Chapter 3
Affected Environment

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3.0 Affected Environment

Chapter 3 describes the physical, biological, social, and economic environment of the West that would be affected by the proposed action or alternatives. Prime and unique farmlands, floodplains, and hazardous and solid wastes have been determined as not being affected by the proposed regulation and are not discussed.

Changes in Chapter 3 include the following:

- Clarifications or additions to avoid misunderstanding of intent or meaning, or to elaborate on a particular topic which the public requested further information:
  - Section 3.4, Grazing Administration- Added additional information concerning the responsibilities of the BLM to protect public rangelands.
  - Section 3.4.2, Implementing Changes in Grazing Use- Added a sentence to explain that not all changes in grazing use are due to undesirable resource conditions; some are made due to land use planning.
  - Section 3.4.3, Range Improvements- Text was added in response to the request for explanation of the process used to transfer any interest in range improvement between permittees or lessees.
  - Section 3.6, Fire and Fuels- language was added in response to a request for more information regarding the influence of human activities, including grazing, on the proliferation and spread of exotic annual grasses.
  - Section 3.8.3 and Table 3.8.3 were added to address water rights.
  - Section 3.12, Wild Horses and Burros- Removed reference to the year in the strategic goal of establishing AML. The year is only a strategic goal; however, it caused confusion because it was not consistent with the assumption upon which the EIS is based, and commenters felt it was unrealistic.
  - Section 3.15, Paleontological and Cultural Resources- The title was modified by adding the term "Heritage Resources" to denote that both paleontological and cultural properties are considered heritage resources. The term "properties" was also added to the title to help clear up confusion in the comments regarding physical expressions of culture and the social lifeways that ascribe them significance.
  - Section 3.15.2, Cultural Resources- The first paragraph was modified to remove language that caused confusion of the physical properties of culture and the lifeways which are abstract aspects of a social group.
  - Section 3.15.3, Cultural Resources Through Time- The last paragraph was modified to clear up confusing text regarding cultural properties and social lifeways.
- Changes in text to correct errors or misleading statements made in draft EIS:
  - Section 3.13, Recreation- the text made the incorrect statement that "recreationists from local or rural areas" tend to be less affected by

rangeland conditions. Comments correctly identified this as incorrect and the reference to "recreationists from local or rural areas" was removed.

- o Section 3.4.8, Rangeland Health- The acreage corresponding to allotments meeting (58,711,307) and not meeting (32,332,345) standards was removed. The number of acres not meeting rangeland health standards has been inconsistently reported since 1997. Some BLM State offices reported the actual acres not meeting standards when it was determined that an allotment did not meet all standards; other offices reported all acres in an allotment as not meeting standards if a determination was made that the allotment did not meet standards, even if a large proportion of the acres within the allotment met all standards. Therefore, it was determined that the numbers of acres are not reliable for analysis. However, the number of allotments has been consistently reported and is valid data for analysis.

- Changes in Chapter 3 to update information:
  - o Section 3.4.1, Issuing, Modifying, or Renewing Permits or Leases- The entire first paragraph has been replaced with a new paragraph which includes updated information and data, as well as language which further explains and clarifies the state of the permit renewal process.

3.1 General Setting

Bureau of Land Management land is grazed by livestock on 160 million acres of land in 15 States in the West, excluding Alaska. The area covered by this action is shown in Figure 1.1.

3.2 Physiographic Setting

The physiographic setting is classified according and directly derived from Robert G. Bailey's ecoregion division classifications and descriptions for the United States (Bailey 1995, 1997). Bailey delineated ecoregions utilizing a scale based on macroclimates. Through consideration of macroclimatic conditions, in combination with the plant formations produced by the macroclimates, Bailey subdivided the United States into ecoregions composed of three levels of detail.

The broadest level of detail is reflected within the domain level. The two domain levels within the effected environment in the United States are delineated primarily by the related climate, for example, the humid domain versus the dry domain. Within the two domain levels in the affected environment, Bailey further delineated 6 divisions. These divisions are classified according to the seasonality of precipitation or the degree of dryness and cold. Corresponding climate diagrams that assist in explaining the division description can be found in Bailey 1998a and 1998b.

The six divisions are divided further into 13 providences and 6 mountain providences. The providence level provides the greatest level of detail. The organization of providences is mainly concentrated on the uniformity of climate subtypes and corresponding plant formations. Mountain environments that further characterized providences through altitudinal zonation compromise the mountain providences.

3.2.1 Marine

Situated on the Pacific coast between latitudes 40 ° and 60 ° N is a zone that receives abundant rainfall from maritime polar air masses and has a rather narrow range of temperatures because it borders on the ocean.

Trewartha (1968) classifies the marine west coast climate as Do—temperate and rainy, with warm summers. The average temperature of the warmest month is below 72 ° F (22 ° C), but at least 4 months per year have an average temperature of 50 ° F (10 ° C). The average temperature during the coldest month of the year is above 32 ° F (0 ° C). Precipitation is abundant throughout the year, but is markedly reduced during summer. Although total rainfall is not great by tropical standards, the lower air temperatures here reduce evaporation and produce a very damp, humid climate with much cloud cover. Mild winters and relatively cool summers are typical. Coastal mountain ranges influence precipitation markedly in these middle latitudes. The mountainous coasts of British Columbia and Alaska annually receive 60 to 80 inches (1,530 to 2,040 mm) of precipitation and more. Heavy precipitation greatly contributed to the development of fiords along the coast—heavy snows during the glacial period fed vigorous valley glaciers that descended to the sea, scouring deep troughs that reach below sea level at their lower ends.

Natural vegetation in the Marine Division is needleleaf forest. In the coastal ranges of the Pacific Northwest, Douglas-fir, red cedar, and spruce grow to magnificent heights, forming some of the densest of all coniferous forests with some of the world's largest trees.

Soils are strongly leached, acid Inceptisols and Ultisols. Because of the region's low temperatures, bacterial activity is slower than in the warm tropics, so vegetative matter is not consumed and forms a heavy surface deposit. Organic acids from decomposing vegetation react with soil compounds, removing such bases as calcium, sodium, and potassium.

3.2.2 Mediterranean

Situated on the Pacific coast between latitudes 30 ° and 45 ° N is a zone subject to alternate wet and dry seasons, the transition zone between the dry west coast desert and the wet west coast.

Trewartha (1968) classifies the climate of these lands as Cs, signifying a temperate, rainy climate with the dry, hot summers indicated by the symbols. The combination of wet winters with dry summers is unique among climate types and produces a distinctive natural vegetation of hardleaved evergreen trees and shrubs called sclerophyll forest. Various forms of sclerophyll woodland and scrub are also typical. Trees and shrubs must withstand the severe summer drought (2 to 4 rainless months) and severe evaporation.

Soils of this Mediterranean climate are not susceptible to simple classification. Alfisols and Mollisols typical of semiarid climates are generally found.

3.2.3 Tropical–Subtropical Steppe

Tropical steppes border the tropical deserts on both the north and south, and in places on the east as well. Locally, because of altitude, plateaus and high plains within what would otherwise be desert have a semiarid steppe climate. Steppes on the poleward fringes of the tropical deserts grade into the Mediterranean climate in many places. In the United States, they are cut off from the Mediterranean climate by coastal mountains that allow tropical deserts to extend farther north.

Trewartha (1968) classifies the climate of tropical–subtropical steppes as BSh, indicating a hot, semiarid climate where potential evaporation exceeds precipitation, and where all months have temperatures above 32 ° F.

Steppes typically are grasslands of short grasses and other herbs, and with locally developed shrub- and woodland. On the Colorado Plateau, for example, there is pinyon–juniper woodland. To the east, in Texas, the grasslands grade into savanna woodland or semideserts composed of xerophytic shrubs and trees, and the climate becomes semiarid–subtropical. Cactus plants are present in some places. Soils are commonly Mollisols and Aridisols, containing some humus.

3.2.4 Tropical-Subtropical Desert

South of the Arizona–New Mexico mountains are the continental desert climates, which are arid with high air and soil temperatures. Direct sun radiation is strong, as is outgoing radiation at night, causing large variations between day and night temperatures and a rare nocturnal frost. Annual precipitation ranges from 4 to 8 inches. These areas have climates that Trewartha (1968) calls BWh.

