resource condition trends and changes.
- Adjustments made to plans and their rationale.
- Recommendations for the next planning cycle.

4.10.3 Tools and Resources

Appendix D provides a comprehensive overview of monitoring strategies and includes standardized forms and templates to streamline data collection and reporting. These tools have been refined for efficiency and practicality, ensuring that monitoring efforts are both effective and manageable for field staff and land users.

By integrating this monitoring feedback loop into the RMP, LMD-1 can adapt to changing conditions, improve resource stewardship, and achieve sustainable production goals. This process ensures that stakeholders remain informed, engaged, and empowered to collaborate in the management of shared resources.

4.11 How Project Needs are Determined, Installed, and Maintained

The successful implementation of this RMP depends on addressing critical infrastructure and restoration needs, including water development, fencing for grazing control, livestock handling facilities, road access and controls, and rangeland restoration projects. These efforts are fundamental to achieving sustainable land management and production goals.

4.11.1 Water Development for Forage Access

Rest-rotation grazing, a cornerstone of range conservation, requires a reliable and strategically located water supply. Centralized water sources should be situated in areas with optimal forage, with pastures radiating outward to facilitate livestock movement and rotational grazing. Reliable water systems reduce labor by minimizing herding requirements and allows water to be turned off as needed to enforce rest periods for vegetation recovery.

Infrastructure needs include large water storage tanks capable of holding 10,000 to 30,000 gallons to sustain herds during periods of pump failure or repairs. Buried pipelines extending a

mile or more from wells can improve livestock distribution, offering greater flexibility in pasture rotation, and reducing localized overgrazing near water points.

Groundwater scarcity is a persistent challenge across LMD-1, requiring long-term solutions such as large-diameter pipelines. These systems can transport potable water to strategically located troughs, reducing the need for storage and ensuring equitable access across rangelands. By aligning these pipelines with highways, both livestock and domestic needs can be met while promoting safer, more centralized housing near utilities. This forward-thinking strategy supports better land use, reduces vehicle conflicts on rangelands, and improves resilience to climate change.

4.11.2 Fencing for Conservation

Fencing is a critical tool for effective conservation and livestock management. By containing herds within designated pastures, fences simplify breeding, calving, and grazing rotations while deterring feral horses and unauthorized livestock. Wildlife-friendly fence designs, such as those with smooth bottom wires and 16-inch ground clearance, enable wildlife like pronghorn to move freely, promoting ecological balance and biodiversity.

4.11.3 Livestock Handling Facilities for Efficiency

Centralized livestock handling facilities within RMUs eliminate the need for individual working corrals, enabling ranchers to share resources and reduce costs. Facilities designed for humane and efficient livestock handling, such as Temple Grandin-style corrals, streamline essential tasks like branding, tagging, veterinary care, and culling. These labor-saving designs enhance herd management, improve profitability, and ensure welfare of the animals.

4.11.4 Roads and Cattleguards for Access Control

With RMUs encompassing larger fenced areas, permit holders can collectively decide to limit vehicle traffic on rangelands. Strategic planning encourages the placement of new homes near highways and utilities, thereby reducing road expansion and associated land degradation. Fenced homes and gardens protect against livestock intrusion, while cattleguards control access to sensitive areas, preserving the integrity of grazing lands.

4.11.5 Rangeland Restoration Practices

Biologically planned pulse rotation grazing naturally supports land restoration by promoting vegetation regrowth and soil stabilization, reducing the need for costly mechanical interventions. Where additional restoration is necessary, techniques such as erosion control structures, mechanical land shaping, and strategic reseeding can complement grazing management efforts.

Pulse grazing can also be used to stimulate new plantings, allowing vegetation to recover fully before being reintroduced to grazing. Comprehensive watershed-scale projects, such as those demonstrated in the BIA WNA Tsegi and Nitsin Canyon Grazing Management Plan and EA (BIA WNA, 2018), can enhance water cycles, improve soil retention, and restore habitats. These initiatives bolster the ecological and productive capacity of the land, fostering long-term sustainability.

Chapter 5.0 - HOME SCALE GARDEN BMPs

Home-scale gardening presents an opportunity for residents of LMD-1 to engage in sustainable food production, enhancing household food security, nutrition, and resilience. While grazing and large-scale agriculture are central to the district's economy, home gardening empowers families to actively contribute to their well-being and fosters stronger connections to the land. The RMP supports these efforts by providing guidance, resources, and technical assistance for diverse gardening practices.

5.1 Indoor Gardening

Indoor gardening allows for year-round cultivation of vegetables, herbs, and other crops within homes, utilizing minimal space and resources. Residents can employ simple soil-based systems, such as pots and planters, or adopt innovative water-based methods like hydroponics, aeroponics, or aquaponics. These approaches maximize productivity and resource efficiency, particularly in water-scarce regions. LED grow lights and compact systems make indoor gardening accessible for households with limited natural light.

5.2 Outdoor Gardening

Outdoor home gardening enhances community engagement with food production, offering options for growing vegetables, fruits, and native crops. Raised beds, container gardens, and dryland plots allow for tailored approaches to local conditions. Innovative methods such as lasagna gardening, keyhole gardens, and wicking beds improve soil quality and water efficiency. Structures like cold frames and greenhouses extend the growing season, ensuring year-round access to fresh produce.

5.3 Community and Educational Initiatives

School and community gardens provide valuable opportunities to teach sustainable food production practices and foster collaboration among residents. These shared spaces are particularly beneficial for youth education, offering hands-on learning experiences that promote lifelong skills in gardening and healthy food preparation. Community-led initiatives also strengthen social ties and cultural connections to the land.

5.4 Supporting Home-Scale Gardening

The ATC plays a critical role in facilitating home gardening success across LMD-1. By offering training, distributing seeds and materials, and providing technical expertise, the ATC empowers residents to implement effective gardening practices. These efforts align with the RMP's broader goals of improving resource management, fostering resilience, and enhancing community well-being.

Home-scale gardening is an integral component of LMD-1's agricultural strategy, complementing grazing and large-scale agriculture to create a more diverse and sustainable food system. By supporting innovative, resource-efficient practices, the RMP ensures that all residents can actively participate in building a resilient future for themselves and their communities.

Chapter 6.0 - AGRICULTURAL BEST MANAGEMENT PRACTICES

To implement this RMP, the BIA and Navajo Nation program managers will coordinate in establishing a local ATC aimed at achieving the objectives of AIARMA. The concept of the Navajo Nation ATC is supported by the precedent set by in the New Land's Range Office established in 1988 on the 352,000-acre Navajo New Lands by the Office of Navajo and Hopi Indian Relocation (ONHIR). This office worked closely with grazing permittees relocating from Hopi Partitioned Lands to the New Lands. One of the BRIC LLC contractors has firsthand experience with the New Lands Range Office and believes it serves as a cost-effective model for LMD-3 and LMD-1 (BRIC, former U.S. Department of the Interior employee, Lowe, Personal Notes).

The effectiveness of the Range Office stemmed from its own standalone office and yard, staffed by credentialed and experienced professionals for 25 years until the retirement of its last Conservationist. During its operation, the office efficiently:

- 1) Conducted comprehensive inventory and mapping of all agricultural lands.
- 2) Developed regulations, policies, conservation plans and procedures for effective management of all acreage through extensive engagement with agriculture permittees.
- 3) Oversaw the construction and maintenance of numerous land improvements.
- 4) Facilitated workshops, newsletters, and site-specific trainings to educate ranchers and farmers on BMPs.
- 5) Engaged in continuous monitoring, reporting, and collaboration with stakeholders to ensure both production and conservation goals were met.

These tasks align well with the objectives and outcomes stipulated by AIARMA for LMD-1.

The Navajo Nation's Navajo-Hopi Land Commission (NHLC) has had oversight of New Lands, similar to its role in FBFA planning, including the FBFA IRMP and Navajo Thaw program. As one of the nine chapters involved in Navajo Thaw planning, the NHLC could support a similar concept for the FBFA to achieve the high level of land management seen on Navajo New Lands. Like the New Lands Range Office, the ATC will require full-time certified range manager and extension experts authorized to assist the farmer and rancher associations in LMD-3 and LMD-1. This ATC program represents a new strategy not currently provided by any agency, specifically designed to build capacity by engaging staff who will work closely with local associations and individual ranchers and farmers. Their focus will be on developing all AIARMA objectives through consultation, education, equipment assistance, and ensuring the establishment and functionality of water systems across rangeland areas.

A crucial element for success is the participation of all ranchers and farmers in their local Agricultural Associations, where local leadership will play a vital role in ensuring work and development proceeds according to schedule. While the LMD-3 and LMD-1 ATC will require significant investment, it will ultimately be the most cost-effective means of achieving the AIARMA objectives. The ATC will also serve as an ideal location for greenhouses and demonstration gardens for training farmers as well as producing seed sets and heirloom seeds, as outlined in Section 4.4.1.1 of the FBFA IRMP. Establishing a Food Hub at the ATC location will promote the following:

- 1) Value-added preparation and branding of bulk foods produced by ranchers and farmers.
- 2) A Farmers Market on-site for individual farmers to collaborate on marketing to the public.
- 3) Assistance with the formation and operation of a Marketing Cooperative to optimize marketing effect.

Agencies such as NRCS, University Extension, and the Navajo Nation Agriculture Department, among others, will readily collaborate to leverage educational and technical assistance needs, using the ATC and Food Hub as a base.

During the development stages of this RMP, the contractor with BIA and professional staff from multiple agencies agreed that BMPs utilized across various agencies should be included in long-term plans like this RMP (Table 1, Table 2). BMPs are a Management Action directive of the FBFA IRMP Section 5.2, which states, “Evaluate soil properties and determine best management practices and functions based on NRCS Ecological Site Descriptions” (Figure 7). Ecological Site IDs for specific sites are publicly available online through the Soil Data Explorer tab of the NRCS Web Soil Survey. These practices are rooted in a holistic approach to farming that enhances the quality of life of food producers and consumers through sustainable production methods, fostering a productive and stable landscape resource base. While these practices are essential for sustaining large ranch and farm operations, they should also be considered for home and community-scale applications. Tribes can also develop their own field guides for best practices.

6.1 Land Planning Best Management Practices

- **Model Integrated Goal Planning:** Implement a feedback loop of “Vision; Plan; Actions; Monitoring; Control; Replan.” All stakeholders should work towards these RMP goals:
 - 1) Applying BMPs.
 - 2) Achieving resources conservation in the face of climate change.
 - 3) Enhancing livestock production.
- **Follow Grazing Regulations:** For LMD-1, adhere to 25 CFR Part 167 and the FBFA IRMP (BIA, 2021a) as it pertains to grazing permit holders collaborating with the District Grazing Committee to establish RMUs.
- **Employ Range Management Professionals:** These professionals should closely follow their training protocol with all stakeholders to plan rotational grazing, conduct monitoring, build and maintain rangeland improvements, and provide education to ranchers and producers. A clear supervisory structure, including roles for all agency staff, should be outlined by BIA to align the responsibilities in the Navajo Grazing Regulations.
- **Structure Range Management Units:** These units will serve as the foundation for conservation and production planning. For LMD-1, neighboring permit holders should voluntarily form Grazing Associations to define large RMU land units, which can then be established with the District Grazing Committee.

- **Develop RMU plans with Permit Holders:** These plans will guide all management activities, including multiple use needs (wildlife, firewood, soils, etc.). Note: RMU plans (see Attachment #2) are more detailed than the Conservation Plans outlined in BIA's SOP, providing clearer direction on daily management.
- **Incentives for Permit holders:** Compliance with plans will enhance livestock production, rewarding permit holders for their conservation practices. Options may include temporary permit increases or association permits to utilize additional available forage.
- **Leadership Selection:** Permit holders should choose leaders to facilitate meetings and manage livestock. This can be achieved through regular permit holder meetings, appointing range bosses for daily management, or maintaining a grazing association that outlines permit holder responsibilities.
- **Design RMUs to Minimize Sprawl:** Large RMUs should encourage new housing to be clustered near highways and utilities, which is a significant factor in climate adaptation, requiring less energy and resources use.
- **Regular Coordination Meetings:** Permit holders and government staff should meet regularly to coordinate and assess progress.
- **Divide RMUs into Pastures:** RMUs should be divided into five or more pastures for rest-rotational grazing.
- **Active Monitoring of Rotational Grazing:** Biologically planned rotation grazing should be actively monitored.
- **Herd Management:** Permit holder livestock should be managed as a single herd to optimize forage impact and rest.
- **Efficient Nutrition and Health Management:** Livestock nutrition and supplementation should be efficient, and health and vaccination practices should be effective.
- **High Breeding Rates:** Livestock breeding rates and calf/lamb crops should be maximized.
- **Effective Handling Practices:** Livestock handling, branding, and marking should be well-managed.
- **Optimal Revenue Generation:** Revenues from livestock should be maximized through effective marketing practices.
- **Controlled Firewood Cutting:** Firewood cutting should be planned and controlled to prevent land damage.

6.2 Monitoring BMPs

- **Forage Utilization Monitoring:** Conduct monitoring of forage utilization after livestock pasture moves, at least during the fall, and share information with permit holders.
- **Rangeland Base Inventory Maintenance:** Complete and maintain a base inventory using Ecological Site Descriptions (ESDs) and kept on file.

- **Precipitation Monitoring:** Monitor several precipitation gauges at least every four months.
- **Rangeland Health Condition Monitoring:** Conduct monitoring of rangeland health conditions and trends in key areas every few years.
- **Livestock Counts:** Conduct livestock counts in spring and fall.
- **Annual Reporting:** Share an annual fall report reflecting compliance and progress with permit holders.
- **Control of Feral Livestock:** Ensure there are no feral horses or trespass livestock on range management units.
- **Wildlife Health Monitoring:** Monitor the health of wildlife herds (deer, antelope).

6.3 Range Improvement BMPs

- **Water Infrastructure Maintenance:** Ensure water infrastructure is in place and maintained to support rotational use of pastures.
- **Boundary and Pasture Fence Maintenance:** Maintain RMU boundaries and pasture fences.
- **Access Control:** Ensure roads and gates have effective access controls to prevent land and property damage.
- **Efficient Handling Facilities:** Design corrals and handling facilities for low-labor efficiency.
- **Noxious/Invasive Weed Control:** Control noxious weeds in accordance with the 2021 Navajo Nation Integrated Weed Management Plan (BIA, 2021c). Website: <https://www.bia.gov/regional-offices/navajo/navajo-nation-integrated-weed-management-plan>

6.4 Education BMPs

- **Conservation Education:** Provide education on conservation and livestock care at most meetings.
- **Rotating Education Sessions:** Rotate education sessions for all permit holders and other stakeholders to attend.
- **Dedicated Office for Agriculture:** Establish a dedicated office for rangeland and agriculture-oriented business to enhance communication, education, and process work with producers.
- **Accreditation Programs:** Implement an accreditation program (such as a Ranchers Roundtable or college extension) to promote essential skills in agriculture.