The region is characterized by dry-desert vegetation, a class of xerophytic plants that are widely dispersed and provide negligible ground cover. In dry periods, visible vegetation is limited to small, hard-leaved or spiny shrubs, cacti, or hard grasses. Many species of small annuals may be present after rains have saturated the soil.

In the Mojave–Sonoran Deserts (American Desert), plants are often so large that some places have a near-woodland appearance. Well known are the treelike saguaro cactus, the prickly pear cactus, the ocotillo, creosote bush, and smoke tree. But much of the desert of the southwestern United States is in fact scrub, thorn scrub, savanna, or steppe grassland. Parts of this region have no visible plants; they are made up of shifting sand dunes or almost sterile salt flats.

A dominant pedogenic process is salinization, which produces areas of salt crust where only salt-loving (halophytic) plants can survive. Calcification is conspicuous on well-drained uplands, where encrustations and deposits of calcium carbonate (caliche) are common. Humus is lacking and soils are mostly Aridisols and dry Entisols.

3.2.5 Temperate Steppe

Temperate steppes are areas with a semiarid continental climatic regime in which, despite summer rainfall, evaporation usually exceeds precipitation. Trewartha (1968) classifies the climate as BSk; the letter k signifies a cool climate with at least 1 month of average temperatures below 32 ° F (0 ° C). Winters are cold and dry, summers warm to hot. The vegetation is steppe, sometimes called shortgrass prairie, and semidesert. Typical steppe vegetation consists of numerous species of short grasses that usually grow in sparsely distributed bunches. Scattered shrubs and low trees sometimes grow in the steppe; all gradations of cover are present, from semidesert to woodland. Because ground cover is generally sparse, much soil is exposed. Many species of grasses and other herbs occur. Buffalo grass is typical of the American steppe; other typical plants are the sunflower and locoweed.

The semidesert cover is xerophytic shrub vegetation accompanied by a poorly developed herbaceous layer. Trees are generally absent. An example of semidesert cover is the sagebrush vegetation of the middle and southern Rocky Mountain region and the Colorado Plateau.

In this climatic regime, the dominant pedogenic process is calcification, with salinization on poorly drained sites. Soils contain a large excess of precipitated calcium carbonate and are very rich in bases. Mollisols are typical in steppe lands. The soils of the semidesert shrub are Aridisols with little organic content, pedogenic and (occasionally) clay horizons, and (in some places) accumulations of various salts. Humus content is small because the vegetation is so sparse.

3.2.6 Temperate Desert

Temperate deserts of continental regions have low rainfall and strong temperature contrasts between summer and winter. In the intermountain region of the western United States between the Pacific coast and Rocky Mountains, the temperate desert has characteristics of a sagebrush (Artemisia) semidesert, with a pronounced drought season and a short humid season. Most precipitation falls in winter, despite a peak in May. Aridity increases markedly in the rain shadow of the Pacific mountain ranges. Even at intermediate elevations, winters are long and cold, with temperatures falling below 32 ° F (0 ° C).

Under the Koppen-Trewartha system, this is true desert, BWk. The letter k signifies that at least 1 month has an average temperature below 32 ° F (0 ° C). These deserts differ from those at lower latitudes chiefly in their far greater annual temperature range and much lower winter temperatures. Unlike the dry climates of the tropics, dry climates in the middle latitudes receive part of their precipitation as snow.

Temperate desert climates support the xerophytic shrub vegetation typical of semidesert. One example is the sagebrush vegetation of the Great Basin and northern Colorado Plateau. Soils of the temperate desert are Aridisols low in humus and high in calcium carbonate. Poorly drained areas develop saline soils, and dry lake beds are covered with salt deposits.

3.3 Drought

Drought is a temporary component of climate; it differs from aridity, which is restricted to ecosystems where low rainfall is a permanent feature of climate. On the majority of rangelands managed by the BLM, it is not a question of if drought will occur, but rather when it will occur and how long will it persist.

During drought, the quantity of moisture drawn from storage by transpiration increases, reducing soil moisture early in the growing season. This is reflected in lower water levels in shallow wells and in deep wells subject to recharge in the drought area. High temperatures aggravate the situation by increasing transpiration and evaporation requirements.

During drought, low soil moisture levels limit plant growth. Further, root growth is limited, making plants less able to extract scarce soil moisture. Litter, the dead portion of the previous season’s plant growth, insulates soils and thus reduces evaporative water loss, which provides more moisture for plant growth.

Many areas of the West have been experiencing mild to severe drought conditions since 1999.

3.4 Grazing Administration

Excluding Alaska, the BLM administers about 160 million acres within grazing allotments. Congressional authority and direction expressed through laws authorize or affect the BLM grazing administration on these allotments. These authorities primarily include the Taylor Grazing Act of June 30, 1934, as amended; the Federal Land Policy and Management Act of 1976; and the Public Rangelands Improvement Act of 1978. The responsibilities of BLM to protect public rangelands include:

- The Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands, Federal Land Policy and Management Act, U.S.C. § 1732(b)}.
- The goal of (public rangeland) management shall be to improve the range conditions so that they become as productive as feasible, Public Rangelands Improvement Act, 43 U.S.C. § 1903(b).
- Do any and all things necessary to stop injury to the public grazing lands by preventing overgrazing and soil deterioration and provide for the orderly use, improvement, and development of the public range, Taylor Grazing Act , 43 U.S.C. § 315a and 48 Stat. 1269.

The Department of Interior Code of Federal Regulations (CFR), BLM manuals and manual handbooks, Instruction Memorandums, Information Bulletins, and the Interior Board of Land Appeal orders and decisions further guide the BLM's grazing administration program. The CFR are the regulations that the Department of Interior establishes to carry out the laws enacted by the legislative branch. The regulations that govern grazing administration (excluding Alaska) are contained within 43 CFR Part 4100 Grazing Administration—Exclusive of Alaska.

The grazing administration program includes the issuing of permits, leases, and annual grazing licenses; billings and collections of grazing fees; inspections to verify that permittees and lessees are in compliance with the terms and conditions of their permits; leases, authorizations, and Federal regulations; preparing land use and activity plans; identifying and planning rangeland improvement projects; obtaining livestock management agreements; reviewing base property for compliance; conducting vegetative monitoring studies; and evaluating whether grazing management is achieving objectives.

3.4.1 Issuing, Modifying, or Renewing Permits or Leases

Between 1999 and the end of 2003, 12,119 grazing permits expired. BLM has completed the analysis and documentation required by NEPA and any necessary Section 7 ESA consultation on 85 percent (10,234) of those expired permits. In 1999 Congress recognized the difficulty of completing all NEPA and ESA requirements, as well as the new land health standards evaluations that have become part of the renewal process. Consequently, Congress has provided for conditional permit renewal under existing terms and conditions through a series of budget appropriation riders. This relief was provided to allow the backlog of permits that had developed by 1999 to carry over while BLM completes analysis of environmental impacts under NEPA and any necessary Section 7 consultation under ESA. Compliance with analysis requirements of NEPA has only been delayed, not circumvented. Between 2004 and 2009, 9,549 permits will expire. During this same time period 4,662 permits that have been or will be temporarily renewed under Congressional authority will be re-issued with full NEPA analysis and documentation, completely eliminating the backlog.

For each of the permits or leases issued in which there was a change in management (i.e., duration of use, class of livestock, numbers of livestock, or season of use), the

BLM analyzes the effects according to the NEPA process. The critical environmental elements are analyzed to document whether an effect occurred or did not occur to the element. While NEPA guidelines contain the process for analysis, the grazing regulations contain no context to the NEPA requirements for grazing permit or lease actions, or specify any additional critical elements that must be analyzed prior to the issuance of a permit or lease. Changes in grazing management require coordination with the grazing permittee or lessee, the state having lands or responsibility for managing resources within the area, and interested public, and often involve consultation under the Endangered Species Act.

A grazing permit or lease specifies permitted use (subpart 4110.2-2). Permitted use is granted to qualified holders of grazing preference. Permitted use shall include active use, any suspended use, and conservation use. The animal unit months (AUMs) of permitted use are attached to the base property.

3.4.2 Implementing Changes in Grazing Use

The BLM may modify the terms and conditions of the permit or lease (subpart 4130.3) when needed to manage, maintain, or improve rangeland productivity; assist in restoring ecosystems to properly functioning condition; conform with land use plans or activity plans; or comply with the provisions of Subpart 4180 (Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration). These changes are supported by monitoring, field observations, ecological site inventory, or other data acceptable to the authorized officer. Additional forage available on a sustained yield basis may be apportioned to qualified applicants for livestock grazing use consistent with multiple-use management objectives. The authorized officer will consult, cooperate, and coordinate with the affected permittees or lessees; the state with lands or managing resources within the area; and the interested public (subpart 4110.3-1). When monitoring or field observations show grazing use or patterns of use are not consistent with provisions in subpart 4180, or grazing use is otherwise causing an unacceptable level or pattern of utilization, or when use exceeds the livestock carrying capacity as determined through monitoring, the authorized officer shall reduce use or otherwise modify management practices (subpart 4130.3-2).

After consultation, cooperation, and coordination with the affected permittees or lessees; the state with lands or managing resources within the area; and the interested public; changes to permitted use shall be implemented through a documented agreement or decision (subpart 4110.3-3). Decisions shall be issued as proposed decisions, as described in subpart 4160.1, unless the authorized officer determines that resources on the public lands require immediate protection due to catastrophic events (flood, fire, or insect infestations) or when continued grazing use poses an imminent likelihood of significant resource damage. In this instance, after at least a reasonable attempt to consult with the above-mentioned parties, the authorized officer shall close all or a portion of an allotment or require modification of authorized grazing by issuing a final decision, which becomes effective upon issuance or on a date specified in the decision (subpart 4110.3-3(b)).

Most reductions to permitted use greater than 10 percent were made prior to the late 1980s. Since that time, most changes to grazing use involve changes to season of use or duration, and not livestock numbers. Some changes in grazing use may be made because of a reallocation of resources in a land use plan rather than because of undesirable resource conditions.

3.4.3 Range Improvements

The BLM cooperates in planning and financial partnership with permittees or lessees in the construction and maintenance of range improvement projects. Range improvements are "authorized physical modifications or treatments...designed to improve production of forage; change vegetation composition; control patterns of use; provide water; stabilize soil and water conditions; restore, protect and improve the condition of rangeland ecosystems to benefit livestock, wild horses and burros, and fish and wildlife." (43 CFR 4100.0-5). Typical range improvements include fences, wells, reservoirs, seedings, and corrals.

The BLM uses two instruments to authorize range improvements and provide for maintenance of structural improvements; the Cooperative Range Improvement Agreement (CRIA) and the Range Improvement Permit (RIP). The CRIA is used to authorize permanent improvements, and may be used by any person, organization or other government agency to share costs for constructing the improvement. Costs contributed by each party are documented in the CRIA. Title to permanent structural improvements constructed since 1995 is held by the United States. Title to these types of improvements constructed prior to 1995 is held jointly between the cooperators. Title to all nonstructural improvements is held solely by the United States.

The Range Improvement Permit (RIP) allows livestock permittees and lessees to construct or place removable improvements on public land. The permittee or lessee may hold title to the improvement if it is a livestock handling facility such as a corral, creep feeder, loading chute, or temporary water trough. Prior to 1995, the permittee could also hold title to other removable structures (e.g., fences, corrals) authorized by a RIP.

The three major changes to BLM range improvement construction policy made by the 1995 rules change are:

- All permanent water developments must be authorized under a CRIA
- Title to all permanent structural improvements are in the name of the United States rather than being shared with the cooperator in proportion to their contribution
- The permittee or lessee can hold title to a range improvement authorized by a RIP only if it is a livestock handling facility.

From 1982 to 1994, the BLM authorized 25,280 rangeland improvement projects under a CRIA or RIP; an average of 1,945 improvements per year. From 1995 to 2002, the BLM authorized 9,684 rangeland improvement projects, an average of 1,210 per year. The decrease in the number of range improvements constructed each year is attributable to a number of factors, including decreasing availability of public funds and shifting BLM work priorities. The 1995 change in CRIA title provisions may also have been a factor in the decrease. Table 3.4.3.1 provides the number of rangeland improvement projects by state and year.

The transfer of any interest or obligation in permanent range improvements is provided for in section 4110.2-3(a) (2) and section 4120.3-5. An application to transfer grazing preference must "evidence assignment of interest and obligation in range improvements authorized on public lands…"and "The terms and conditions of the cooperative range improvement agreement

Table 3.4.3.1. Number of rangeland improvement projects by state.

Fiscal Year	AZ	CA	CO	ID	MT	NM	NV	OR	UT	WY	Total
1982	120	125	280	290	410	209	243	318	227	177	2399
1983	180	103	245	333	481	242	191	491	428	211	2905
1984	120	128	192	245	437	161	165	202	232	183	2065
1985	112	173	181	213	332	148	159	209	188	390	2105
1986	110	88	180	232	312	148	181	149	198	135	1733
1987	114	119	216	231	284	113	159	159	246	238	1879
1988	168	120	275	164	255	155	121	146	257	161	1822
1989	155	70	189	214	246	228	117	190	243	196	1848
1990	142	34	179	233	300	183	141	138	183	183	1716
1991	66	64	267	192	328	180	163	228	145	204	1837
1992	56	46	282	156	329	249	102	160	133	217	1730
1993	61	47	286	147	323	300	62	214	119	134	1693
1994	69	46	213	133	286	218	125	197	107	154	1548
1995	67	44	242	116	159	278	70	241	102	181	1500
1996	44	34	172	91	118	106	70	204	125	98	1062
1997	25	35	225	91	211	118	76	161	118	141	1201
1998	20	38	183	104	224	92	82	161	102	102	1108
1999	29	44	178	133	165	99	111	217	86	167	1229
2000	58	55	243	112	209	106	122	244	140	169	1458
2001	31	41	130	133	141	50	132	140	40	138	976
2002	83	49	180	145	283	49	52	114	34	161	1150
Total	1830	1503	4538	3708	5833	3432	2644	4283	3453	3740	34964

Source: (BLM 2002c).

and range improvement permits are binding on the transferee." Under section 4120.3-5 the authorized officer shall not approve the transfer of grazing preference unless the transferee of existing range improvements as agreed to compensate the transferrer for their interest in authorized range improvements.

3.4.4 Involvement of Interested Publics

The grazing administration regulations include a definition for the involvement of interested publics in the decision-making process. The regulations define interested publics as an individual, group, or organization that has submitted a written request to the authorized officer to be provided an opportunity to be involved in the decision-making process for the management of livestock grazing on a specific allotment or has submitted written comments to the authorized officer regarding the management of livestock grazing on a specific allotment (subpart 4100.0-5). Within the present regulations, the interested public may decline to participate in the preliminary decision making process (i.e., formulation of a proposed grazing decision), but at a later date may become involved in the final decision making process (Appeals, subpart 4160.4). In addition, the grazing regulations specify that the BLM will cooperate, within the applicable laws, with state, county, or Federal agencies in regard to the administration of laws and regulations related to state cattle or sheep sanitary or brand boards and county or other local weed control districts (subpart 4120.5-2).