6.5 Farming BMPs

The USDA NRCS office provides guidance for BMPs tailored to local resources and conditions. The following BMPs are adapted from the 2013 Wyoming Department of Environmental Quality (DEQ) Cropland Best Management Practice Manual (Wyoming, 2013):

- **Cooperative Farming:** Utilize cooperative/association farming options for planning, labor, and machinery sharing.
- **Develop ALUP plans:** Create ALUPs based on Agriculture Associations and their water systems. Complete a Plan of Operations to include sections that address Organization and Leadership, Partnerships and Collaborations, Market Analysis and Marketing, Cash Flow, Funding Sources and Use, Ecological and Financial Sustainability, and Monitoring of Goals.
- **Site Mapping:** Develop a favorable ranch or farm site map, excluding incompatible areas such as urbanized zones, contaminated sites (uranium or arsenic contamination, sewer pond), steep or erosive land, and unsuitable soils (dunes, clays, saline soils, etc.). Refer to the FBFA IRMP PEA for guidelines on abandoned mine lands buffer zone.
- **Field Location Considerations:** Locate ranch, garden and farm fields for legal and practical access, protection/fencing, optimum sunlight, gravity water, good drainage, minimum erosion, and efficient equipment usage.
- **Geomorphological Site Selection:** Conduct a geomorphological site selection process (aspect, slope, drainage) and include soil testing (structure, texture, organic matter, fertility, and chemistry balance). Utilize Web Soil Survey information and management recommendations (per FBFA IRMP Section 5.2, Action #20).
- **Water System Assessment:** Assess and map potential water systems, including flood water, pond water, shallow alluvium water, spring water, and horizontal drill options for gravity-fed water. List quality criteria, quantity limits, affordability, and legal access. Calculate benefit-cost ratios for significant projects.
- **Vandalism Prevention Plan:** Develop and implement a vandalism prevention plan, including strategies for trash and waste removal.
- **Irrigation Planning:** Pre-irrigate and stagger planting of corn and other crops to align water projected water delivery.
- **Riparian Buffer Mapping:** Map riparian buffers for all irrigation systems and mark them on-site.
- **Wildlife Habitat Consideration:** Incorporate wildlife habitat consideration into appropriate plans.
- **Irrigation Efficiency Technology:** Apply technology to improve pipeline and irrigation efficiency, including gated pipe, drip, surge, and micro-irrigation, as well as land leveling.
- **Soil Conservation Practices:** Implement contour farming, terracing, and runoff control measures.
- **Water Diversion Structures:** Construct water diversion structures for farm protection and rainwater harvesting.
- **Crop Management Techniques:** Practice strip cropping, intercropping, and planting windbreak trees.

- **No-Till Practices:** Utilize no-till (carbon-saving regenerative agriculture) methods over traditional tilling for planting and soil management, reducing fossil fuel dependency and water use.
- **Cover Cropping:** Implement off-season cover cropping to enhance soil health, fertility, and water retention.
- **Soil Amendments:** Use mulching, composting, and soil amendments in conjunction with no-till methods.
- **Innovative Composting:** Explore creative composting methods, including new materials and preparation techniques.
- **Nutrient Management:** Consider nutrient management and non-chemical fertilizer options.
- **Conservation Crop Rotation:** Practice conservation crop rotation to enhance soil quality.
- **Silt and Salt Mitigation:** Address silt and salt build up through appropriate management practices.
- **Crop Residue Management:** Manage crop residue effectively, including beneficial use of grazing animals and manure.
- **Smart Weed Management:** Implement smart weed management strategies, considering cover crops and roller crimping. Refer to BIA's Navajo Nation Integrated Weed Management Plan and FPEIS guidelines (BIA, 2021c).
- **Creative Pest Management:** Explore innovative pest management methods, prioritizing non-chemical options.
- **Monitoring and Data Sharing:** Regularly monitor land, crops, and goals, sharing schedules, data and findings with stakeholders.
- **Seed Procurement:** Encourage smart seed procurement, such as sourcing heirloom seeds, planting, and saving; utilize seed banks and exchanges.
- **Machinery Sharing:** Use appropriate tools and machinery sharing to reduce costs; time planting and harvesting to optimize machinery use and expenses.
- **Water System Engineering Standards:** Improve engineering and installation standards for water systems:
 - **Proper Engineering:** Conduct field inspection of both old and new waterlines to ensure minimal maintenance and avoid early systems failures, which can lead to reduced ranch or crop production.
 - **Insulation Practices:** When properly designed and installed, no insulation should be used, as soil provides the best and most reliable insulation. The recommendations in Table 2 have been proven effective on the 62 well and pipeline systems on Navajo New Lands, resulting in high performance and very low maintenance. Although initial installation costs may be slightly higher, they are offset due to low deferred maintenance needs and increased crop production over many years of use.

Table 1. Best Management Practices by Resource Area

BMP Resource Area	BMP Category	BMP	BMP Description
Enforcement	Monitoring BMPs	Control of Feral Livestock	Ensure there are no feral horses or trespass livestock on RMUs.
Enforcement	Range Improvement BMPs	Boundary and Pasture Fence Maintenance	Maintain range management unit boundaries and pasture fences.
Enforcement	Range Improvement BMPs	Access Control	Ensure roads and gates have effective access controls to prevent land and property damage.
Enforcement	Farming BMPs	Vandalism Prevention Plan	Develop and implement a vandalism prevention plan, including strategies for trash and waste removal.
Fire and Fuel	Land Planning BMPs	Controlled Firewood Cutting	Firewood cutting should be planned and controlled to prevent land damage.
Forage and Rangeland	Monitoring BMPs	Forage Utilization Monitoring	Conduct monitoring of forage utilization after livestock pasture moves, at least during the fall, and share information with permit holders.
Forage and Rangeland	Monitoring BMPs	Rangeland Base Inventory Maintenance	Complete and maintain a base inventory using ESDs and kept on file.
Forage and Rangeland	Monitoring BMPs	Rangeland Health Condition Monitoring	Conduct monitoring of rangeland health conditions and trends in key areas every few years.
Forage and Rangeland	Range Improvement BMPs	Noxious/Invasive Weed Control	Control noxious weeds in accordance with the 2021 Navajo Nation Integrated Weed Management Plan (BIA, 2021c). Website: https://www.bia.gov/regional-offices/navajo/navajo-nation-integrated-weed-management-plan
Livestock	Land Planning BMPs	Optimal Revenue Generation	Revenues from livestock should be maximized through effective marketing practices.
Livestock	Land Planning BMPs	Efficient Nutrition and Health Management	Livestock nutrition and supplementation should be efficient, and health and vaccination practices should be effective.
Livestock	Land Planning BMPs	High Breeding Rates	Livestock breeding rates and calf/lamb crops should be maximized.

BMP Resource Area	BMP Category	BMP	BMP Description
Livestock	Land Planning BMPs	Effective Handling Practices	Livestock handling, branding, and marking should be well-managed.
Livestock	Monitoring BMPs	Livestock Counts	Conduct livestock counts in spring and fall.
Management and Regulation	Land Planning BMPs	Model Integrated Goal Planning:	Implement a feedback loop of “Vision; Plan; Actions; Monitoring; Control; Replan.” All stakeholders should work towards the RMP goals of: 1) Applying BMPs. 2) Achieving resources conservation in the face of climate change. 3) Enhancing livestock production.
Management and Regulation	Land Planning BMPs	Follow Grazing Regulations	For LMD-1, adhere to 25CFR Part 167 and the FBFA IRMP (BIA, 2021a) as it pertains to grazing permit holders collaborating with the District Grazing Committee to establish range management units.
Management and Regulation	Land Planning BMPs	Employ Range Management Professionals	These professionals should closely follow their training protocol with all stakeholders to plan rotational grazing, conduct monitoring, build and maintain rangeland improvements, and provide education to ranchers and producers. A clear supervisory structure, including roles for all agency staff, should be outlined by BIA to align the responsibilities in the Navajo Grazing Regulations.
Management and Regulation	Land Planning BMPs	Structure Range Management Units	These units will serve as the foundation for conservation and production planning. For LMD-1, neighboring permit holders should voluntarily form Grazing Associations to define large RMU land units, which can then be established with the District Grazing Committee.
Management and Regulation	Land Planning BMPs	Develop RMU plans with Permit Holders	These plans will guide all management activities, including resources needed for multiple uses (wildlife, firewood, soils, etc.). Note: RMU plans (see Attachment #2) are more detailed than the Conservation Plans outlined in BIA’s SOP, providing clearer direction on daily management.

BMP Resource Area	BMP Category	BMP	BMP Description
Management and Regulation	Land Planning BMPs	Incentives for Permit holders	Compliance with Plans will enhance livestock production, rewarding permit holders for their conservation practices. Options may include temporary permit increases or association permits to utilize additional available forage.
Management and Regulation	Land Planning BMPs	Leadership Selection	Permit holders should choose leaders to facilitate meetings and manage livestock. This can be achieved through regular permit holder meetings, appointing range bosses for daily management, or maintaining a grazing association that outlines permit holder responsibilities.
Management and Regulation	Land Planning BMPs	Design RMUs to Minimize Sprawl	Large RMUs should encourage new housing to be clustered near highways and utilities, which is a significant factor in climate adaptation, requiring less energy and resources use.
Management and Regulation	Land Planning BMPs	Regular Coordination Meetings	Permit holders and government staff should meet regularly to coordinate and assess progress.
Management and Regulation	Monitoring BMPs	Annual Reporting	Share an annual fall report reflecting compliance and progress with permit holders.
Management and Regulation	Range Improvement BMPs	Efficient Handling Facilities	Design corrals and handling facilities for low-labor efficiency.
Management and Regulation	Educational BMPs	Conservation Education	Provide education on conservation and livestock care at most meetings.
Management and Regulation	Educational BMPs	Rotating Education Sessions	Rotate education sessions for all permit holders and other stakeholders to attend.
Management and Regulation	Educational BMPs	Dedicated Office for Agriculture	Establish a dedicated office for rangeland and agriculture-oriented business to enhance communication, education, and process work with producers.
Management and Regulation	Educational BMPs	Accreditation Programs	Implement an accreditation program (such as a Ranchers Roundtable or college extension) to promote essential skills in agriculture.

BMP Resource Area	BMP Category	BMP	BMP Description
Management and Regulation	Farming BMPs	Develop ALUP plans	Create ALUPs based on Agriculture Associations and their water systems. Complete a Plan of Operations to include sections that address Organization and Leadership, Partnerships and Collaborations, Market Analysis and Marketing, Cash Flow, Funding Sources and Use, Ecological and Financial Sustainability and Monitoring of Goals.
Management and Regulation	Farming BMPs	Site Mapping	Develop a favorable ranch or farm site map, excluding incompatible areas such as urbanized zones, contaminated sites (uranium or arsenic contamination, sewer pond), steep or erosive land, and unsuitable soils (dunes, clays, saline soils, etc.). Refer to FBFA IRMP PEA for guidelines on abandoned mine lands buffer zone.
Management and Regulation	Farming BMPs	Monitoring and Data Sharing	Regularly monitor land, crops, and goals, sharing schedules, data and findings with stakeholders.
Soil	Farming BMPs	Geomorphological Site Selection	Conduct a geomorphological site selection process (aspect, slope, drainage) and include soil testing (structure, texture, organic matter, fertility, and chemistry balance). Utilize Web Soil Survey information and management recommendations (per FBFA IRMP Section 5.2, Action #20).
Soil	Farming BMPs	Soil Conservation Practices	Implement contour farming, terracing, and runoff control measures.
Soil	Farming BMPs	Crop Management Techniques	Practice strip cropping, intercropping, and planting windbreak trees.
Soil	Farming BMPs	No-Till Practices	Utilize no-till (carbon-saving regenerative agriculture) methods over traditional tilling for planting and soil management, reducing fossil fuel dependency and water use.
Soil	Farming BMPs	Cover Cropping	Implement off-season cover cropping to enhance soil health, fertility, and water retention.

BMP Resource Area	BMP Category	BMP	BMP Description
Soil	Farming BMPs	Soil Amendments	Use mulching, composting, and soil amendments in conjunction with no-till methods.
Soil	Farming BMPs	Innovative Composting	Explore creative composting methods, including new materials and preparation techniques.
Soil	Farming BMPs	Nutrient Management	Consider nutrient management and non-chemical fertilizer options.
Soil	Farming BMPs	Conservation Crop Rotation	Practice conservation crop rotation to enhance soil quality.
Soil	Farming BMPs	Silt and Salt Mitigation	Address silt and salt build up through appropriate management practices.
Soil	Farming BMPs	Crop Residue Management	Manage crop residue effectively, including beneficial use of grazing animals and manure.
Sustainable Practices	Land Planning BMPs	Divide RMUs into Pastures	RMUs should be divided into five or more pastures for rest-rotational grazing.
Sustainable Practices	Land Planning BMPs	Active Monitoring of Rotational Grazing	Biologically planned rotation grazing should be actively monitored.
Sustainable Practices	Land Planning BMPs	Herd Management	Permit holder livestock should be managed as a single herd to optimize forage impact and rest.
Sustainable Practices	Farming BMPs	Cooperative Farming	Utilize cooperative/association farming options for planning, labor, and machinery sharing.
Sustainable Practices	Farming BMPs	Field Location Considerations	Locate ranch, garden and farm fields for legal and practical access, protection/fencing, optimum sunlight, gravity water, good drainage, minimum erosion, and efficient equipment usage.
Sustainable Practices	Farming BMPs	Smart Weed Management	Implement smart weed management strategies, considering cover crops and roller crimping. Refer to BIA's Navajo Nation Integrated Weed Management Plan and FPEIS guidelines (BIA, 2021c).
Sustainable Practices	Farming BMPs	Creative Pest Management	Explore innovative pest management methods, prioritizing non-chemical options.

BMP Resource Area	BMP Category	BMP	BMP Description
Sustainable Practices	Farming BMPs	Seed Procurement	Encourage smart seed procurement, such as sourcing heirloom seeds, planting, and saving; utilize seed banks and exchanges.
Sustainable Practices	Farming BMPs	Machinery Sharing	Use appropriate tools and machinery sharing to reduce costs; time planting and harvesting to optimize machinery use and expenses.
Water	Monitoring BMPs	Precipitation Monitoring	Monitor several precipitation gauges at least every four months.
Water	Range Improvement BMPs	Water Infrastructure Maintenance	Ensure water infrastructure is in place and maintained to support rotational use of pastures.
Water	Farming BMPs	Water System Assessment	Assess and map potential water systems, including flood water, pond water, shallow alluvium water, spring water, and horizontal drill options for gravity-fed water. List quality criteria, quantity limits, affordability, and legal access. Calculate benefit-cost ratios for significant projects.
Water	Farming BMPs	Irrigation Planning	Pre-irrigate and stagger planting of corn and other crops to align water projected water delivery.
Water	Farming BMPs	Riparian Buffer Mapping	Map riparian buffers for all irrigation systems and mark them on-site.
Water	Farming BMPs	Irrigation Efficiency Technology	Apply technology to improve pipeline and irrigation efficiency, including gated pipe, drip, surge, and micro-irrigation, as well as land leveling.
Water	Farming BMPs	Water Diversion Structures	Construct water diversion structures for farm protection and rainwater harvesting.

BMP Resource Area	BMP Category	BMP	BMP Description
Water	Farming BMPs	Water System Engineering Standards	<p>Improve engineering and installation standards for water systems:</p> <ul style="list-style-type: none"> • Proper Engineering: Conduct field inspection of both old and new waterlines to ensure minimal maintenance and avoid early systems failures, which can lead to reduced ranch or crop production. • Insulation Practices: When properly designed and installed, no insulation should be used, as soil provides the best and most reliable insulation. The recommendations in Table 2 have been proven effective on the 62 well and pipeline systems on Navajo New Lands, resulting in high performance and very low maintenance. Although initial installation costs may be slightly higher, they are offset due to low deferred maintenance needs and increased crop production over many years of use.
Wildlife	Monitoring BMPs	Wildlife Health Monitoring	Monitor the health of wildlife herds (deer, antelope).
Wildlife	Farming BMPs	Wildlife Habitat Consideration	Incorporate wildlife habitat consideration into appropriate plans.