The BLM is required to consult, cooperate, and coordinate or seek review from the interested publics on the following actions:

1. Designating and adjusting allotment boundaries,
2. Increasing active use,
3. Implementing reductions in permitted active use,
4. Emergency closures or modifications to grazing use,
5. Development or modification of allotment management plans,
6. Planning (NEPA) of the range development or improvements,
7. Issuing grazing permits or leases,
8. Modification of permits or leases,
9. Reviewing or commenting on grazing evaluation reports, and
10. Issuing temporary, nonrenewable grazing permits or leases

3.4.5 Authorizing Temporary Changes in Use

In 2002, there were 18,142 grazing permits or leases on lands administered by the BLM. Grazing permits and leases are normally issued for a 10-year term, but in some circumstances may be issued for less, (e.g., rule of law, estate rules, and base property lease; subpart 4130.2). In 2002, 12.7 million Animal Unit Months (AUMs) were available for use, with 7.9 million AUMs authorized as active use and 4.8 million AUMs authorized as temporary nonuse or conservation use. (Table 3.4.5.1)

Temporary nonuse is typically requested by a permittee or lessee for convenience (such as for personal or financial reasons) and resource management. The permittee or lessee may apply for temporary nonuse for as long as 3 years, and the BLM has the discretion to accept or reject the application for nonuse. However, the BLM may use other methods to provide longer periods of rest from grazing (nonuse), for example, permittee or lessee mutual agreements, allotment closures, suspension through grazing decisions, and others, to achieve a variety of resource or vegetative objectives. This nonuse is not at the request

Table 3.4.5.1. Estimated authorized use and non use.

Fiscal Year	Authorized Use	Nonuse
2002	7,872,819	4,824,362
2001	8,112,008	4,664,361
2000	9,837,588	2,972,899
1999	10,087,988	2,906,895
1998	10,353,032	2,662,271
1997	9,445,482	3,624,694
1996	9,738,638	3,547,697

Source *BLM Public Land Statistics FY96-02* (BLM 2002c) of the permittee or lessee. Examples of this type of nonuse may be for post-wildfire rehabilitation, drought, prescribed fire management, riparian area recovery, or other reasons.

A permittee or lessee may apply for changes in permitted use that is maintained within the terms and conditions of the permit and the BLM may approve the application. The regulations do not address what is meant by “within the terms and conditions of the permit.” If the application for changes in use is received after the billing notice has been issued, the permittee or lessee would be subject to a service charge.

3.4.6 Prohibited Acts

The authorized officer has the ability to withhold issuance, suspend, or cancel a grazing permit or lease in whole or part, a free-use permit, or any other grazing authorization if a grazing permittee or lessee violates any of the provisions listed in prohibited acts (§4140.1). These prohibited acts are classified under three sections within the grazing regulations.

In general, the first set of prohibited acts states that permittees and lessees who perform the prohibited acts listed under subsection 4140.1(a) may be subject to civil penalties (e.g., cancellation of permit or lease in whole or part). Included in the list of prohibited acts under section (a), for example, are: “violating special terms and conditions incorporated in permits or leases”; “unauthorized leasing or subleasing”; and “failing to comply with the terms, conditions, and stipulations of cooperative range improvement agreements or range improvement permits.” This first section of prohibited acts is a major vehicle used by BLM to address grazing violations or to take direct action against permittees or lessees who are violating terms and conditions or their grazing permit or lease.

The second set of prohibited acts classified under §4140.1(b) applies to any persons (not just permittees or lessees) performing the prohibited acts included in this subsection. Anyone who violates these prohibited acts is subject to civil and criminal penalties. Included in this list are actions such as “allowing livestock....to graze on [BLM-administered] lands...without a permit or lease”; “damaging or removing U.S. property without authorization”; “molesting, harassing, injuring, poisoning, or causing death of livestock authorized to graze on these lands and removing authorized livestock without the owner’s consent”; “littering”; and “interfering with lawful uses or users including obstructing free transit through or over public lands by force, threat, intimidation, signs, barrier or locked gates.”

The third set of prohibited acts is included within §4140.1(c). Performance by a permittee or lessee of any of these prohibited acts is subject to civil penalties. However, there is an important distinction between these prohibited acts and those identified in the first two sets. Violations of these acts are subject to civil penalties if the following four conditions are met:

1. public land is involved or affected,

2. the violation is related to grazing use authorized by a BLM-issued permit or lease,

3. the permittee or lessee has been convicted or otherwise found to be in violation of any of these laws or regulations by a court or by final determination of any agency charged with the administration of these laws, and

4. No further appeals are outstanding.

The BLM has been unable to find an instance in which the BLM has utilized the third set of prohibited acts to take an adverse action against or penalize a BLM permittee or lessee.

3.4.7 Appeals

In order to provide permittees, lessees, and others an opportunity to communicate on BLM's grazing actions, the grazing administrative process contains a decision process that includes opportunities for public input. In general, the BLM issues a proposed grazing decision in which the interested publics and the permittee or lessee have 15 days to protest the proposed decision. If no protests are received by the authorized officer, the proposed grazing decision automatically becomes the final grazing decision. The final decision contains a 30-day appeal period upon receipt.

If the interested public or the permittee or lessee protest the proposed decision, the authorized officer must review the protest and either address or dismiss the protest rationale within the final grazing decision. The interested public or the permittee or lessee may appeal the final decision to the Office of Hearings and Appeals and request a stay of the decision. If a stay is granted, the decision is usually suspended pending the Office of Hearings and Appeals final determination. If a stay is denied, the final grazing decision is in force until the Office of Hearings and Appeals final determination.

This process is used within the permit or lease transfer process. For example, a permittee or lessee appeals a final decision concerning the grazing season on a permit or lease and a stay of the final decision is granted. The permittee or lessee must graze in accordance with the previous permit. If the permittee or lessee is a new applicant for the allotment and therefore has no previous permit for the allotment, the applicant must graze in accordance with the final decision.

3.4.8 Rangeland Health

Over time, many terms have been used to describe rangeland condition. The term "health" gained acceptance when the National Research Council used the term in the title of its 1994 report, *Rangeland Health—New Methods to Classify, Inventory, and Monitor Rangelands*. Although this was not the first time "health" was used to describe rangeland condition, it was the first time the term was applied in a broad sense and made available for the general public in a book published for non-technical audiences.

In an effort to provide a definition for rangeland health that multiple audiences could understand and accept, a working task force composed of research institutions, Federal agencies, and private organizations met in 1995 to develop standardized definitions for range management terms. The task force defined rangeland health as "the degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological processes of the rangeland ecosystem, are balanced and sustained. Integrity is defined as maintenance of the structure and functional attributes characteristic of a locale, including normal variability" (SRM 1999).

Whereas the soil, vegetation, water, and air are visible components of rangeland health, several essential ecological processes are often overlooked as important factors that contribute to rangeland health. The ecological processes include the water cycle (the capture, storage, and redistribution of precipitation), energy flow (conversion of sunlight to plant and animal matter), and nutrient cycle (the cycle of nutrients through the physical and biotic components of the environment; Pellant 2000). Within normal variation, these ecological processes will enable a rangeland to support a specific plant community. Maintenance of stable ecological processes within plant communities contributes to overall rangeland health. Once one of the ecological processes has deteriorated past the point of self-repair, the rangeland no longer meets the definition of a healthy rangeland. Since plant communities depend on ecological processes, management now focuses on ecological processes to evaluate if rangeland is healthy. (Pellant 2000; Stringham 2003).

The grazing regulation changes in 1995 initiated assessment of allotments for conformance to the standards for rangeland health. In general, these regulations specify that allotments must meet certain standards for rangeland health. The determination of whether an allotment meets or does not meet the standards for rangeland health is formulated through an allotment assessment and, if available, historical monitoring data.

When an allotment does not meet one of the standards for rangeland health and livestock grazing is a significant factor for the standard not being met or for non-conformance with a guideline, the grazing regulation directs the authorized officer to ensure that some type of action (e.g., grazing plan, noxious weed treatment, or another action) is implemented before the start of the next grazing season.

The BLM had assessed 7,437 allotments comprising 58,711,307 acres by the conclusion of fiscal year 2002 (BLM 2002). The BLM concluded that 5,671 allotments met all the standards for rangeland health. The remaining 1,766 allotments did not meet one or more of the standards. Existing grazing management practices or levels of grazing use were determined to be a significant factor in failing to achieve the standards and conform with the guidelines on 1,213 of these 1,766 allotments.

Expressed as a percent for additional perspective; 35 percent of all 21,273 BLM grazing allotments had been evaluated by the end of fiscal year 2002. This represents evaluation of more than 36 percent of all BLM land in allotments (BLM 2002). Of these assessed allotments, 76 percent were meeting all standards, 8 percent were not meeting all standards for reasons other than livestock grazing, and current livestock grazing management practices or levels of grazing use were determined to be a significant factor in the failure of the remaining16 percent of all allotments assessed to achieve the standards and conform to the guidelines.

3.5 Vegetation

The dominant vegetation within the affected environment exists on a type of land that is referred to as rangeland. Rangeland is classified as an area where the natural vegetation is dominated by grasses, forbs, and shrubs and the land is managed as a natural ecosystem (SRM 1999). In addition to providing forage for livestock and wildlife, rangelands also provide clean air, high quality water, habitat for native plant species, open space, and recreational opportunities.

Vegetation Types

The classification of vegetation types within the affected environment are displayed in Table 3.5.1. The map units in Figure 3.5.1 represent the subclass level of Table 3.5.1. These vegetation types were selected due to their consistency with the Federal Geographic Data Committee and the National Vegetation Classification Standard. The plant communities contained within the 14 vegetation types are listed in Table 3.5.2.

Figure 3.5.1. Vegetation classification: subclass.

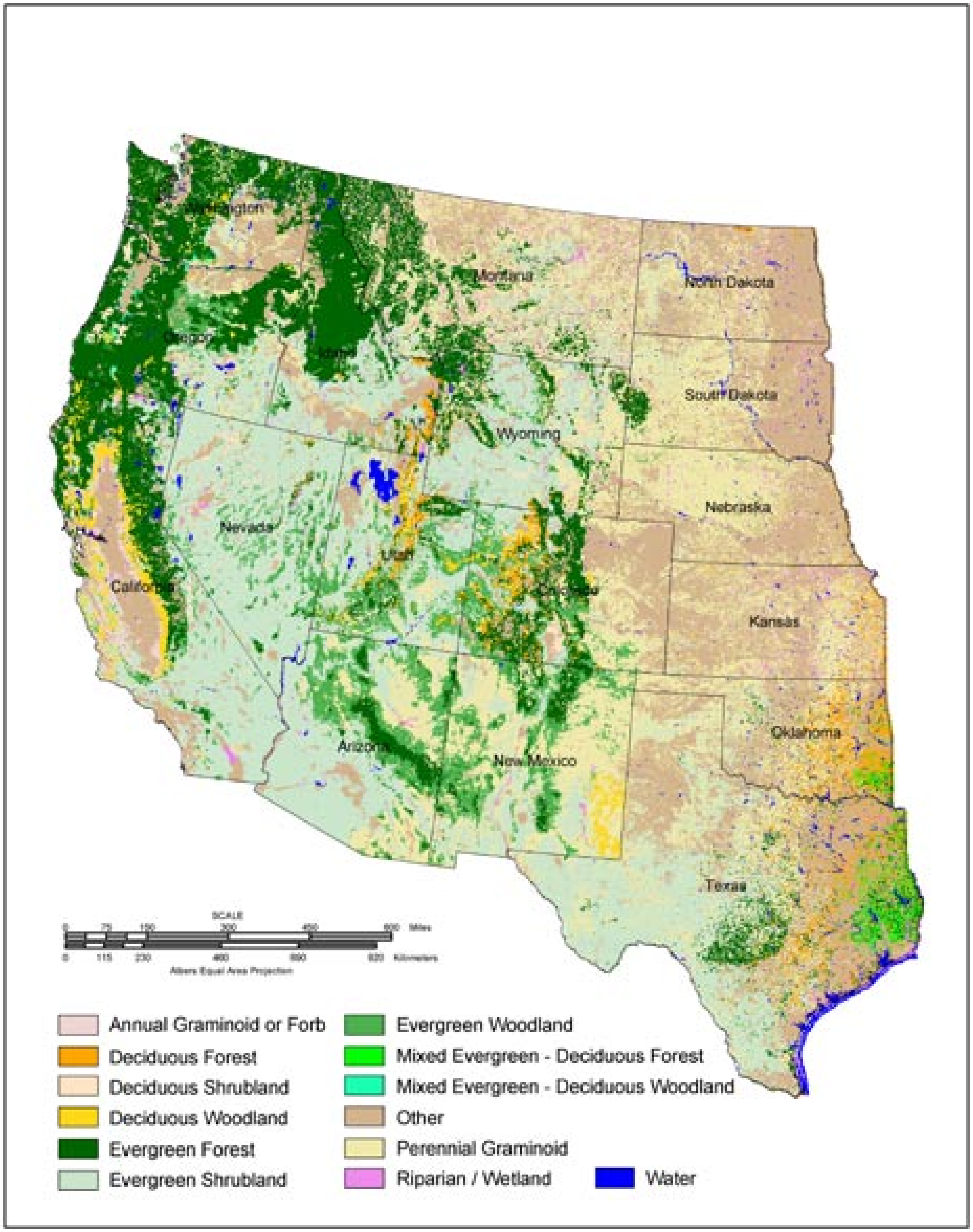


Table 3.5.1. Vegetation classification noting the division, order, and subclass of vegetation.

Division	Order	Class	Subclass
Vegetated	Tree Dominated	Closed Canopy	Evergreen Forest
			Deciduous Forest
			Mixed Evergreen–Deciduous Forest
		Open Tree Canopy	Evergreen Woodland
			Deciduous Woodland
			Mixed Evergreen–Deciduous Woodland
	Shrub Dominated	Shrubland	Evergreen Shrubland
			Deciduous Shrubland
			Evergreen Dwarf–Shrubland
			Deciduous Dwarf–Shrubland
	Herb Dominated	Herbaceous Vegetation	Perennial Graminoid
			Annual Graminoid or Forb
			Perennial Forb
Not included in National Vegetation Classification Standard			Riparian–Wetland

Table 3.5.2. Plant communities depicted within each of the 14 vegetation types.

Vegetation State	Plant Communities within Vegetative State
Evergreen Forest	Subalpine Spruce Fir–Mountain Hemlock, Red Fir, Mixed Sugar Pine, Ponderosa Pine, Ponderosa Pine/Shrub, Ponderosa Pine/Oak–Juniper–Pinyon, Jeffery Pine, Monterey Pine, Bishop Pine, Lodgepole Pine–Douglas Fir, White Fir–Douglas Fir, White Fir–Douglas Fir/Shrub, Douglas Fir–White Fir–Blue Spruce, Coastal Lodgepole Pine, California Bay, Eucalyptus, Inland Douglas Fir, Inland Douglas Fir–Western Red Cedar, Inland Western Red Cedar–Western Hemlock, Douglas Fir–Tanoak–Pacific Madrone, Douglas Fir–Sugar Pine–Ponderosa Pine, Douglas Fir–Ponderosa Pine–Incense Cedar, Pacific Silver Fir, Sitka Spruce, Ponderosa Pine–Lodgepole Pine, Colorado Mixed Forest, Western Larch–Grand Fir, Western White Pine, Grand Fir–Douglas Fir, Western Larch–Douglas Fir, Westside Western Hemlock–Western Red Cedar, Westside Douglas Fir–Western Hemlock, Westside Douglas Fir, Mountain Shrub/Clearcut, Costal Redwood
Deciduous Forests	Aspen, Aspen–Conifer, Bur Oak, Cypress, Ash, Maple, Russian Olive

Table 3.5.2 (continued). Plant communities depicted within each of the 14 vegetation types.