Table 2. Well and Pipeline System Design Recommendations

Irrigation Tools	Issues	Solution
Valves	<ol style="list-style-type: none"> 1. Quality 2. Correct size 3. Freezing 	<ol style="list-style-type: none"> 1. Use high-quality valves from Robert Manufacturing Company (RMC) 2. Ensure valves are large enough for proper flow 3. Install valves in steel boxes with hinged lids below soil surface level to prevent freezing.
Spring-fed water tanks	Freezing/Frost	Install brass float valve assemblies (RMC) in shallow buried steel box located uphill of the tank, level with water at top of tank, to ensure frost-free and reliable water year-round
Pipelines from Springs to Tanks and Fields	<ol style="list-style-type: none"> 1. Correct size 2. Freezing 	<ol style="list-style-type: none"> 1. Use large diameter polyurethane pipes for long-lasting performance 2. Bury pipes at least 2 feet deep to ensure frost-free water supply. 3. Cover and clearly mark ditches for safety.
Tank Setup	<ol style="list-style-type: none"> 1. Steel box placement 2. Correct box size 	<ol style="list-style-type: none"> 1. Construct one large steel box at the side of the tank to house all pipelines (from spring to tank bottom, from tank bottom to outlet valve, and from multiple outlet valves to fields). 2. Ensure the box is large enough to accommodate all valves, provide space for pipe-tool use, and allow for 2 inches of insulation board on all sides and lid (excluding the ground side to utilize earth heat and prevent from freezing).

Chapter 7.0 - MARKETING PRODUCTS

The success of the RMP hinges not only on increasing agricultural production but also on effectively connecting locally grown food and livestock products with consumers. AIARMA emphasizes the importance of enhancing agricultural revenue and employment, which necessitates robust marketing strategies to link producers with local and regional markets. Currently, marketing of farm products in LMD-1 is primarily limited to informal flea markets, which lack the structure needed to optimize agricultural income and employment opportunities.

To tackle these challenges, the ATC will play a pivotal role in organizing and supporting marketing initiatives. By facilitating Agricultural Associations and establishing an Agricultural Food Hub, the ATC will enhance both production and marketing, ensuring that locally grown products are available, accessible, and profitable.

7.1 Current Challenges in Marketing

Agricultural marketing in LMD-1 faces several significant obstacles that hinder its effectiveness:

- **Lack of Structured Markets:** Sales are informal, with no centralized system for consistent marketing of farm products.
- **Limited Awareness of Local Food Availability:** Many residents and tourists are unaware of the quality and availability of locally grown products.
- **Inconsistent Supply and Quality:** Without coordinated efforts, producers struggle to consistently meet market demand.
- **Insufficient Infrastructure:** There is no dedicated facility for food processing, packaging, or branding, which limits to add value to products.

These challenges underscore the need for a comprehensive approach that integrates education, infrastructure, and community involvement.

7.2 The Role of the ATC in Marketing

The ATC will act as a hub for marketing innovation, uniting producers, consumers, and stakeholders to foster a thriving agricultural economy. Its key roles will include the following:

1. **Facilitating Agricultural Associations:**
 - Organizing producers into associations to enhance coordination and collective marketing efforts.
 - Providing training in production planning and quality control.
2. **Developing a Marketing Cooperative:**
 - Establishing a cooperative to streamline distribution, set fair prices, and expand market reach.
 - Encouraging collaboration among producers to stabilize supply and meet consumer demand.

7.3 Establishing an Agricultural Food Hub

To enhance production and marketing, the ATC will establish an Agricultural Food Hub which will feature the following:

- **Greenhouses and Starter Plants:** Providing heirloom seeds and seedlings to ensure consistent crop quality and availability.
- **Food Processing and Packaging:** An indoor/outdoor kitchen for bulk processing, packaging, and branding of products to increase market value.
- **Farmers' Market Area:** A dedicated space for producers to sell their products directly to consumers and tourists.
- **Branding and Messaging:** Developing a cohesive brand identity that emphasizes the cultural and sustainable values of LMD-1 products.

7.4 Expanding Market Access

The ATC will implement the following strategies to connect producers with a variety of markets:

- **Public Awareness Campaigns:** Educating residents about the benefits of purchasing fresh, locally grown food.
- **Direct Sales Channels:** Supporting the establishment of farmers' markets, roadside stands, and partnerships with local businesses.
- **Tourism Integration:** Creating opportunities for tourists to purchase local products, thereby supporting economic growth and cultural promotion.

7.5 Building Capacity for Sustainable Marketing

The ATC will ensure that producers are well-equipped to navigate and sustain their presence in the agricultural market:

- **Training Programs:** Covering essential topics such as market analysis, production planning, and cost competitiveness.
- **Collaboration Initiatives:** Encouraging cooperation among producers to stabilize supply and share resources.
- **Support for Value-Added Products:** Promoting innovation in food processing and branding to enhance profitability.

Through these initiatives, the ATC will transform the marketing landscape of LMD-1, creating a system that supports both producers and consumers while driving economic growth and sustainability.

Chapter 8.0 - FUNDING RESOURCES

The successful implementation of this RMP will necessitate significant funding to achieve the objectives outlined in the AIARMA, the goals of this RMP, and the directives of the FBFA IRMP. The FBFA IRMP, approved in December 2022, emphasizes the importance of collaborative commitment from stakeholders to ensure the effective implementation of conservation plans like this RMP. It states, “Successful implementation of the IRMP has the potential to create a shift in philosophy within organizations that starts with buy-in of this IRMP and a commitment to cooperation and collaboration” (BIA, 2021a).

Achieving the goals of this RMP requires securing several million dollars in federal funding, which will be essential for the following:

- Establishing the ATC to serve both LMD-3 and LMD-1.
- Conducting water resource surveys and constructing pipeline distribution systems.
- Developing and implementing a new grazing permitting program based on RMUs.

The AIARMA regulatory process, which supports this 10-year RMP, aligns with broader initiatives such as the NHLC and the Navajo Thaw program. This RMP encompasses three of the nine Land Management subunits within the FBFA, and the proposed ATC program presents a scalable pilot solution for the entire FBFA region.

8.1 Key Stakeholders and Collaboration

The agricultural community in LMD-1 has demonstrated strong support for the programs and permitting changes recommended in this RMP. Stakeholders recognize the urgent need for a transparent and well-structured program to revitalize agriculture in the area. Currently, no single agency within the federal or Navajo Nation governments is fully equipped to implement the comprehensive scope of this RMP.

The Office of Navajo-Hopi Relocation (ONHIR), established in 1974 under Public Law 93-531, plays a crucial role in addressing issues related to Navajo and Hopi lands. The NHLC, funded through AIARMA, oversees the work of ONHIR and administers the Navajo Thaw program for the FBFA area. The NHLC’s Director, Sarah Slim, has expressed interest in obtaining special federal authorization to lead a collaborative effort such as the ATC to meet the goals of the FBFA IRMP. This initiative would align with the NHLC’s mission and leverage its existing framework to accelerate progress.

8.2 Federal Support and Task Force Recommendations

The scale and complexity required to implement this RMP indicate the need for higher-level federal involvement. The U.S. Secretary of the Interior could establish a dedicated task force to oversee program implementation and funding for both LMD-1 and LMD-3. Such a task force would achieve the following:

- Facilitate coordination among federal, Tribal, and local stakeholders.
- Ensure adequate funding for infrastructure development and program management.
- Provide technical expertise and policy guidance to meet AIARMA objectives.

By securing federal funding and fostering collaboration among stakeholders, the RMP can serve as a transformative model for addressing agricultural challenges and advancing sustainable land management in the FBFA region. Additionally, resources and programs to support agriculture can be found through the University of Arizona Cooperative Extension and the ATC, once established.

Chapter 9.0 - REFERENCES

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Appendices

Appendix A. Range Management Unit Formation Steps

Background on Navajo Range Management Units:

Rangeland managers and specialists who have worked on Navajo Nation recognize the necessity of defining fenced Range Management Unit (RMU) areas within the Land Management Districts (LMDs). This definition is crucial for determining the carrying capacity based on the actual grazing of animals within a well-defined ranch area, which is managed collectively by several permit holders. The Navajo Nation Code Title 3, mandates that grazing outside of reservation land must be managed under RMUs. Additionally, the 2014 Navajo Nation Department of Agriculture (NNDA) proposed grazing act (*Rangeland Improvement Act of 2014*) authorized the establishment of RMUs, allowing for the determination of carrying capacity and enabling multiple permit holders to manage an area collaboratively.

Current examples on the Navajo Nation include:

- 1) The 900,000-acre area Navajo Partition Lands, where grazing regulations (25 Code of Federal Regulations [CFR] Part 161) are being implemented through a gradual process of issuing grazing permits that require identification of a Range Unit (RU) and a Range Management Plan (RMP), along with specified livestock numbers.
- 2) The 352,000-acre area Navajo New Lands grazing regulations (25 CFR Part 700), which are based on RUs averaging approximately 18,000 acres each. There are currently 14 RUs utilized by approximately 90 permit holders. As the ONHIR phases out, the BIA Navajo Regional Office will assume supervision of these lands, continuing the effective management of RUs.

The 2021 FBFA IRMP Goal #2 as “*to encourage grazing permittees within land management districts/units to establish livestock associations or cooperatives to manage livestock...*” and Goal #4 as “*to ensure that all range unit fencing complies with Navajo grazing regulations.*” Additionally, there is a goal “*to establish an FBFA District Grazing Committee*” (BIA, 2021a).

In summary, within the next few years the BIA Navajo Regional Office natural resource staff will manage various parts of the Navajo Nation requiring RMUs, as well as larger areas still under individual CUA permitting. The RMP developed in 2022 for LMD-3 is based on formation of RMUs and, together with this LMD-1 RMP, can serve as the exemplary plans for the Navajo Nation. These plans will facilitate collaboration among multiple federal and Tribal agencies to assist local groups of grazing permit holders in forming livestock associations within RMU areas, allowing for professional management that achieves both conservation and production goals.

Steps for establishing RMUs in LMD-1:

According to Navajo Grazing Regulation 25 CFR Part 167.6 (c), “*Upon the request of the District Grazing Committee... recommendations for... adjustments to the established carrying capacities shall be made by the Range Technicians based on the best information available through annual utilization studies and range condition studies analyzed along with numbers of livestock and precipitation data.*” The term “capacities” is plural, indicating that capacities must be matched to specific range areas where annual utilization, range condition studies, precipitation

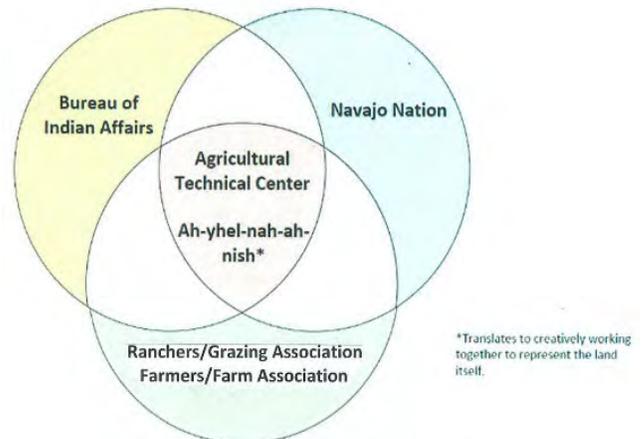
studies, and animal counts are conducted. This suggests that smaller areas within LMD-1 are the preferred management structure.

The LMD-1 District Grazing Committee will play a critical role in the gradual transition from small CUAs to larger RMUs as groups of livestock owners form grazing associations and petition such a transition. BIA personnel, along with other appropriate agency staff, can provide essential support through professional collaboration in developing policies and procedures that make this exemplary model a reality within the next decade in the LMD-1 area. A “top-down” approach to establishing RMUs on the Navajo Nation is unlikely to succeed; instead, a local “bottom-up” rancher leadership process can be employed to form RMUs under the Common Law/Diné Customary Law process – by the local people, for the local people. This collaborative process will engage local grazing permit holders to form a Grazing Association, defining their RMU to achieve mutually beneficial objectives for land protection and improved livestock production that sustains their pastoral lifestyle.

For associations of permit holders interested in forming a RMU, the following steps outline the process, aligning with the NRCS Nine Step Planning Process used to establish effective RMUs:

1) **Establishing an Agricultural Technical Center (ATC):** This center will serve as a collaboration hub within the LMD-3 and LMD-1 areas, focusing on agricultural education, training and assistance, staffed by experienced rangeland managers and technicians. The ATC will require legal authority to assume responsibilities currently shared between BIA, Navajo Nation, and other agencies. The Navajo-Hopi Land Commission may facilitate this in conjunction with the Former Bennett Freeze Area (FBFA) Integrated Range Management Plan (IRMP) responsibilities.

- This reflects the Venn Diagram for 3-Party Collaboration from Figure 5 in Section 4.2.1 emphasizing how the ATC’s essential role in including land users in the collaborative process of achieving goals.



2) **Developing Guidelines:** As the BIA holds primary responsibility for the stewardship of the Indian Trust Lands, including the conservation and protection of the land, BIA range staff for LMD-1 can formulate general guidelines based on BMPs presented in this RMP for the optimal size and structure of a RMU.

- An average area of over 18,000 acres may be considered manageable for developing shared water and fencing infrastructure, making rest rotation grazing economically viable.
- It will be emphasized that RMUs are designed for grazing livestock and related conservation activities; 90% of the RMU area must be designated for grazing as the highest and best use.

- Each RMU will have a designated name and include all grazing permittees within its boundaries, established by consensus and formalized through a governing Range Management Plan (RMP). Once established, RMU boundaries will remain unchanged, even as permittees change. Probate permits actions may not hinder Association leadership from maintaining rangelands for production and conservation purposes.
- 3) **Facilitating**: The ATC should be led by a key facilitator who possesses knowledge of multiple resources terminologies and management practices, has strong interpersonal skills, and is open to providing relevant education. This facilitator may be a government employee or a contractor, depending on the need for neutrality in fostering cooperation among all parties.
 - 4) **Forming LMD-1 District Grazing Committees**: Current LMD-1 District Grazing officials will coordinate meetings with grazing permittees in their respective subunit areas. According to the 2021 FBFA IRMP, a goal is “*to establish a FBFA District Grazing Committee.*” This committee will be essential for facilitating collaboration between bottom-up livestock association members and top-down BIA and Navajo Nation government staff to create RMUs as functional land area institutions. While this process typically takes years due to the political nature of committee selection and duty assignment, it can be expedited through collaborative consensus among stakeholders who recognize the urgency of following the new FBFA IRMP to fund infrastructure for land users.
 - 5) **Announcing Meetings**: BIA range staff can publicly announce their readiness to meet with groups of active grazing permit holders interested in forming a working livestock association, encompassing all permit holders on contiguous land (preferably 18,000 acres or more) with potential for water and fencing to support rest rotation grazing. A sufficient period will be allowed to engage groups on a first-come, first-served basis.
 - 6) **Vetting Participants**: BIA range staff and a facilitator will meet with leaders of responding potential grazing permit holder groups to evaluate their viability and rank them by “most likely to succeed.” One or more meetings will be held with the top-ranked groups to assess stakeholder consensus on moving forward with RMU formation. BIA range staff will provide education on basic concepts to foster trust and understand among key stakeholders regarding the RMU formation process and ongoing management. Permit holders initiating the RMU proposal will consult with the District Grazing Committee to ensure the validity of grazing permits and customary use area claims. A Navajo Nation Fence Application for RMU will be filed by Navajo Nation District Grazing Committee Members and interested permit holders. Approval from the following with signatures include neighboring permit holders, District Grazing Committee, Resource Development Committee, and BIA Regional Director.
 - 7) **Completing a Rangeland Health Baseline Inventory and Initial Planning**: The BIA/ATC range staff will conduct preplanning for the highest-ranked groups, including a comprehensive resource inventory of the proposed RMU area. Topographic maps of 7.5-minute topo scale maps will be created to identify all CUAs, residences, natural and man-made barriers (fences), drainages, roads, water sources, and other developments. Ecological Site descriptions (ESDs) will be compiled, covering:
 - a) Site characteristics: physiographic, climate, soil, and water factors.