Vegetation State	Plant Communities within Vegetative State
Mixed Evergreen–Deciduous Forest	Combinations of the Evergreen and Deciduous Forest Types
Evergreen Woodland	Subalpine Fir, Knobcone Pine, Limber Pine, Manrean Pine, California Foothill Pine, Juniper, Pinyon Pine, Pinyon–Juniper, Chihuahua–Apache Pine, Madrean Pinyon Juniper
Deciduous Forest	Oregon White Oak, California Oak, Mixed Oak, Mesquite
Mixed Evergreen–Deciduous Woodland	Oregon White Oak–Conifer, California Oak–Conifer
Evergreen Shrubland	Southern Rockies Oak–Mahogany Shrub, Southern Rockies Oak–Manzanita Scrub, Bitterbrush, Interior Chaparral, California Chaparral, Mountain Mohogany, Sagebrush, Sagebrush/Perennial Grass, Rabbitbrush, Salt Desert Shrub, Blackbrush, Creosote–Bursage, Mojave Mixed Scrub, Great Basin Mormon Tea, Joshua Tree, Great Basin Saltbush Scrub, Mojave Creosotebush–Yucca, Shadscale–Mixed Grass–Mixed Scrub, Paloverde–Mixed Cacti–Scrub, Crucifixon Thorn Chihuahuan Creosotebush Scrub, Costal Dune Scrub, Costal Sage, Costal Scrub, Sandsage Shrubland
Deciduous Shrubland	Mesic Upland Shrub/Hardwoods, Warm Mesic Shrub, Greasewood, Hopsage, Catclaw Acacia, Smoketree, Scotch Broom
Evergreen Dwarf Shrubland	No examples on BLM Lands
Deciduous Dwarf Shrubland	Alaska and not within the affected environment of this EIS
Perennial Graminoid	Introduced Wheatgrass (e.g. Crested Wheatgrass, Intermediate Wheatgrass), Meadow, Forest Meadow, Alpine/Subalpine Meadows, Great Basin Grassland California Native Perennial Grassland, Foothills Grassland, Shortgrass Prairie Midgrass Prairie, Tallgrass Prairie, Desert Grassland, Semidesert Tobosa Grass–Scrub, Semidesert Mixed Grass, Chihuahuan Grassland

Table 3.5.2 (concluded). Plant communities depicted within each of the 14 vegetation types.

Vegetation State	Plant Communities within Vegetative State
Annual Graminoid or Forb	California Disturbed Grassland (the annual plant dominated Central Valley portion of California), Cheatgrass/Mustard, Medusahead, Red Brome, Japanese Brome Ventenata, Diffused Knapweed (annual or perennial), Yellow Starthistle
Perennial Forb	Spotted Knapweed, Russian Knapweed, Squarrose Knapweed, Rush Skeletonweed, Canada Thistle, Scotch Thistle (biennial), Whitetop (*Cardaria* spp.), Leafy Spurge, Mediterranean Sage, Purple Loosestrife, Dalmatian Toadflax
Riparian–Wetland	Wet Graminoid, Wet Forb

Evergreen Forests

Evergreen forests are a tree dominated landscape. The canopy of the trees has overlapping crowns generally forming 60 to 100 percent of the vegetative cover. In the evergreen forests subclass the evergreen species contribute greater than 75 percent of the total tree cover.

Deciduous Forest

Deciduous forests are a tree dominated landscape. The canopy of the trees has overlapping crowns generally forming 60 to 100 percent of the vegetative cover. In the deciduous forests subclass the deciduous species contribute greater than 75 percent of the total tree cover.

Mixed Evergreen–Deciduous Forests

Mixed evergreen–deciduous forests are a tree dominated landscape. The evergreen and deciduous species each generally contribute 25 to 75 percent of the total tree cover. This would include semideciduous, semievergreen, mixed evergreen–deciduous xeromorphic and mixed needle-leaved evergreen-cold deciduous woody vegetation.

Evergreen Woodland

Evergreen woodland is a tree dominated landscape. The area is classified as open stands of trees with crowns not usually touching. The trees generally form 25 to 60 percent of the vegetative cover. There are instances when tree cover may be less than 25 percent in cases when the cover of each of the other life forms present (i.e. shrub, dwarf shrub, herb, nonvascular) is less than 25 percent and tree cover exceeds the cover of the other life forms. Evergreen species contribute greater than 75 percent of the total tree cover.

Deciduous Woodland

Deciduous woodland is a tree dominated landscape. The area is classified as open stands of trees with crowns not usually touching. The trees generally form 25 to 60 percent of the vegetative cover. There are instances when tree cover may be less than

25 percent in cases when the cover of each of the other life forms present (i.e. shrub, dwarf shrub, herb, nonvascular) is less than 25 percent and tree cover exceeds the cover of the other life forms. Deciduous species contribute greater than 75 percent of the total tree cover.

Mixed Evergreen–Deciduous Woodland

Mixed evergreen–deciduous woodland is a tree dominated landscape. The area is classified as open stands of trees with crowns not usually touching. The trees generally form 25 to 60 percent of the vegetative cover. There are instances when tree cover may be less than 25 percent in cases when the cover of each of the other life forms present (i.e., shrub, dwarf shrub, herb, nonvascular) is less than 25 percent and tree cover exceeds the cover of the other life forms. Evergreen and deciduous species contribute 25 to 75 percent of the total tree cover. This would include semideciduous, semievergreen, mixed evergreen–deciduous xeromorphic and mixed needle-leaved evergreen-cold deciduous woody vegetation.

Evergreen Shrubland

Evergreen shrubland is a shrub dominated landscape. The shrubland classification has shrubs greater than 0.5 meters tall with individuals or clumps not touching to overlapping. The shrub component generally forms greater than 25 percent of the canopy cover. The tree cover is generally less than 25 percent. Shrub cover may be less than 25 percent in cases where each of the other life forms present is less than 25 percent and the shrub cover exceeds the other life forms. The evergreen shrub species contribute greater than 75 percent of the total shrub cover.

Deciduous Shrubland

Deciduous shrubland is a shrub dominated landscape. The shrubland classification has shrubs greater than 0.5 meters tall with individuals or clumps not touching to overlapping. The shrub component generally forms greater than 25 percent of the canopy cover. The tree cover is generally less than 25 percent. Shrub cover may be less than 25 percent in cases where each of the other life forms present is less than 25 percent and the shrub cover exceeds the other life forms. The evergreen shrub species contribute greater than 75 percent of the total shrub cover.

Evergreen Dwarf Shrubland

There are no examples of evergreen dwarf shrublands on BLM lands.

Deciduous Dwarf Shrubland

Vegetation types included within the deciduous shrubland subclass are located in Alaska and are not within the affected environment.

Perennial Graminoid

A perennial graminoid area is dominated by at least 25 percent of the total vegetative cover formed of perennial graminoids. Trees, shrubs, and dwarf-shrubs form less than 25 percent of the total vegetative cover. Perennial graminoid cover may be less than 25 percent of the total vegetative cover, but it will still exceed the total vegetative cover of other life forms.

Annual Graminoid or Forb

An annual graminoid or forb area is dominated by at least 25 percent of the total vegetative cover formed of annual graminoid or forb. Trees, shrubs, and dwarf-shrubs form less than 25 percent of the total vegetative cover. Annual graminoid or forb cover may be less than 25 percent of the total vegetative cover, but it will still exceed the total vegetative cover of other life forms. Vegetation types included within the annual graminoid or forb subclass are:

Perennial Forb

A perennial forb area is dominated by at least 25 percent of the total vegetative cover formed of perennial forb. Trees, shrubs, and dwarf-shrubs form less than 25 percent of the total vegetative cover. Perennial forb cover may be less than 25 percent of the total vegetative cover, but it will still exceed the total vegetative cover of other life forms. Vegetation types included within the perennial forb subclass are

Riparian–Wetland

Various definitions of riparian–wetlands exist in the publications. In general, the riparian–wetland subclass is highly influenced by the presence of water in the form of flowing rivers, streams, creeks, groundwater or in the form of standing water as in reservoirs, bogs, and pits. Vegetation types within riparian–wetland areas would include wet graminoids and wet forbs.

Other

Other is largely classified as private farm lands and is not within the affected environment.

BLM Vegetation Management

BLM's goal is to manage the public lands on a multiple-use and sustained yield basis. Among the uses and values of the vegetation are forage for livestock and wildlife. Land use plans may provide broad vegetation management objectives. More specific managment objectives are found in activity plans. For example, grazing allotment management plans generally contain vegetation management objectives.

In this document, the rangeland vegetation is divided into upland and riparian sections.

3.5.1 Upland Vegetation

Vegetation on the public lands can be described and evaluated in many ways. In the early 1900s, the rangeland management field was undergoing a formation of theories for the understanding of how vegetation responds to introduced activities, such as livestock grazing, and natural disturbances, such as fire. In 1916 Clements introduced the theory that rangeland has a single persistent state, "the climax" (Clements 1916). This theory is referred to as the Clementsian theory of range succession and became widely embraced within the ecological field.