- b) Plant communities: plant species, vegetation status, and ecological dynamics.
- c) Site interpretations: management alternatives for the site and related resources.
- d) Supporting information: relevant literature, information, and data resources.

Where formal ESD data is unavailable, the best available information will be utilized as baseline inventory data. BIA/ATC staff will determine a base carrying capacity for the entire proposed RMU by comparing total permitted livestock numbers from grazing permits with baseline inventory and monitoring data.

- 8) **Proposing Pastures and Permanent Water Sites**: Ranchers will be educated about and engage in discussions regarding effective strategies for combining livestock herds and implementing rest rotation schemes to identify optimal water and pasture fencing locations, particularly focusing on fencing going through water centers to facilitate stock movement. Alternative stocking rates will be presented based on water locations and management actions.
- 9) **Drafting a Preliminary Range Management Unit Plan (RMP)**: Grazing management and range development strategies will be developed collaboratively with permit holders. ATC staff and grazing permit holders will refer to the BIA Navajo Regional Office Division of Natural Resources Standard Operating Procedure (SOP) while drafting a Permittee Conservation Plan. The more comprehensive RMU Plan Template in Appendix B, developed through extensive permittee meetings on the 14 RMU of Navajo New Lands, will guide the planning process. Range staff will consult with Navajo Nation wildlife and cultural resources specialists to identify any potential issues that could render the area unworkable.
- 10) **Issuing Grazing Permits**: The BIA will issue new grazing permits as consolidate to all eligible individuals identified during the participatory RMU development process. It is not the responsibility of the BIA or ATC to ensure probates of deceased individuals or to issue any permit to a non-able-bodied rancher. This is because the grazing association is accountable for achieving the production and conservation goals outlined in their RMP plan, and it is not fair to have unused carrying capacity or to burden able ranchers with the responsibilities of those unable to participate equitably. Refer to Section 4.5.1 for how carrying capacity and stocking rates are determined, and Section 4.5.2 for information on grazing permits are issuance.
- 11) **Forming a Grazing Association**: Grazing permit holders must finalize formation of a Grazing Association within their RMU, selecting leaders to coordinate meetings with RMU area stakeholders and collaborate with agency personnel on necessary planning and paperwork. Formal and legal work will be required, with Appendix C providing a template for forming grazing and farming associations.
- 12) **Formalizing the Agreement**: This initial plan must be shared with all stakeholders and neighbors of the proposed RMU area, allowing all participants and affected parties the opportunity to learn about the proposal and provide consent. This agreement should include names of permit holders, their intentions and goals, types of livestock, boundaries definitions, and a RMU name. It is the responsibility of the stakeholders to reach consensus, not government staff. Participants must be educated about forming a working livestock association, as it is crucial for them to identify leadership and available skillsets of participants. Leaders, including the first president and officers responsible for paperwork,

must be designated. A signed statement from participants committing themselves to forming an association and collaborating with the government on the subsequent planning phases will be required. A comprehensive map delineating the boundaries of the unit must be signed by all grazing permit holders, including those bordering the area, to ensure any disputes have been resolved.

- 13) Monitoring Progress:** Once the RMU is established and planning is implemented, the BIA should adhere to 25 CFR Section Part 167.6 subsection (c) where it states that the Range Technician must “*have available best information through annual utilization through annual utilization studies and range condition studies analyzed along with numbers of livestock and precipitation data.*” Key areas will need to be selected to represent all pastures on the proposed RMU, where “T-post” sampling sites can be established, and two to three hours of studies conducted at each site to document rangeland production, condition, and forage utilization. For periodic utilization studies, the range technician can survey the recently grazed pasture, noting watering locations and stopping frequently to assess forage utilization levels (see method in Appendix D), ultimately creating a multi-colored map to illustrate use levels across the area. A rain gauge should also be located nearby to obtain general (at least seasonal) precipitation data. This information will be shared at stakeholder meetings, where grazing permit holders can identify usage patterns, including who uses which areas, at what times, and with what type of livestock.
- 14) Finalizing the Range Management Unit Plan (RMP):** The next planning stage involves the grazing association leadership working with agency staff to finalize a Permittee Conservation Plan (see Appendix B) and develop a more detailed RMP. Management projects and practices can then proceed.
- 15) Recognizing the RMU:** Recognition of the RMU will be sought from the District Grazing Committee, Navajo Nation Central Grazing Committee —now Resource Development Committee, Navajo Nation Council, and BIA Navajo Region Superintendent—now Regional Director, as required in the Navajo Grazing Regulation.

Appendix B. RMU Plan Template

Please refer to the regional Navajo office's regional template for guidelines. The following is a comprehensive outline for a Range Management Plan (RMP) that Range Management Units (RMUs) will eventually encompass. Over time, permit holders will collaborate to optimize conservation, production, and good quality of life. This template is based on a complete plan from Navajo New Lands (NNL), detailing land and livestock management practices that are widely applicable for effective ranch management.

Note: This outline was developed over a decade for 14 NNL Range Units (RUs), each exceeding 32 pages, and was created through numerous meetings with each RU, incorporating input from university extension agents and the Navajo Nation veterinary program. The meetings were primarily held in people's homes, reflecting the aspiration of average Navajo regarding quality of life, production, and land health goals.

Note: These plans remain largely intact, with 98% of the original content preserved even 20 years after their finalization, despite the departure of most government range staff from NNL employment.

While Land Management District (LMD)-1 RMPs may not be so complex, it is essential to recognize that RMUs encompass much more than grazing. Policies and procedures will naturally align through on-going collaborative meetings. Most land users appreciate the order, structure, and assurance that detailed, customized plans provide.

All the following topics are crucial and should be included to prevent conflicts and ensure active participation:

NAME OF RANGE MANAGEMENT UNIT

1. Purpose of Plan
2. Authority
3. Community Process and Planning Process

Note: RMUs are democratically governed by resident stakeholders, per grazing regulations and the terms this signed plan, maintained through a consensus process.
4. RMU Description
5. Map of RMU: Boundaries, natural features, fencing, pastures, housing, roads, rangeland improvements
6. Stakeholder Listing: Permit holders; Grazing Association; Other permitted users; Agencies; Organizations
7. Grazing Association formation, Structure, and Function
8. Goals for Quality of Life, Production and Land Health: Conservation and Climate Change; Responsibility listing; Record-keeping and reporting
9. Management Planning
10. Cultural Resources
11. Farming: Permit map

12. Fire policy

13. Grazing Association, Role, and Duties

14. Grazing in Common

Note: Every permit holder must manage their livestock and participate in roundups and livestock care.

15. Grazing Capacity Mapped by Pastures

- Based on original base inventory data, adjusted for actual use, utilization, and dry-year precipitation data.

16. Grazing Permit List with stock numbers, brands, and ear tags

Note: Sheep Unit Yearlong (SUYL) for each permit should be listed as a percentage (%) of total RMU to facilitate quick permit adjustments and allow unused portions to be utilized by the grazing association until needed by the permit holder.

17. Grazing Permit issuance and revocation

- Annual stocking rate based on monitoring to avoid fluctuations due to weather.

Note: University of Arizona defines drought as years with precipitation 25% or more below normal, thus most years can accommodate normal stocking with timing and herding adjustment. In severe years, permit holders must agree on livestock reductions based on actual stock present on the range.

18. Grazing Plan for Pastures; Rotation schedule and record keeping

- Based on seasonal and weekly observations by the range boss (leader) and livestock movements, following the guidelines from *Living from Livestock* (Bingham, 1984).

19. Grazing Pasture Use and Sheep Herding Policy

20. Herb Gathering

21. Livestock Branding, Ear Tagging, and Records

22. Livestock Class and Breeds Preferences

23. Livestock Breeding Practices: including artificial insemination

24. Livestock Calving and Lambing

25. Livestock Culling

26. Livestock Handling

27. Livestock Health; Disease control and vaccinations

28. Livestock Leasing

29. Livestock Management Responsibility

30. Absentee Grazing Policy

31. Livestock Marketing and Purchasing

32. Livestock Nutrition: including phosphorus and mineral supplements; No feeding on rangeland.
33. Livestock Predator Control: dog policy.
34. Livestock Production Goals
35. Livestock Roundups and Counts
36. Mineral Materials/Mining
37. Recreation
38. Roads, Access, and Off-road Driving Policy
39. Map of Roads and Access Points
40. Noxious/Invasive Weed Control
41. Wildlife Management
42. Woodlands Management
43. Map of Firewood Cutting Areas
44. Projects and Developments
45. Map of Existing Projects and Responsibilities
46. Proposed Rangeland Projects
 - Infrastructure projects (waters, fencing, handling facilities)
 - Rangeland restoration projects (vegetation manipulation, reseeding)
 - Riparian habitat restoration and management
47. Project Maintenance Responsibilities
48. Project Special Use Permits and Map
49. Monitoring; utilization, actual use, precipitation, condition, and trend studies
 - Methodology used by agencies and permit holders
50. Enforcement Control
51. Community/Housing Area Management
52. Map of Housing and Camp Areas: listing of considerations

Note: A map and history of CUAs are necessary to honor family heritage, ensuring all permit holders have access for livestock use across the RMU, and acknowledging their “quit claim” to compensation for lost property value.
53. Flexibility
54. Agreement and Signatures of All Permit Holders and BIA Rangeland Management Specialist or Natural Resources Manager

Appendix C. Grazing and Farming Association Template

The following is a template of topics that may be included in structuring a grazing association. This template draws from the framework established by various Indian Associations, including the Ash Creek Livestock Association (one of nine privately owned cattle associations on the San Carlos Apache Indian Nation), as well as association from the Navajo New Lands, Hopi Tribe, Hualapai Tribe, Tohono Oodham Nation, and Mescalero Apache Tribe.

Associations typically have both a constitution and bylaws that define the members' privileges and responsibilities. They possess considerable flexibility in rulemaking to achieve their objectives.

Key considerations for structuring a grazing association include:

1. Constitution and Bylaws
 - Outline the purpose of the association.
 - Define membership criteria, rights, and responsibilities.
2. Leadership Structure
 - Associations may appoint or elect officers, but they can operate without formal officers if an alternative leadership style is preferred.
 - Consideration of roles such as President, Vice President, Secretary, and Treasurer, if applicable.
3. Formality and Stability
 - An association may choose to form a corporation to enhance stability, enabling it to receive grants, own property, and enter contracts with limited liability for members.
 - Alternatively, the association can remain informal, conducting periodic meetings to discuss tasks and responsibilities.
4. Financial Management
 - Establish guidelines for managing finances, including contributions from members for land management, animal care, and project upkeep.
 - Consider creating a budget and financial reporting system.
5. Meetings and Communication
 - Schedule regular meetings to facilitate communication among members and discuss ongoing projects and issues.
 - Develop a system for documenting meeting minutes and decisions made.

6. Work Assignments
 - Clearly outline the tasks required for managing land, animals, and projects, along with individual responsibilities for each member.
7. Conflict Resolution
 - Establish procedures for addressing disputes among members to maintain harmony within the association.
8. Membership Engagement
 - Encourage active participation from all members in decision-making processes and project implementation.

By considering these topics, a grazing association can effectively structure itself to meet the needs of its members while promoting sustainable land and livestock management practices.

An association has the option to appoint or elect officers if desired, but it can also function without officers if another leadership style is adopted. If members seek greater stability over time, they may choose to form a corporation, which would allow the association to receive grants, own property, and into enter contracts with limited liability for its members. Conversely, the association may opt to maintain a more informal structure, conducting periodic meetings to outline tasks and clarify each member's financial contribution for managing the land, animals, and ongoing projects.

1. Purpose and Need

The following are some purposes and needs of livestock associations:

- Manage for healthy range resources (improved water, nutrient, and fire cycles), healthier plants and recovery from drought. Be better able to obtain professional advice and management help.
- Manage for healthy livestock and higher calf crops from common bull management
- Elect officers for leadership to better manage range and livestock affairs
- Equally and fairly share costs of handling livestock, hauling water, construction and maintenance of livestock facilities, supplementation and some vet fees
- Formulate and follow the Range Unit Management Plan for conservation management
- Stable Association management with improved trust in the Association by the members.
- To gives permittees a stronger bond and voice in the eyes of agencies and others.

2. Association Profile

The _____ (insert name) Livestock Association is organized for the purpose of managing a cow-calf enterprise consisting of good quality _____ (insert breed) cattle and improving the quality of life of its members while sustaining healthy land resources conditions.

Introduction: _____ The Association is recognized by _____ (list Navajo Nation Grazing Committee, or Tribal charter, etc.)

- If applicable: “The Association is a non-profit organization chartered with the State of Arizona” [– or not]. The Association was established by the _____ (list how) in _____ (list date) under the Articles of Incorporation of the _____ (insert name) Livestock Association. The Association has the following officers: _____ Association meetings are held _____ (state how often). Each member has one vote. The executive committee conducts approved business. List duties of officers _____
- The Association headquarters is _____ (insert place of business, mailing address).
- The Association is in control of grazing on the _____ (insert name) Range Management Unit, or _____ (give acreage) acres, located _____ (give approximate distance and direction from a well-known point). Once this range management unit is established and recognized by BIA and Navajo Nation, it will remain with the same boundaries, even as grazing permits transfer over time.
- The Association legal members are those who have grazing permits issued by BIA in their own names, with a historic customary use area on the Range Management Unit area.
- Association members include all the current grazing permit holders (with current BIA issued permits) as follows:
 - #1 _____ (list permit #, permittee name, permit SUYL and % of total capacity; also list how the permit is “anchored” to this Range Management Unit, and no other unit)
 - #2 _____
 - #3 _____
 - #4 _____
 - #etc. _____
- Note if the Association recognizes Designees to act for a permittee _____
- The Association has/does not have authority to graze livestock under its own brand, under the following stipulations _____ (list)
- The Association does/does not allow other members besides grazing permit holders _____ (stipulate who and under what terms others may act)
- The Association will recognize the following brands on the range _____ Note the policy on shared brands under a grazing permit _____ Note, the Association may have its own brand and own and sell livestock _____

3. Goals and Objectives

Describe the Quality of Life and customs the association tries to maintain for their range area community_____

- Note if and how it is required that each member of the Association work hard to make the association successful. Note training you would like to help this _____ Describe general Production goals association members share to ensure and improve that quality of life and pride of owning livestock _____ List any production or income goals _____ Describe some Landscape condition goals you would like to achieve (like restoring grass to certain places, healing erosion areas, limiting too much road making, etc.) _____ Describe a realistic 10-year vision of how the land will improve.

4. Basic Elements of Livestock Management

- All cattle and horses graze in common on a rotation grazing schedule (with young heifers separated seasonally). The Association oversees daily management of _____ SUYL/ _____ AUYL (list maximum permit total of all members) of livestock on the range management unit.
- The Association decides on breeds of bulls to allow and may exclude unfit bulls from being on the range. Bulls may be individually or cooperatively owned. A committee purchases bulls. A percentage of the sale of permittee cattle is given to the association for the purpose of replenishing the bulls, or bulls may be owned or leased by the Association. Animals used for home consumption are not assessed by the association.
- List how livestock are sold, whether by individual owners or by common auction _____
- Permittees share in work and in herding and water hauling, when necessary. Roundups are done as an association, with participation of all association members. No one works cattle outside of the organized roundups. List other obligations _____
- The Association charges fees: _____ (stipulate what, how much, when, who and for what purpose). Stipulate if management fees are collected when permittees sell livestock. Stipulate how money is to be managed _____ (bank accounts, etc.) Stipulate if money (dividends) is to be paid from the association to members, how paid, and if advances can be made.
- Stipulate if payment can be in-kind (labor) _____
- The Association may/may not appoint one or more Range Bosses (or rider) to manage daily operations on the range management unit. List duties _____ Payment to these persons, or others providing services, is done under the following terms: _____
- Enforcement of Association rules and management protocol will be by _____

5. Role sharing with Government Agencies:

List agencies and what each is to do in helping the Association _____

List workshops and trainings Association members will need _____

APPROVAL

State authority for approval of these bylaws _____

Signatures of each member and approving official:

Appendix D. Monitoring Program and Forms

Monitoring Requirement

Monitoring is a critical component of the range management planning process, serving as a feedback mechanism to evaluate implementation of best management practices (BMPs), assess range conservation measures, and analyze livestock production outcomes.