The Clementsian theory provides a linear nature of vegetation succession. According to Stoddard, Smith, and Box (1975), "retrogression may be caused by drought, fire, or grazing. If this action is temporary, a succession leading back to climax follows." In other words, once a disturbance such as grazing was removed from an area, that area would return to the vegetative community that existed before the disturbance.

In 1949, Dyksterhuis utilized the principles of the Clementsian theory to classify the condition of rangeland. This rangeland condition classification and succession process relied on comparing the present vegetation of an area to the vegetation that was thought to be original to the site, referred to as the "climax vegetation" (Dyksterhuis 1949). Using the climax vegetation at the pristine condition, Dyksterhuis proposed classifying rangeland as excellent (climax vegetation), good, fair, or poor.

The Dyksterhuis range succession model was adopted worldwide to provide the framework for the management of rangelands. But over time researchers and land managers recognized that the Clementsian theory and the Dyksterhuis range condition model did not adequately describe the ecological situation that exists in arid and semiarid rangelands. These arid and semiarid rangelands were not returning to the original vegetative community once a disturbance was removed from the system.

Westoby et al. (1989) introduced the state-and-transition model that provided the framework for modeling the vegetative changes occurring on arid and semiarid regions. The main departure from the Clementsian theory was that arid or semiarid rangelands may never return to the original vegetative community once a disturbance is removed. The framework they provided allowed for "states" and "transitions". A state is"an abstraction encompassing a certain amount of variation in space and time"; a transition is "the movement between states".

Freidel (1991) added to the state-and-transition model by envisioning that once a threshold is crossed a new state is formed. Without intensive inputs, a return to the original state is not possible. Additional research and comments (Laycock 1991; Tauch et al. 1993; Iglesias and Kothmann 1997; Stringham 2003; and Bestelmeyer 2003) provided additional refinement and illustrated applications of the state-and-transition model.

A state-and-transition model for arid and semiarid rangeland contains state, transitions, and threshold definitions:

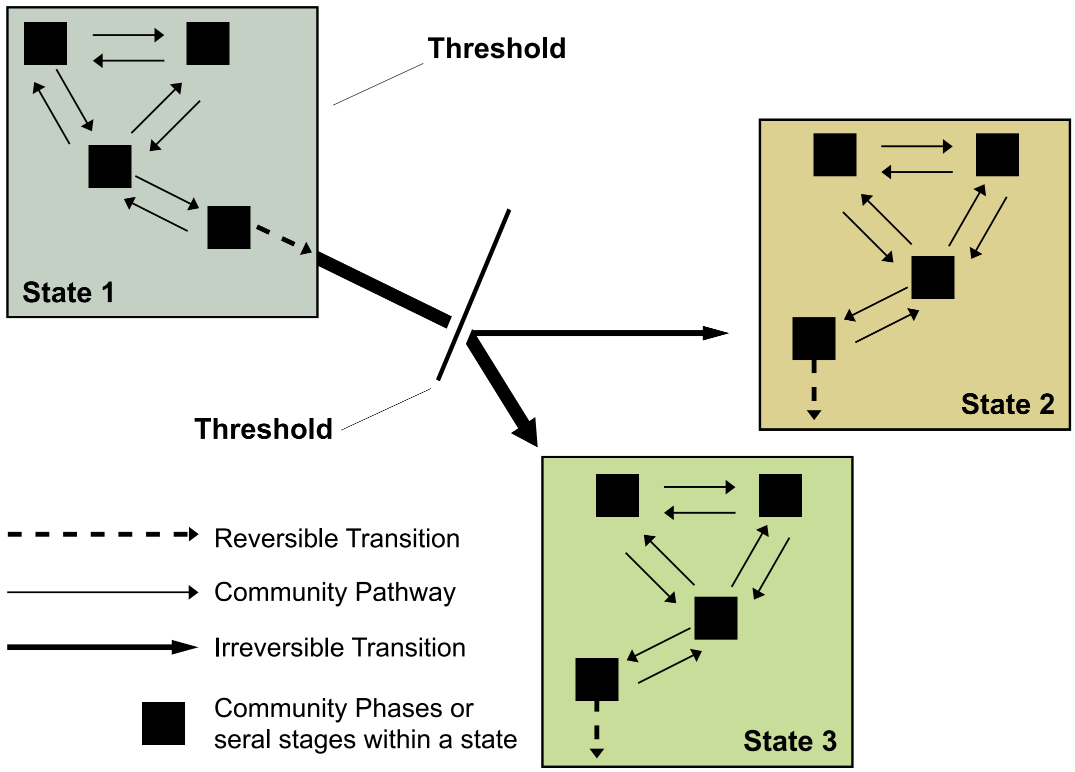
- State—A variety of vegetative communities that are a function of the soil complex and the vegetative community that inhabits the complex (Stringham et al. 2003).
- Transition—A change from the present stable state that is triggered by natural events, management actions, or both (Stringham et al. 2003). A transition can be:
    - Reversible if it occurs within the state and it is possible to return the existing vegetative community back to the original vegetative community without large inputs and is in managerial timeframe
    - Irreversible if the transition crosses a threshold where it is impossible to return to the original vegetative community without large inputs of energy.
- Threshold—A point in space and time at which a state is no longer able to maintain its present condition. Once this threshold is crossed a new state is formed and it is not possible to revert back to original state without significant inputs.

With the incorporation of the additional information, state-and-transition models continue to be refined to provide an accurate description of how upland vegetation responds to management activities or natural disturbances. Figure 3.5.1.1 illustrates how a state-and-transition model would be applied to upland vegetation.

Condition and Trends

The vegetation on the public lands is a dynamic, living system that changes over time. As mentioned above, methods to assess the condition of vegetation has also changed over time. However, since 1934 the public lands have had managed livestock grazing and conditions have continued to improve. Although conditions have improved, there are still a number of acres that are dominated by invasive or exotic species and have not returned to the potential natural community.

Figure 3.5.1.1. State-and-transition model incorporating the concepts of community pathways between plant community phases within states, reversible transitions, multiple thresholds, irreversible transitions, multiple pathways of change, and multiple steady states (Stringham et al. 2003).



The BLM National Rangeland Inventory reporting system is based on a vegetative condition rating by comparing percent composition, by weight and species, of the existing vegetation to the potential natural plant community that the site can produce. The 2002 National Rangeland Inventory reflects the following:

Potential Natural Community—6%
Late Seral—31%
Mid Seral—34%
Early Seral—12%
Unknown or Unclassified—17%

Monitoring and data collection used to determine upland conditions are also used to formulate trend for upland vegetation. Trend is classified as up, static, down, or undetermined. An "up" trend rating is correlated with the upland vegetation progressing toward the potential natural community. A downward trend is correlated with the upland vegetation moving away from the potential natural community. Static trend is classified as the vegetation not moving away from or toward the potential natural community for the upland vegetative communities. The national trend from the 2002 National Rangeland Inventory for vegetation is:

Up—21%
Static—51%
Down—12%
Undetermined—16%

3.5.2 Riparian and Wetland Vegetation

Riparian areas are highly productive and unique wetland environments that are found adjacent to rivers and streams. Riparian communities are often referred to as “ribbons of green” in the arid western United States. Though estimates vary, it is generally agreed that riparian ecosystems comprise less than 1 percent of the surface area in the 11 western States (Cooperrider et al. 1986; Ohmart 1996). Riparian communities in the western United States are the most productive habitats in North America (Johnson et al. 1977), and provide important wildlife habitat for breeding, wintering, and migration. An estimated 75 percent of the vertebrate species in Arizona and New Mexico depend on riparian habitat for some portion of their life history (Johnson et al. 1977).