- Regulatory Framework: Monitoring is mandated by the Navajo Grazing Regulations, specifically in Section 25 Code of Federal Regulations (CFR) Part 167.3 Objectives:
 - (a) *“The preservation of the forage, the land, and the water resources...and the building up of those resources where they have deteriorated.”* This requires baseline conducting baseline resources inventories, periodic condition and trend studies to verify current conditions, and seasonal forage utilization studies.
 - (c) *“Adjustment of livestock numbers to the carrying capacity of the range...”* This involves monitoring actual livestock use through annual counts correlated with the grazing land area.
 - (d) *“To secure increasing responsibility and participation of the Navajo People...in the sound management of grazing lands, and to foster a better relationship and a clearer understanding between the Navajo people and the Federal Government in carrying out the grazing regulations.”* This includes developing Range Management Plans (RMPs) with grazing permit holders’ input, signing and implementing BMPs, and holding regular meetings between the livestock owners and government staff.
 - (e) *“The improvement of livestock through proper breeding practices and the maintenance of sound culling policy.”* This monitoring involves maintaining records at the management unit level for each grazing permit holder, documenting livestock breeds, breeding outcomes, and culling records.
- Carrying Capacity Monitoring: Section 25 CFR Part 167.6 mandates that: “...adjustments to the established carrying capacities shall be made by Range Technicians based on...utilization studies and range condition studies analyzed along with numbers of livestock and precipitation data.” This requires numerous spot checks for forage utilization and seasonal monitoring of rain gauges.
- AIARMA Compliance: The American Indian Agricultural Resources Management Act (AIARMA), also requires monitoring. Section 101 (b) states that *“a 10-year Indian agricultural resource management and monitoring plan shall be developed...”* which includes RMPs and monitoring programs to evaluate management effectiveness [Sec 4 (12)(A)].

Range Monitoring Procedures

Range Management professionals are trained in monitoring protocols as outlined in the following sources.

- National Range and Pasture Handbook. June 2022. Website: <https://directives.nrcs.usda.gov/sites/default/files2/1712930339/33908.pdf>
- Monitoring Forms: Refer to Figures D1 and D2 Monitoring Forms for examples of efficient range monitoring. Bureau of Land Management (BLM) Measuring and

Monitoring of Plant Population and Vegetation. Appendix 15. Data Forms. Page 421-446. Website: <https://www.ntc.blm.gov/krc/system/files/legacy/uploads/3342/technical%20reference.pdf>

- Interpretating Indicators of Rangeland Health. Technical Reference 1734-6, Version 6. August 2020. Website: <https://www.blm.gov/documents/national-office/blm-library/technical-reference/interpreting-indicators-rangeland-health-0>
- Utilizing and Understanding the Web Soil Survey. <https://websoilsurvey.nrcs.usda.gov/app/>
- Utilizing and Understanding the Ecological Site Description. <https://edit.jornada.nmsu.edu/catalogs/esd>
- Introduction to ArcPro (ArcGIS) software and graduating into different courses from ESRI and Bureau of Indian Affairs (BIA) Geospatial programs.
- *Rangeland Health: New Methods to Clarify, Inventory and Monitor Rangelands*, by the National Research Council (National Resource Council, 1994).
- *Holistic Resource Management Workbook* by Sam Bingham and Allan Savory, Island Press 1990.
- A reference for monitoring terminology is the December 2019 *Rangeland Monitoring Plan and Report, Eastern Navajo Agency* by Ecosphere Environmental Services, Inc., of Durango, Colorado.
- Refer to Navajo Nation Range Management handbook, published by University of Arizona Cooperative Extension (University of Arizona, 1981). Website: https://navajorange.nmsu.edu/Navajo_Nation_Range_Management_Handbook_1981.pdf
- Selected Plants of Navajo Rangeland. 2018. Website: https://navajorange.nmsu.edu/download_handbook.php

Baseline Resource Inventory and Mapping

Field mapping at 7.5-minute topographic scale will be conducted for all landmarks, drainages, roads, buildings, water sources, fences, and livestock facilities when initiating a plan on a new Range Management Units (RMU). A soil (Soil Scientist) and vegetation (Rangeland Management Specialist) professional will review existing BIA Navajo Region Order 3 or 4 Soil Survey and ecological site description (ESD) data. Field spot checks will align ESD and soils data for practical interpretation within the RMU pasture or water lotting system. Vegetation sampling and a rangeland health assessment will be performed, noting vegetation associations and inherent productivity to calculate carrying capacity based on acres per sheep unit yearlong.

- Woodlands will be inventoried and mapped for woodcutting.
- Riparian areas will be mapped for wildlife habitat.
- Recreation and Cultural resources will be included in the mapping process.
- Visits grazing permit holders and family will be conducted to understand the history and claims related to land developments, providing context for 1941 Customary Use Areas (CUAs) and grazing permit issuance.

These actions help determine optimal locations for livestock water facilities and pasture fencing to facilitate efficient rotational grazing. While baseline inventory may incur initial cost, it is a one-time requirement. Base maps will be stored in government office files for periodic reference, with partial updates conducted if significant changes in vegetation or land development warrant the expense.

Carrying Capacity and Permitting

The base carrying capacity for livestock within a RMU is determined by graphing a production zones on 7.5-minute topographic maps then summarizes baseline inventory data to assess gross annual vegetation production for pasture areas. Adjustments are made for a below-normal precipitation year, allowable use, suitability based on distance to water, terrain limitations, and a grazing system factor for progressive management needs. Stocking rates are calculated based on livestock type, and grazing permits are issued according to historical records and type of grazing association (if any) involved. Annual utilization and actual use data are then utilized to ensure stocking rates align with livestock production and resources conservation goals.

Precipitation

Precipitation data is vital in interpreting range monitoring results, including utilization levels and condition and trend studies. Rainfall can vary significantly between dry and wet years, sometimes by as much as 200%. Without matching rainfall data from the season prior to data sampling with current and past data, erroneous comparisons are likely.

While precipitation data from Tuba City and Page, Arizona, provides general seasonal patterns, it is insufficient for comprehensive monitoring across the entire 0.8 million-acre LMD-1 area. Therefore, additional rain gauges must be placed installed to represent all major grazing areas. The Navajo Nation Department of Water Resources monitors several gauges in the LMD-1 area, And the National Weather Service may assist in deploying automated gauges. Large-capacity gauges, filled with mineral oil to prevent evaporation, should be read either monthly or for 4-month winter, spring, and summer seasons.

For the 352,000-acre Navajo New Lands, 10 large canisters were placed in secure locations and read three times a year (end of September, end of February, and end of June) to gather reliable data on vegetation growth relative to precipitation during in winter, spring, and summer growing seasons. A map of LMD-1 isohyetal lines can be included in the fall annual reports to illustrate areas receiving low, medium, or high levels of precipitation. Each RMU can be represented on this map to assess the impact of weather on utilization and condition monitoring study results throughout the year.

Forage Utilization

The grazing regulations stipulate that forage utilization studies must be conducted to evaluate the effectiveness of stocking rate, identify areas of actual use, locate overgrazed regions, and assess usage levels on key forage plants.

- For efficiency, a utilization base map can be created for each RMU, highlighting key areas (located $\frac{1}{4}$ to $\frac{1}{2}$ mile from water) where a technician can conduct a 5-minute utilization check (see Figure D1 example map below).
- Due to ongoing plants growth, these studies should be conducted when livestock are rotated off a pasture area, or in the fall when growth ceases, allowing for an assessment

of summer use and estimating available forage for winter. It is crucial to perform quick utilization checks across all pastures on the same day, gather data from ranchers regarding historical grazing pastures, and calculate regrowth, as no single pasture can represent all pastures in a rotational grazing system.

Refer to Figure D1 for an example map of a 14,000-acre RMU with 11 pastures and 42 utilization key areas as stop locations. An average pasture may have five stops, enabling the technician to document utilization within an hour. Additionally, see also Figure D2, the Utilization Site Survey form, which was developed for the Navajo New Lands program and allows for documentation of 10 stops on one sheet and provides space for notes of vegetation and livestock observed. This streamlined process yields valuable management information that can be immediately applied.

Figure D 2. Forage Utilization Site Survey Notes Sample.

Form 132 UTILIZATION SITE SURVEY NOTES
 Range Unit *Little Silversmith Pasture 3*
 Observer(s) *DeSimone*

File 62-d
 Date *9.30.99*
 Page *1* of *1*

SPECIES	SU		LU		MU		HU		SW		Hits/prnts	Ave. %
	0_10_20	21_30_40	41_50_60	61_70_80	81_90_100							
<i>STIPA</i>	::	<input checked="" type="checkbox"/> ::	::								<i>14/880</i>	<i>30</i>
<i>Orhy</i>	::	<i>7</i>	::								<i>10/300</i>	<i>30</i>
<i>Bagr</i>	<input checked="" type="checkbox"/>	::									<i>12/190</i>	<i>15</i>

Map	Range site	Use Site	Use Class
		<i>13</i>	<i>SU</i>

Topography: *Midslope*
 Soil:
 Veg. Type: *grass/shrubs/Juniper*
 Forage Vigor: *good*
 Nearest Water: *.25 to horseshoe*
 Livestock Class: *cattle*
 Amount Sign: *pronghorn*
 Odometer:

SPECIES	SU		LU		MU		HU		SW		Hits/prnts	Ave. %
	0_10_20	21_30_40	41_50_60	61_70_80	81_90_100							
<i>STIPA</i>		::	<input checked="" type="checkbox"/>	::							<i>14/880</i>	<i>49</i>
<i>Atca</i>		::	<input checked="" type="checkbox"/>	::							<i>16/840</i>	<i>52.5</i>
<i>Bagr</i>		::	<input checked="" type="checkbox"/>	::							<i>11/550</i>	<i>50</i>

Map	Range site	Use Site	Use Class
		<i>14</i>	<i>MU</i>

Topography: *Toe slope*
 Soil:
 Veg. Type: *grass/shrubs*
 Forage Vigor: *good*
 Nearest Water: *.5 to horseshoe*
 Livestock Class: *cattle*
 Amount Sign:
 Odometer:

SPECIES	SU		LU		MU		HU		SW		Hits/prnts	Ave. %
	0_10_20	21_30_40	41_50_60	61_70_80	81_90_100							
<i>Bagr</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	::								<i>20/920</i>	<i>26</i>
<i>Atca</i>		<i>7</i>	<input checked="" type="checkbox"/>	::							<i>18/820</i>	<i>46</i>
<i>Cela</i>	::	<input checked="" type="checkbox"/>	::								<i>14/400</i>	<i>29</i>

Map	Range site	Use Site	Use Class
		<i>15</i>	<i>SU</i>

Topography: *Swale*
 Soil:
 Veg. Type: *grass/shrubs*
 Forage Vigor: *good*
 Nearest Water: *1 mile to horseshoe*
 Livestock Class: *Cattle*
 Amount Sign:
 Odometer:

SPECIES	SU		LU		MU		HU		SW		Hits/prnts	Ave. %
	0_10_20	21_30_40	41_50_60	61_70_80	81_90_100							
<i>Bagr</i>	::	<input checked="" type="checkbox"/> ::	::								<i>23/690</i>	<i>30</i>
<i>Atca</i>		<input checked="" type="checkbox"/>	<i>7</i>	::							<i>19/170</i>	<i>41</i>
<i>Cela</i>	::	<input checked="" type="checkbox"/>	::								<i>16/500</i>	<i>31</i>

Map	Range site	Use Site	Use Class
		<i>10</i>	<i>SU</i>

Topography: *Bottom*
 Soil:
 Veg. Type: *grass/shrub*
 Forage Vigor: *good*
 Nearest Water: *.5 to silversmith*
 Livestock Class: *cattle*
 Amount Sign:
 Odometer:

SPECIES	SU		LU		MU		HU		SW		Hits/prnts	Ave. %
	0_10_20	21_30_40	41_50_60	61_70_80	81_90_100							

Map	Range site	Use Site	Use Class

Topography:
 Soil:
 Veg. Type:
 Forage Vigor:
 Nearest Water:
 Livestock Class:
 Amount Sign:
 Odometer:

Notes: *est. 195 cattle & horses grazed from July 15 to Aug 25*

2-85 N.L., res. 3-93 P.D.

This sample form is designed to document utilization observations within a CUA or RMU. Data for each horizontal boxed set can be collected in under 10 minutes time. The two-sided form accommodates documentation of up to ten observation stops, applicable to either a single pasture or an entire unit management area.

Actual Use Counts

Navajo Nation grazing officials will ensure that annual livestock counts are conducted for each CUA and RMU, identifying the type and number of livestock for each permit holder. To monitor production goals, the permit holders should also track calf and lamb crop success, as well as the birth and shipping weights of their animals. In RMUs, individual livestock tally sheets will be provided to each permit holder, and a consolidated tally sheet for the entire RMU will be completed for the grazing association leadership. This data will indicate whether permits are being fully utilized and highlight any individual issues. It will then be compared to utilization mapping and grazing schedule records to assess how effectively pasture rotations distribute grazing pressure and identify any necessary future adjustments.

Condition and Trend

The grazing regulations mandate condition and trend studies be conducted periodically at designated to evaluate whether resources “waste” is being prevented and whether the land is degrading or improving. At least one key area within a pasture must be marked with a metal T-post and global positioning system (GPS) coordinates, accompanied by a data-stamped metal label plate attached to the top/ This marker should be located ½ mile from a reliable water source and approximately 100 feet from an access road. A rangeland management specialist and staff professional will conduct a study transect at this site to assess plants species present, their condition, and any changes since the last study.

Typically, a Pace Frequency transect will be established in a consistent direction, with both close-up and general photos taken. The monitoring form documents will document the key plant species found within transect frames, the ground cover at a specific point on the frame, and the distance to the nearest perennial plant from those points. Condition and trend studies are generally repeated every five to ten years. Precipitation data is crucial to ensure that assessments reflect the grazing rather than natural fluctuation in forage production. For detailed methods ecological health monitoring, refer to USDI BLM Interpreting Indicators of Rangeland Health (USDI BLM, 2005).

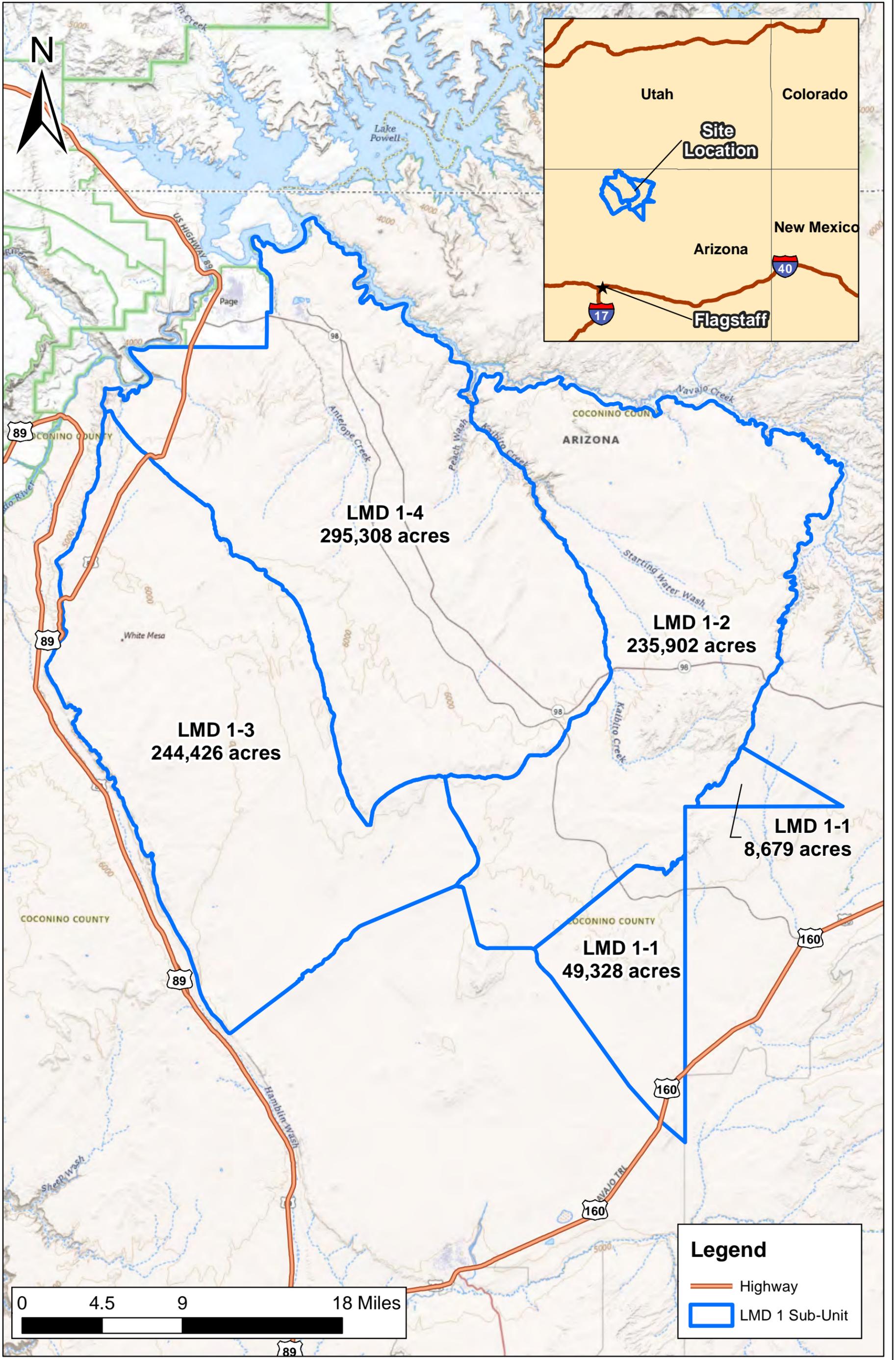
Annual Report

It is essential for agency staff to provide periodic reports summarizing planning, management, and monitoring progress on RMUs. This information should be shared with all stakeholders, to include RMU permit holders, their families, and agency staff, to maintain a healthy feedback loop of planning, action, monitoring, control and re-planning. While many agencies operate on an annual reporting cycle, collaboration with livestock associations may allow for more frequent updates, such as those needed for spring rangeland readiness and grazing planning, as well as fall assessments to determine forage availability for the winter months. These reports will be valuable for evaluating progress within 10-year RMP planning timelines.

Appendix E. Full-Size Copies of Maps (Figures 2, 3, and 4)

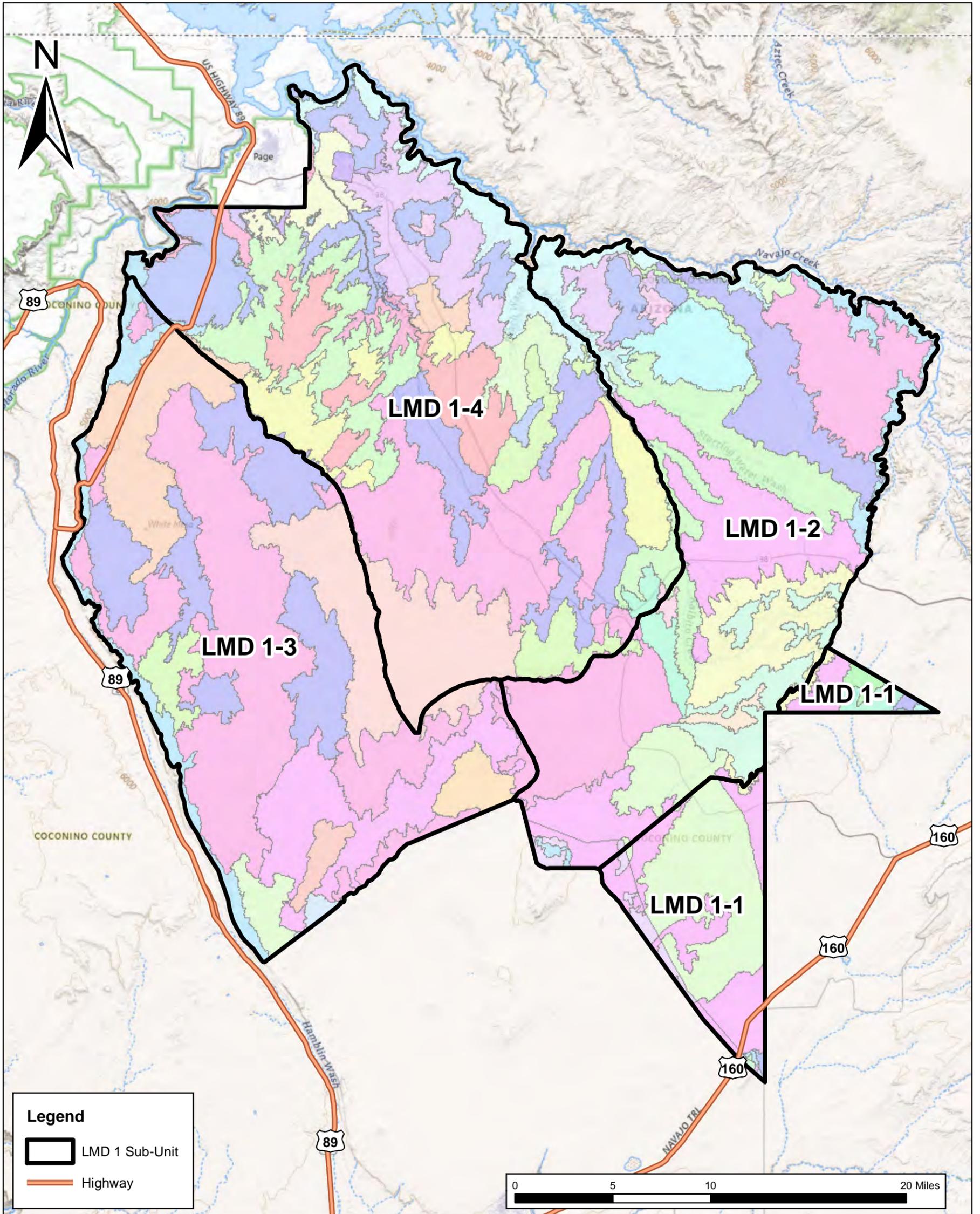
Site Location

Rangeland Management Plan Land Management District (LMD) 1



Soils

Rangeland Management Plan Land Management District (LMD) 1



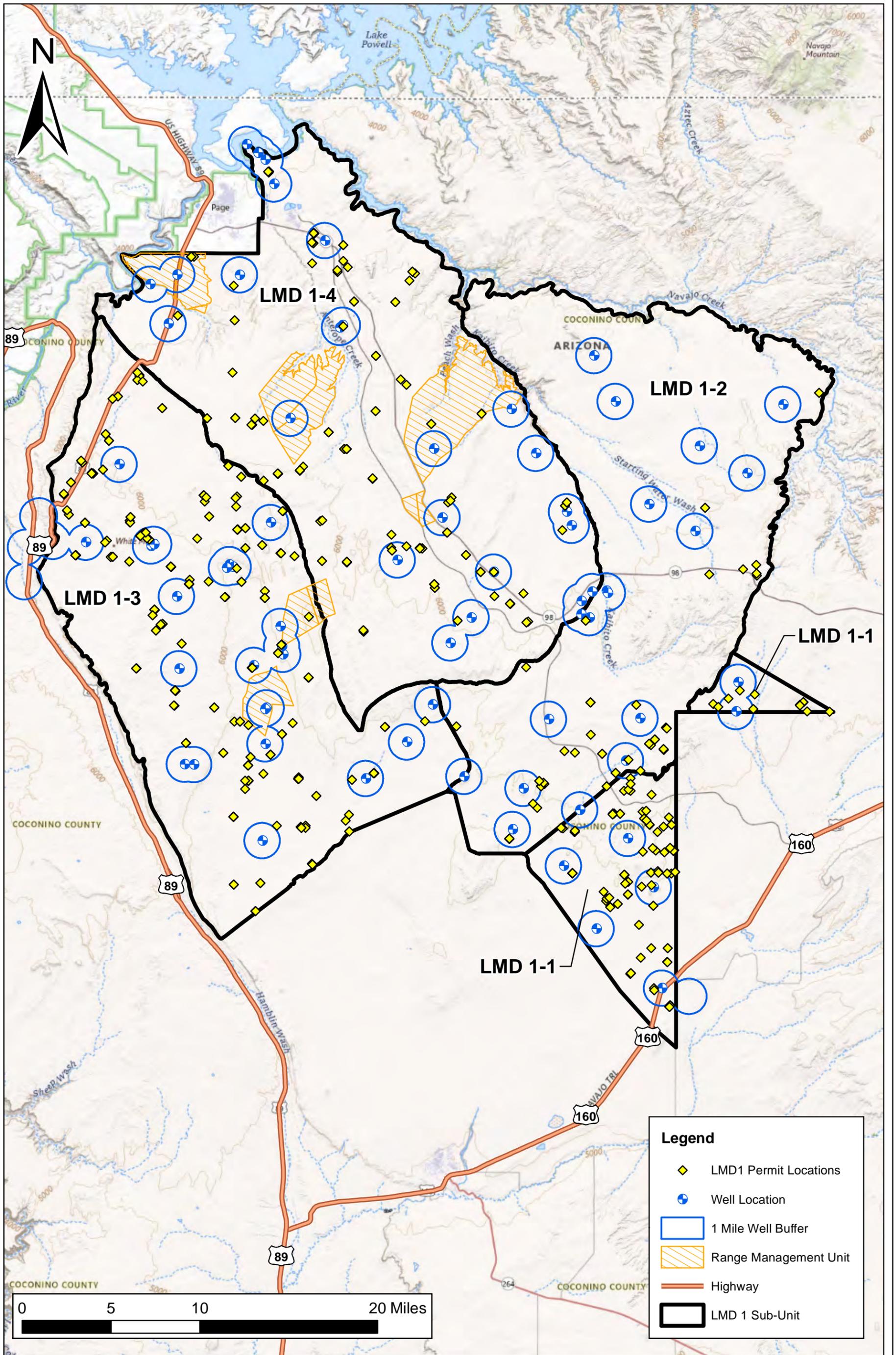
Legend

- LMD 1 Sub-Unit
- Highway

Soil Units			
Arches-Rock outcrop-Mido complex, 2 to 15 percent slopes	Mido, loamy substratum-Arches-Ustic Haplocalcids complex, crooked ridge, 2 to 10 percent slopes	Pocum family-Earweed complex, 1 to 15 percent slopes	Sheppard sand, 5 to 15 percent slopes
Aridic Ustorthents-Royosa-Plumasano complex, 0 to 15 percent slopes	Mido-Gish, moderately deep-Tekapo family complex, 1 to 10 percent slopes	Reef-Rock outcrop complex, 4 to 35 percent slopes	Sheppard-Needle-Rock outcrop complex, 2 to 20 percent slopes
Begay-Pensom, moderately deep complex, 1 to 10 percent slopes	Mido-Pensom, moderately deep-Ustic Haplocambids complex, 1 to 10 percent slopes	Riverwash-Sheppard complex, 0 to 24 percent slopes	Sheppard-Rock outcrop-Sheppard, moderately deep complex, 2 to 15 percent slopes
Earweed-Shoegame complex, 2 to 6 percent slopes	Mido-Radnik-Riverwash complex, 1 to 8 percent slopes	Rock outcrop-Mathis-Nalcase complex, 10 to 50 percent slopes	Shoegame family, 1 to 5 percent slopes
Florita, moderately deep-Rizno-Rock outcrop complex, 0 to 5 percent slopes	Needle-Sheppard complex, 2 to 12 percent slopes	Rock outcrop-Mido-Mido, loamy substratum complex, 2 to 15 percent slopes	Torriorthents-Rock outcrop complex, 25 to 65 percent slopes
Mespun-Councilor-Mespun, limy substratum complex, 0 to 10 percent slopes	Nepalto family-Tsaya-Rock outcrop complex, 35 to 70 percent slopes	Rock outcrop-Needle-Lithic Torriorthents complex, 2 to 12 percent slopes	Typical Torriorthents, 1 to 5 percent slopes
Mespun-Nalcase-Bispen complex, 0 to 10 percent slopes	Pensom-Arches-Rock outcrop complex, 2 to 25 percent slopes	Rock outcrop-Needle-Lithic Torriorthents complex, 1 to 25 percent slopes	Typical Torriorthents-Needle-Moenkopie family complex, 2 to 12 percent slopes
Mespun-Rock outcrop-Nalcase complex, 1 to 25 percent slopes	Pinavetes-Begay complex, white mesa, 1 to 5 percent slopes	Sandoval family-Ustic Haplocambids complex, 0 to 5 percent slopes	Urban land-Sheppard-Typic Torriorthents complex, 1 to 10 percent slopes
Mespun-Santrick-Rock outcrop complex, mormon ridges, 2 to 40 percent slopes	Pinavetes-Pinavetes, moderately deep association, white mesa, 1 to 15 percent slopes	Santrick-Nalcase-Rock outcrop complex, 1 to 15 percent slopes	Urban land-Ustic Haplocambids complex, 1 to 5 percent slopes
	Pinavetes-Rock outcrop complex, white mesa, 5 to 60 percent slopes	Sheppard fine sand, 1 to 5 percent slopes	Ustic Haplargids-Mido-Campanile complex, 0 to 7 percent slopes

Range Management and Water Resources

Rangeland Management Plan Land Management District (LMD) 1



**Appendix F. Range Management Branch Report, L.M.U. NO. 1
May 1937**

Complete Except Map

**RANGE MANAGEMENT BRANCH
REPORT
L.M.U. NO. 1
MAY 1937**

D.G. Anderson
**D.G. ANDERSON
JR. RANGE EXAMINER**

RANGE DIVISION FILE *875.1*

WR: 746

RANGE MANAGEMENT BRANCH REPORT

LAND MANAGEMENT UNIT NO. I

May - 1937

D. G. Anderson
Jr. Range Examiner

WR: 747

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RANGE MANAGEMENT BRANCH REPORT

LAND MANAGEMENT UNIT NO. 1

I. INTRODUCTION

A. Dates of Survey, Personnel of Party:

Land planning surveys on Land Management Unit No. 1 (Kaibito Unit) were made between April 1 and June 5, 1937. This was an excellent time for making the surveys for it gave the survey party an opportunity to see in progress the long shift of population and livestock from winter to summer range, a condition which is especially pertinent to land planning in this area.

Personnel comprising Study Group "B" as follows:

Section of Agronomy - - - - -	H. M. Ivory
Section of Biology - - - - -	R. S. Neilson Asst. Chief of Party
Section of Conservation Surveys -	R. H. Kerr, L. A. Hill
Section of Engineering - - - -	C. L. Moyes
Section of Human Surveys - - -	J. N. Hadley
Section of Range Management -	D. G. Anderson Chief of Party
Section of Woodland Management -	R. S. Richardson

B. Location:

Land Management Unit No. 1 is located in the northwestern part of the Navajo Indian Reservation and comprises the northwestern part of the Western Navajo Jurisdiction. The Unit lies in Coconino County, Arizona, roughly between $110^{\circ} 45'$ and $111^{\circ} 30'$ west longitude and $36^{\circ} 15'$ and $37^{\circ} 00'$ north latitude. Kaibito, Arizona, the Unit Headquarters, is located approximately in the geographic center of the Unit.

C. Boundaries:

In general, the boundaries of the Unit are as follows: Beginning on the Colorado River at Lee's Ferry the Unit is bounded on the west by Echo Cliffs; on the south by the North boundary of Land Management Unit No. 3 along Crooked Ridge, Red Mesa, Little White Mesa and Blue Canyon; on the east by the west boundaries of Land Management Unit No. 4 and No. 2 along Blue Canyon, Black Mesa, and White Mesa; and on the north by Navajo Canyon and the Colorado River.

1. Boundary Changes:

Two boundary changes, both effective, were involved in this Unit. The first boundary change excluded the area between Echo Cliffs and Marble Canyon, and the area south of Crooked Ridge from the Unit. This area of 485,000 surface acres with 40,000 forage acres and a carrying capacity of 16,000 sheep units yearlong was added to Land Management Unit No. 3. The

change was proposed for reasons of usage, topography, and administration.

The second boundary change added to the original Unit 258,000 surface acres with 13,000 storage acres and a carrying capacity of 7200 sheep units yearlong. This area is located around Red Lake, Cow Springs, and Black Mesa, and was originally in Land Management Unit No. 3. Reasons for making this change were primarily usage and ease of administration from Kaibito rather than Tuba City.

D. Area:

The area of Land Management Unit No. 1 as compiled from the Range Management type maps is 1,035,540 surface acres. This figure includes the boundary changes as effective.

E. Roads, Schools, Hospitals, Etc.

The Tuba City-Kayenta road which crosses the southeastern portion of the Unit is the only road which is maintained at all seasons of the year. A bladed road also extends from Red Lake to Kaibito and Inscription House. Wagon trails and minor roads radiate from the main roads, so that nearly all the Unit is accessible to car.

The Tuba City-Kayenta telephone line crosses the southeastern portion of the Unit. Telephones are located at Red Lake, Kaibito and Cow Springs.

One day school is located at Kaibito.

The nearest hospital is at Tuba City. Field doctors and nurses from this hospital care for the medical needs of the Unit.

Trading posts within the area are located at Red Lake, Cow Springs, Kaibito, and Coppermine.

II. GENERAL DESCRIPTION

A. Climatology:

1. Elevation:

Elevation of the area varies from 7000 feet above sea level to 4600 feet on the Moencopi Wash. Average elevation over the area is approximately 6000 feet above sea level.

2. Precipitation:

Rainfall records applicable to this Unit are taken from Lee's Ferry, Tuba City and Kayenta. Average annual precipitation for these stations is 6.2, 6.9 and 8.3 inches, respectively.

3. Temperature:

Temperature records for the area were taken from the same climatological stations and show annual mean temperature of about 54° F, with a maximum of 114° F at Lee's Ferry and a minimum of -15° registered at both Kayenta and Tuba City.

4. Growing Season:

Killing frosts come as late as May 13 and as early as September 21, with an average growing season of 160 to 180 days.

B. Physical Geography:

1. Topography:

Topographically, the Unit is characterized by a broad, gently sloping, sandy plateau, broken by high mesas and deep canyons. The main topographical features of the area are: Echo Cliffs and Mormon Ridges to the west; Navajo Canyon and Glenn Canyon to the north; White Mesa, Kaibito Canyon and the head of Navajo Canyon on the east; and Black Mesa, Blue Canyon, and Wildcat Peak to the south.

2. Drainage and Run-off:

The northern part of the area is drained to the west by the Colorado River and its tributaries, Navajo Canyon and Kaibito Canyon. The eastern part of the area, Red Lake and Black Mesa, drains to the south through Blue Canyon and its tributaries. The entire area is in the Little Colorado and Colorado River watersheds. A large portion of the area to the south and west of Kaibito is of such a sandy nature that no run-off is to be expected.

3. Geology:

Practically all of this district is included in the Kaibito physiographic sub-province. The geological formations present are confined entirely to the Jurassic and Cretaceous and include the Navajo sandstone, Carmel, Entrada and Morrison formation of the Jurassic age and the Dakota, Mancos and Mesa

Verde formation of the Cretaceous age. The dominant formation is the Navajo sandstone which covers as much area in the Unit as all others combined.

Mr. Meeks, Junior Geologist, made the geological survey of the Unit.

4. Soils:

The majority of the soils of the Unit originate from sandstone and are highly susceptible to wind erosion when the vegetative cover has been partially or wholly removed. Soils are derived from the Navajo sandstone in the western half of the Unit, the Carmel formation in the north, the Entrada formation in the east, and scattered areas of Dakota sandstone and Mancos shales in the south and east. Soils of the latter classification are more susceptible to water erosion than the rest of the soils of the Unit.

Residual soils occupy the greater portion of the area and constitute the better class of grazing land.

5. Erosion:

Strong southwest winds, low rainfall, and light soils are responsible for the predominance of wind erosion. Partially stabilized sand dunes, ranging in depth from thirty-six inches to several feet, are common west of Kaibito. Small active sand dunes are sparsely distributed throughout the Unit, but are more frequent in the southern and southeastern portions of the Unit.

Extensive areas of barren sandstone dissected by deep

canyons are common to the north portions of the Unit. A shallow, severely wind blown, intermittent soil cover, spotted with accumulations of active dune sand, occupies the northwestern portion of the Unit.

Sheet and gully erosion prevail on the steep slopes of Black Mesa and White Mesa.

C. Vegetation:

Vegetation of the area is typical of the Upper Sonoran Zone. A few species typical of the Lower Sonoran Zone are present but in such limited quantities as to become unimportant. Species occurring in the area are as follows:

GRASSES

Blue Grama
Calleja grass
Spiny Muhley
3-Awn
Sand dropseed
Indian Rice
Black Grama
Saccaton

Bouteloua gracilis
Hilaria jamesii
Luhlenbergia pungens
Aristida spp.
Sporobolus cryptandrus
Oryzopsis spp.
Bouteloua eriopoda
Sporobolus aeroides

WEEDS

Russian thistle
Indian Wheat
Heath Aster
Sunflower
Lupine

Salsola pestifer
Plantago spp.
~~Leuceline~~ ~~Aster~~
Helianthus spp.
Lupinus spp.

SHRUBS

Black brush
Chamise
Mormon tea
Sand sage
Snakeweed
Yellowbush
Rabbitbush
Winterfat
Cliffrose

Colcogyne ramosissima
Atriplex canescens
Ephedra spp.
Artemisia filifolia
Gutierrezia spp.
Chrysothamnus greenii
Chrysothamnus bigelovii
Eurotia lanata
Cercocarpus stansburiana

TREES

Pinon
Juniper

Pinus edulis
Juniperus monosperma
Juniperus utahensis

In listing the above species an attempt was made to rank the various species according to abundance and importance.*

1. Vegetative types:

A table showing graphically the percentage and importance of the various vegetative types found in the area follows:

(See Page 9)

*Note: The figures obtained here for cultivated area were based on compilation of range type maps and include all land under fence adjacent to cultivated lands. They also include some area that was cultivated at the time the Extensive Grazing Survey was made of the area but which is now abandoned land, but may be farmed in future years. The Section of Agronomy reports 803 acres actually cultivated on the area.

Type	Surface Acres	Percent of Area	Forage Acres	Carrying Capacity S.No.	Pct. of C.C.
1. Grassland	249,094	24.05	38,713	185,922	45.20
4. Sagebrush	37,789	3.65	3,982	19,114	4.65
5. Browse	342,911	33.11	22,709	109,003	26.54
7. Waste	54,700	5.28			
8. Barren	32,213	3.11			
9. Woodland	317,107	30.63	20,149	96,715	23.88
Cultivated*	1,726	.17			
Total	1,035,540	100	85,553	410,654	100

2. Woodland Areas:

Woodland and browse each make up one-third of the area; grassland, one-fourth; waste and barren land, one-twelfth; and cultivated, less than one-eighth of one percent. Carrying capacity figures show a different relationship. Although grassland comprises only one-fourth of the area, it makes up 45% or nearly one-half of the carrying capacity. Browse and woodland each comprise about one-third of the area, but each makes up approximately one-fourth of the carrying capacity. This indicates a relatively low carrying capacity for woodland and browse types, and a relatively high average carrying capacity for grassland types. The entire area is in a low rainfall belt and a high

carrying capacity range over the entire area could not be expected.

3. Condition of Vegetation:

For the most part vegetation of the area has been over-used for so many years that a partial to severe depletion has resulted. Remaining palatable plants have lost a great deal of their vitality. Only relatively small amount of volume growth is forthcoming. A large area north of the Coppermine is exception. Here, condition of vegetation is good with, in most cases, adequate cover.

4. Poisonous Plants:

Poisonous plant species found in this area include loco, lupine, larkspur, isoconia, greasewood and cocklebur. Loco, lupine and larkspur are widespread over the area and are fairly abundant in the western part of the Unit, but are not causing severe death loss in livestock. Isoconia, greasewood and cocklebur are localized in alluvial valley floors.

As a whole, only small death losses were reported for the area and poisonous plant eradication is not at present economically feasible.

D. Water Developments:

Water development in this Unit is the most important problem facing range management plans. During the survey 125 water

supplies and developments were located, classified as follows:

- 20 permanent developed springs
- 9 permanent undeveloped springs
- 6 temporary undeveloped springs
- 6 temporary shallow wells
- 20 permanent shallow wells
- 3 permanent reservoirs
- 19 temporary reservoirs
- 32 reservoirs that are dry practically all the time
and cannot be counted on to furnish any live-
stock water.
- 4 drilled wells
- 1 drilled well (water supply gone dry)
- 2 shallow wells with windmills
- 3 permanent or nearly permanent streams

125 Total

Total permanent supplies	61
Total temporary "	31
Total dependable "	35

On this classification there is some kind of water supply or development on an average of every 8264 acres, a dependable supply, temporary or permanent, on an average of every 11,256 acres, and a permanent supply on an average of every 16,876 acres.

To apply an average figure for area in which water supplies are found in this Unit is very misleading. Whereas the developments as shown on the Vegetative Type map are rather uniformly scattered over the area, nearly all the permanent water is located in the central portion of the Unit (around Kaibito, Red Lake and Cow Springs). A very large area in the western portion of the Unit around the Coppermine and Kle Chee

is practically without water of any kind. Antelope reservoir and a few temporary wells in sandstone pockets furnish all the water available. To look at the distribution of developments on a map is misleading for it is in this area that so many charco types of reservoirs are constructed, nearly all of which have never caught water and which are located in sandy drainages where runoff is only slight in the heaviest of rainstorms.

The area north of Kaibito around Ste Skizzie is similar in that water is only of a temporary nature and not adequate to care for the needs of the livestock. An area on Black Mesa is likewise characterized by inadequate water.

In order to correct the condition of water in this Unit three drilled wells, two reservoirs and detailed geological surveys on the Ste Skizzie and Coppermine areas are proposed. Geological approval has been obtained on two drilled well locations and if water is obtained in these locations further detailed study might reveal other possible locations. If the wells prove to be dry, detailed study on rock slopes for the purpose of selecting cement or masonry dam sites is recommended. If water cannot be obtained in this area a change in the range management plan will be necessary, using those areas only when snow is on the ground.

E. Biological Aspects:

1. Rodents:

Heavy infestations of prairie dogs exist in approximately 200,000 acres in the following parts of the Unit: South of Kaibito along the Kaibito-Gap road; along the Kaibito-Red Lake road; and north of Kaibito in the area between Kaibito Canyon and Navajo Canyon. This entire area is good range land, and rodent control is recommended to prevent further range depletion.

The principal rodent over the entire Unit is the kangaroo rat, though less abundant and more widespread, damaging vegetation severely only in restricted areas around Red Lake. Ground squirrels and miscellaneous mice make up the remainder of the rodents in the area and damage is restricted to farm areas. (For further information see Biology Report.)

2. Predators:

Predatory animals in the Unit are coyotes and bobcats, with an occasional mountain lion. No losses were reported during the survey, but losses are often reported by the Indians. Predatory control is not recommended at present, but may be necessary in the future. (See Biology Report)

3. Livestock Pests and Diseases:

Scabies is effectively controlled by dipping. No cases of scab have been reported for this Unit for three years. Lice and ticks are quite prevalent, but are controlled to some

degree by dipping. Re-infection by using old bedding grounds and bedding in the same corral for long periods of time can be corrected by proper animal husbandry practices.

Grub-in-the-head is present, but not in large quantities, and causes only slight damage.

Screw worms are not reported.

Other livestock pests include the heel fly and bot fly. (See Biology Report.)

F. General Range Conditions:

There is adequate feed in the western portion of the Unit because of adequate rainfall and lack of permanent water. In the eastern portion of the Unit, because of adequate permanent water and in some instances very light and spotted rainfall, there is practically no available forage at the present time.

Feed over the entire Unit was coming good because of the heavy snowfall last winter. The Indians report more moisture in the soil this spring than any time for the same period in ten or fifteen years. Range soils are rather evenly distributed according to class over the entire Unit. High carrying capacity land in the north and west portions of the Unit are under, proper or moderately over-utilized, whereas the central and eastern portions are severely over-grazed (see Utilization Map). Range soils are in general very sandy and precaution of over-grazing should be taken to avoid consequent wind erosion that accompanies

range depletion.

The area as a whole is quite accessible to livestock, but is so sandy as to cause difficulty in car travel in dry weather. White Mesa and canyons running into Navajo Canyon are accessible only by stock trails and tend to segregate portions of the Unit.

There are probably more large owners of sheep in this Unit than in any other on the Reservation. Several herds number more than 2000 head.

G. Chief Values of the Land:

Of the total area, 1,035,540 acres in this Unit, 8.39% or 86,913 acres are classified as waste or barren and have no significant value from a resource standpoint. Thirty per cent or nearly one-third of the area is woodland, with stands of pinon and juniper. This furnishes posts, poles and fuel and comprises the forest resources of the Unit. There is at present 800 acres of farm land with only a small area of potential land. The entire area remaining has as its chief value range land. Forested areas throughout the Unit are of dual purpose, furnishing wood and wood products and also forage for livestock production. Range soils in the area are divided as follows: Class A, 20,000 acres; Class B, 370,000 acres; Class C, 300,000 acres; and Class D, 130,000 acres, and Class E 215,000 acres.

III. PAST AND PRESENT USE OF LAND

Because of its remote location and early addition to the Navajo Indian Reservation, the factor of white man usage in the area is a negligible factor. There is little land suitable for cultivation because of a lack of water for irrigation, either strict irrigation or flood irrigation. The land has been used primarily for grazing and bands of true Navajo sheep are to be found in the area practically uninfluenced by other breeds. When selecting stock to use in breeding experiments at the Navajo Sheep Breeding Experiment Station at Ft. Wingate, stock in this area and near Navajo Mountain were selected because of the little influence of other breeds of sheep. The herds had been maintained as in their original state because of remote location on the Reservation.

In the future the chief value of the land will be grazing and watershed values, the latter being significant over only a small portion of the area because of the sandy texture of the soil with a consequent very minor run-off.

A. Carrying Capacity:

The present carrying capacity for the Unit is 34,221 sheep units yearlong.*

*The forage acre requirement of 2.5 forage acres per sheep unit yearlong was used in computing the carrying capacity of the area, except in the buck pasture, where a forage acre requirement of 3 forage acres per sheep unit yearlong was used.

B. Season of Use:

The forage of the area is such that it can be grazed as yearlong range. There are, however, factors of water and cultivation that modify the usage at present. With the development of water of a permanent nature in the Coppermine Area, near Tsai Skizzie, and northeast of Kaibito the area can be used as yearlong range. The plan for seasonal use is dependent upon water development. If permanent water cannot be developed, the north and western portions of the Unit will of necessity become only winter range. (For description of livestock water see "Water Developments")

C. Livestock Numbers:

Livestock numbers as compiled from 1936 dipping records are as follows:

Grown Livestock Converted to Sheep Units from 1936 Dipping Records
 (Recompiled from Mr. S. Maddox's records according to boundary changes)
 Number of Owners Listed, 273. Number of Bands Dipped, 154

Class of Stock	Number of Head	Number of Units	Percent of Units	% of Units per Class to total Units Run
Ewes	26,223	26,223	54.95	Sheep 64%
Wethers	3,973	3,973	8.31	
Bucks	416	416	.87	
Grown Sheep	30,612	30,612		
Nannies	4,000	4,000	8.37	Goats 9%
Billies	142	142	.30	
Wethers	145	145	.30	
Grown Goats	4,287	4,287		
Cows	977	3,908	8.17	Cattle 10%
Bulls	71	284	.59	
Steers	96	384	.91	
Grown Cattle	1,144	4,576		
Mares	617	3,085	6.45	Horses 17%
Stallions	63	315	.66	
Geldings	723	3,615	7.56	
Mules & burros	264	1,320	2.76	
Grown Horses	1,667	8,535		
Total	37,710	47,810	100.	100

1936 Increase	Number of Head	Percent Crop Based on Grown Stock per Class
Lambs	13,024	45%
Kids	2,201	51%
Calves	468	41%
Colts	227	14%

Total grown sheep units run in 1936	47,810
Carrying Capacity sheep units yearlong	34,221
Number of sheep units overstocked	13,589
Percent overstocked	39.7%
Base Preference number	125

The 1936 dipping records had to be recompiled in order to obtain any idea of the stocking of the Unit after the boundary changes were made. This recompilation is accurate only to a certain degree and chance for error is great because of the large number of original dipping vat records that gave inadequate description of the range used by the band. The records will have to be corrected by the 1937 dipping vat records.

During the survey livestock movements were obtained, giving an estimate of the stocking of the Unit. From figures derived from this source 38,500 sheep and goats, 1,140 horses, mules and burros, and 1,960 cattle were enumerated. This figure is somewhat low, especially as far as horses are concerned. From field observation horse population was estimated at 2,500 head, and cattle at 2,000. This makes a total stocking, using this basis, of approximately 59,000 sheep units.

Until more accurate counts on livestock are obtained it will be very difficult to formulate plans for any program of livestock adjustment.

From the above figures one can see the present class of stock on the area. The livestock production enterprise is divided on an average for the whole area of sheep production, 64%; goat production, 9%; cattle production, 10%; and horse production, 17%. Since the above figures are low on horses, actual figures will lower the percentage of the other classes of livestock and raise

the figures on percentage of horses.

D. Utilization:

There is a very close relationship in this Unit between utilization and livestock water supplies. (See Map). In the central portion of the Unit around Kaibito, Cow Springs and Red Lake severe to very severe over-utilization is present. In the area to the west of Kaibito there is practically no water and usage is limited to the winter season. Here large areas exhibit proper utilization or, in many cases, under-utilization. In the areas around permanent water an abundance of unpalatable plants are present. Utilization has been severe enough to have twenty to forty percent or more of these unpalatable plants consumed by livestock. Trading posts and cultivated areas around Red Lake, Cow Springs and Kaibito have augmented the overstocked condition of these ranges during the summer months.

E. Distribution and Livestock Movements:

Concentration of livestock is of a seasonal nature. During summer months when temporary water is not available and farms are being cultivated, there is a serious concentration of livestock around Kaibito, Red Lake and Cow Springs. During the winter months the livestock are rather evenly distributed over the entire Unit.

There are two sections of boundaries on the Unit where

none too definite an economic or geographic line could be followed. There will be some crossing over of livestock from one Unit to another. Between Units No. 1 and 3 there will be some crossing over of livestock, but this shift should be only slight and compensatory. The same condition exists between Units No. 1 and 2, at Blue Lake and north of Cow Springs. Only actual application of the boundaries as they exist for a time and observations as to results will be the deciding factor in determining the need and desirability of making changes in the boundaries at these points. From all information available at the present time the boundaries are as suitable as can be established in regard to livestock shifts.

Movements of livestock within the Unit are an important problem facing land planning. There is a constant shift of livestock from Kle Chee and the Coppermine to Kaibito, Red Lake and Cow Springs. Distances of forty to sixty miles are not uncommon. Reasons for shift are primarily from summer to winter forage and to permanent water supplies and farms in the summer.

Development of permanent water in the Coppermine area and precaution against letting livestock concentrate around agricultural land will do much to remedy the present condition and decrease trailing of livestock from the central and eastern part of the Unit to the western part, with the consequent trampling and destruction of forage.

There is a definite tendency for livestock to concentrate around permanent water more than is necessary, especially around the new drilled wells. This not only puts an undue load on the range adjacent to these supplies, but in many cases uses more water than can be efficiently produced. For instance, while constructing the ram pasture, thousands of sheep were shifted to the area. They not only overgrazed the adjacent range with needless trampling of forage, but also kept the storage tank dry so that sheep were dependent upon immediate wind for water. In many cases this meant a herd did not receive adequate water for several days at a time.

F. Animal Husbandry Practices:

1. Selection:

In the larger herds selection is good for the most part. A large number of rather good breeding herds were noted during the survey. The smaller herds were of a distinct inferior quality and market type and, in many cases, retrogressive selection in the breeding herds is being practiced. Principal reason for this is the sale of the heavier lambs. The condition can be remedied to some extent by regulated breeding season so that lambs are of a uniform age.

Cattle as a whole are only of medium good type and quality and although a few individuals of good market type were seen, many were of an inferior grade.

Horses vary from very good individuals to a large number of small, scrubby "Indian ponies". The majority of the horses fall in the latter class.

2. Bucks and Bulls:

Bucks of good quality and market type are to be found on the area but continual improvement of the market type will be necessary in a range management program. The larger owners in the area have as a rule bucks of better body conformation and market type than the smaller owners. Larger owners also give more attention to the care of their rams than do the smaller owners.

Bulls in the area as a whole are rather good in quality and market type but many are old and of little value. Bulls are not given any special care during the winter and fall and are not in good serviceable condition at breeding time. As a result, there is a lower calf crop and many young calves are held over until the following fall for sale.

3. Breeding and Lambing:

The breeding season is yearlong, as is the lambing season. The majority of lambs come between January 15 and April 15. Too frequently there comes a cold spell of weather with a consequent large death loss among the lambs. There is little green feed in the area before April 15th. Lambing should not begin before this time. Preferably, lambing season should begin on an average of April 20. A lack of green feed and cold weather often result in

small stunted lambs, an undesirable market product.

Calves come at all seasons of the year, making a varied calf crop in age and size. For the most part the cattle are not marketed in this area as yearlings or older which to some degree compensates for the uneven age of calves in the fall.

4. Docking and Castrating:

Most lambs are docked too long, giving an undesirable shaggy appearance to the lamb. Lambs are as a rule not castrated at an early enough age.

5. Shearing:

Hand shearing is the universal practice over the area. No power shearing plants are at present available. Few fleeces are tied. It is a common practice to pick a sandy spot in which to shear and to bury the wool in damp sand so that it will absorb moisture and other waste materials to increase the weight of the wool. This not only makes an undesirable product but on the whole reduces the value per pound of Indian wool. To correct this improper practice central shearing plants should be constructed.

Fleeces are light and shearing takes place about six weeks to two months too early. Shearing should not take place until about June 1. A large amount of the slipping of the wool in the spring is not due to shedding, as is the common belief, but to lambing during severe weather conditions.

6. Herding:

Close herding and trailing of herds is a common practice throughout the Unit, especially in the smaller bands. Larger bands are herded more nearly in the proper manner. Herds are corraled early at night and held in corrals late in the morning. Use of the same corral for extended periods of time, even with the larger bands, is universally practiced. Goats present are more numerous in the smaller herds of sheep than in the larger herds. Much trampling of vegetation because of the presence of goats results from this practice. General herding practices among the larger herds, with the exception of use of bed-grounds over long periods of time, were far above the reservation average.

Education for correction of improper practices is needed.

7. Salting:

The practice of furnishing salt to livestock is none too prevalent in this Unit. There are some large stock owners that buy salt especially for their horses, but for the most part the smaller owners depend upon salt plants as their supply of livestock salt. Salt bush species are not abundant in this area and water for the most part is not alkaline enough to greatly reduce the salt requirements of stock. Salt requirement for sheep is 5 to 6 pounds per year; for cattle about 25 to 30 pounds. Using this figure, 75 to 100 tons of stock salt are required in the Unit. From reports obtained from traders by the Section of Human Surveys, only 10-1/4 tons of salt were sold in this Unit in the

past year. This is only a small fraction of the amount needed by the livestock. Saltbush is unable to furnish the deficiency and as a result serious depletion of chamise and other salt species has resulted.

8. Supplemental Feeding:

Supplying livestock with additional feed grown on farm land is only a small item. Some quantities of hay are fed to horses but, as agricultural land is limited, nearly all supplemental feed has to be imported to the area. With practically no potential agricultural land available for production of forage crops and a high freight rate for imported supplemental feed, supplemental feeding, except as is now practiced, will never be an important feature in the management of this Unit.

IV, RANGE MANAGEMENT OBJECTIVES

Primary range management objectives in the Unit should include:

- A. A livestock adjustment to present estimated maximum carrying capacity of the Unit as compiled from information obtained by the Extensive Grazing Survey of the area 1935.
- B. Development of water and maintenance of existing supplies and other range improvements which will result in the most beneficial and economical use of the grazing resources of the area.
- C. Distribution of livestock over the area which will result in efficient use of the available forage.

D. Allowance of enough horses to meet the needs of the people. The sparse population and sandy nature of the terrain increase the need for horses.

E. Demonstration and education of proper range management and animal husbandry practices so that increased monetary income may be realized per animal unit from the livestock production operation.

V. PLANS AND RECOMMENDATIONS

A. Proper Class of Stock:

Either sheep or cattle should be used to stock the area.

B. Proper Season of Use:

The area is to be stocked on a yearlong basis provided water can be developed so that this can be accomplished. If water cannot be developed the range management plans will have to be altered so as to use the area most efficiently. As a large area with a relatively high carrying capacity is without water at present, and possibilities of development are not too favorable, a further reduction in livestock may become necessary in order that the land adjacent to permanent water is not severely overstocked with consequent range depletion.

C. Proper Distribution:

Distribution of stock is again influenced by water developments. With further water developments the

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will be corrected to a certain degree. Proper herding methods will aid in correcting poor distribution. Special care should be taken to avoid concentration of livestock around agricultural areas, most of which are already in a seriously depleted condition. Range adjacent to permanent water should be used only when temporary water is not available. Livestock should be scattered over the entire area as uniformly as water and forage permit.

D. Proper Numbers of Stock:

The carrying capacity of the area is 34,221 sheep units yearlong or 410,654 sheep months. The area is to be stocked not to exceed this carrying capacity.* Even though a total carrying capacity is reached not in excess of the above numbers, numbers of stock for each sub-unit and even smaller areas should be constantly watched so as to conform to the carrying capacity of that sub-unit or smaller area.

E. Livestock Adjustments:

Reduction of livestock should begin with horses. Enough horses to meet the needs of the people but none in excess should be left. It is deemed advisable to leave six horses per family or eight to ten horses per consumption group where such group is large. Least desirable horses first.

Second should be cull and unproductive stock, old cows, steers, unserviceable bulls, old smooth or broken-mouth ewes,

*The carrying capacity of the area was computed on a basis of 2½ forage acres per sheep unit yearlong (1 cow is equivalent to 4 sheep units, and 1 horse is equivalent to 5 sheep units.)

wethers, undesirable rams.

Third should be goats.

Fourth should be productive stock but of undesirable quality and market type, taking into account age and body conformation.

It must be borne in mind that to avoid serious economical handicap to the already marginal and sub-marginal producers that adjustment of livestock must take place in the larger herds.

F. Proper Animal Husbandry:

1. Breeding:

A ram pasture is already constructed at Kaibito. Breeding dates should be from November 20 to January 5, so lambing season will begin April 20. At a rate of three bucks per one hundred ewes there will be approximately 700 bucks needed. This requirement has been met in the carrying capacity of the ram pasture. At present there is an inadequate number of rams. Rams of improved quality should be purchased to replace the inferior rams and to provide adequate sires.

Bulls should be culled and individuals of improved quality and market type imported into the area.

2. Shearing:

Shearing should start not earlier on an average than June

1. Central shearing pens at Antelope reservoir, the Coppermine, Kaibito, Red Lake and Cow Springs should be constructed so that proper shearing and proper handling of the wool will be made pos-

sible. Education of proper shearing methods, sorting and tying the fleeces should be carried out.

3. Herding:

Education and demonstration as to proper herding methods should be carried out. When the herds are so small that they cannot be efficiently or economically bedded out, a multiple corral system of bedding out should be started. Close herding, trailing, and herding from the rear instead of from the front of the herd are practices to be stopped.

G. Range Improvements:

Proposed water developments are seriously needed. Constant observation by the District Supervisor and his assistants as to further possible water development is necessary.

H. Livestock Population Records:

Information compiled from the 1957 dipping vat records will give a rather accurate count on sheep and goats for the area. It will be necessary for a cattle and horse round-up in order to obtain accurate information on numbers of those classes of stock.

Constant observation and check on livestock numbers will be necessary to give necessary information for range management planning.

RANGEMANAGEMENT PLAN

The area has been subdivided into five divisions or sub-units, according to topography, drainage and economic conditions. The tabular range management plan for the area follows:

Tabular Range Management Plan Land Management Unit No. I.					
Sub-Unit	Surface Acres	Forage Acres	Carrying Capacity S.U. Yl.	Carrying Capacity S.No.	Season of Use
1. Kle Chee	200,510	13,428	5,370	64,440	Yearlong
2. Coppermine	247,965	24,387	9,755	117,060	"
3. Kaibito	111,341	6,949	2,780	33,360	"
4. Tse Skiszie	131,117	11,893	4,727	57,084	"
5. Red Mesa	72,079	8,973	3,589	43,068	"
Cow Springs	177,678	11,878	4,751	57,012	"
Black Mesa	78,501	6,208	2,483	29,796	"
6. Buck Pasture	16,351	1,839	700 (Rams)	7,350	1-6/11-20
Total	1,035,540	85,553	34,186		

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LIVESTOCK MOVEMENTS

By A. B. Sombrero

The livestock movements in Land Management Unit No. 1 were obtained primarily by Albert F. Sombrero. The movements were obtained by questioning Indians.

Write-ups are made for each hogan visit and placed on a livestock movement map in order that present movements might be studied and an idea as to present need for boundary changes in the Unit might be obtained.

The numbers of write-up and numbers of sheep, cattle and horses all correspond with numbers on the livestock movement map.

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RANGE IMPROVEMENT SURVEY

Land Management Unit No. I

Part of the area included in this Unit was originally in L. M. U. No. 3. The survey of that area was conducted in December, 1936 and January, 1937. Maintenance proposed at that time has been completed on many of the projects.

During the survey each separate water supply, dipping vat, etc. was described according to standard procedure and recommendation for development and maintenance work were made.

The following pages include the description of the various range improvements and recommendations.

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