Riparian areas combine the presence of water, increased vegetation, shade, and a favorable microclimate to create the most biologically diverse habitat found on BLM lands. Riparian areas are highly prized for their recreation, fish and wildlife, water supply, and cultural and historic values, as well as for their economic values related to livestock production, timber harvest, and mineral extraction (BLM 1998). In the semiarid West, healthy functioning riparian areas perform several critical functions:

- Improve water quality through filtering and sediment removal
- Stabilize streambanks
- Soil retention
- Dissipate stream energy during high flow events (reduced flood damage)
- Provide water, forage, and shade for wildlife and livestock
- Act as migration corridors for wildlife and birds
- Create opportunities for recreation (fishing, camping, picnicking, hiking)
- Maintain in-stream flows and restore perennial flow
- Maintain aquatic habitat for healthy fish populations
- Raise and maintain the water table
- Increase habitat diversity for wildlife and plants
- Enhance aesthetics

Problems with riparian function generally occur in four ways:

- Alterations in streamside vegetation and soil conditions,
- Changes in channel morphology (water velocity, water table, width-to-depth ratio, substrate composition),
- Altered water temperatures, nutrient loads, sediment loads, bacterial counts, or
- Degradation and erosion of streambanks (Platts 1989; Johnson 1992).

Grazing effects on vegetation and streambank vegetation are important to riparian function (Elmore and Beschta 1987; Platts 1989; Johnson 1992). A range of livestock management strategies that are compatible with riparian restoration are available including timing, duration, and frequency of grazing use or livestock exclusion (Elmore and Kaufman 1994; Platts 1990; Kovalchik and Elmore 1991; and Johnson 1992). A number of successful approaches have relied on applying grazing management in cooperation with the grazing operator, sometimes on both public and private lands.

Riparian areas were greatly altered by early grazing practices prior to the Taylor Grazing Act of 1934 which established control over livestock grazing practices on the public domain (Leopold 1946). Riparian restoration is becoming more widespread and common in every region of the country (Natural Resources Law Center, 1996). The Government Accounting Office review of 22 stream restoration efforts in the West (1988) concluded that there were "no major technical impediments" to riparian restoration. In fact, stream classification systems and assessment tools are well developed (Kenna et al. 1999). Successful restoration efforts consider the complex relations of riparian function and the role of vegetation, which again suggests the importance of grazing management (Elmore and Beschta 1990; Elmore and Kaufman 1994).

Multiple factors, including livestock grazing, often affect riparian systems, indicating the need for careful analysis of contributing factors and management options (Elmore and Kaufman 1994; Adams and Fitch 1995; Hunter 1991; Reeves et al 1991; Robbins and Wolf 1994; Todd and Elmore 1997; Furniss et al 1991). But the primary focus is restoring streamside vegetation (Elmore and Beschta 1987). While livestock exclusion can be a solution (Elmore and Kaufman 1994), changes in livestock management can often also be effective without the expenditures for exclosure fences (Elmore and Beschta 1987; Kinch 1989). Strategies for riparian restoration involving timing, duration and frequency of grazing use have been addressed by Elmore and Kaufman (1994), Platts (1990) Kovalchik and Elmore (1991), and Johnson (1992). Some of the most prominent, large-scale riparian restoration successes, such as Bear Creek drainage and Trout Creek Mountains in Oregon, have relied on cooperation to create long-term, sustainable restoration and grazing management actions (Kenna et al. 1999).

The potential for long-term restoration results through a cooperative effort are probably best illustrated by the changes implemented on Bear Creek in Oregon, initiated under a 1973 watershed plan. Based primarily on changes in grazing management (timing and duration), the riparian plant community increased by 76 percent, eroding and damaged banks decreased by 90 percent, and 17 percent to 26 percent increases occurred in the grass–sedge–rush community between 1978 and 1994 (Rasmussen 1995; Chaney et al. 1990), at the same time available livestock forage increased. Bear Creek and other case studies suggest that reliance on reducing numbers of livestock, while it may produce changes in upland vegetation, may be less important to riparian improvement than other factors (Platts 1990; Kenna et al. 1999).

The response to restoration practices may vary according to riparian area characteristics or conditions. Clary et al. (1996) suggested that past grazing practices at their study site in eastern Oregon probably altered conditions, such that a wide range of grazing treatments (including no grazing) for a period of 7 years resulted in few differential responses by plants or animals. In some cases, recovery of native riparian vegetation may be very slow due to deterioration of stream condition (downcutting, widening), dominance of non-native annuals within the riparian area, or loss of native seed sources (Clary et al. 1996).

In 1993, the BLM adopted the Process for Assessing Proper Functioning Condition (PFC; BLM 1993) as its standard methodology for determining the condition on riparian resources on public lands. The BLM has aggressively undertaken the task of conducting PFC assessments on its lands, resulting in a decrease of sites classified as Unknown from 55 percent in 1993 to only 4 percent in 2001. As a result of its commitment to the standardized PFC assessment technique, the BLM has compiled several years of information on the status and trends of riparian conditions on lands under its management.

Riparian habitat on BLM lands in the lower 48 States includes 34,137 miles adjacent to flowing water (lotic systems) and 328,660 acres of riparian habitat associated with standing water (lentic systems). As of October 2001, the condition of approximately 96 percent of lotic riparian areas on BLM lands in the lower 48 States had been assessed using the Proper Functioning Condition (PFC) assessment technique (BLM 2002). Overall, 42 percent were classified as being in Proper Functioning Condition, 43 percent as Functioning-At-Risk (FAR), 11 percent as Non-Functional, and 4 percent as Unknown (see Figure 3.5.2.1; BLM 2002). Of the miles in the FAR category, 36 percent were in an upward trend, indicating that the condition is improving and no changes in management are immediately needed. In September 1990, the BLM published its Riparian-Wetland Initiative for the 1990s (BLM 1990). The Initiative set the goal of restoring or maintaining riparian–wetland areas so that 75 percent or more would be in PFC by 1997. The fact that only 42 percent of BLM's lotic riparian areas were classified as PFC in 2001 illustrates riparian systems have not responded as quickly as desired.

As of October 2001, the condition of approximately 67 percent of lentic riparian areas on BLM lands in the lower 48 States had been assessed using the PFC assessment technique (BLM 2002). Overall, 51 percent were found to be in PFC, 15 percent in FAR, 2 percent in Non-Functional, and 32 percent were Unknown (BLM 2002; see Figure 3.5.2.2. Over the past 15–20 years, the BLM has focused a great deal of its restoration efforts on riparian areas. Riparian areas typically respond quickly to management changes, and in some instances recovery has been dramatic. Many of the restoration efforts have been in highly visible areas, providing opportunities to increase public exposure to, and understanding of, riparian function. While the apparent trend based on the percentage in Properly Functioning Condition shows improvement from 36 percent to 42 percent in miles of stream, and from 41 percent to 51 percent in wetland acres, these percentages are affected by shifts of

Figure 3.5.2.1. Condition of lotic riparian areas on BLM lands (lower 48 states), 2001.

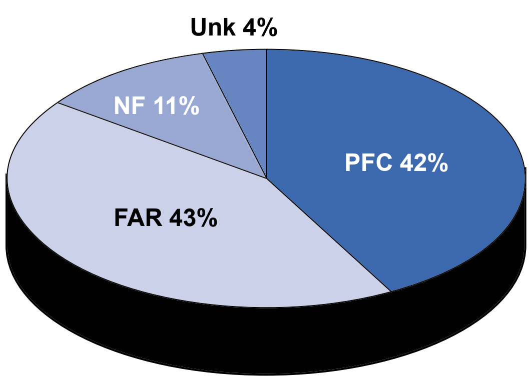
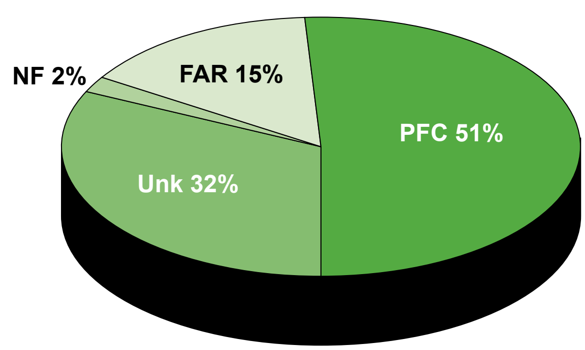


Figure 3.5.2.2. Condition of lentic riparian areas on BLM lands (lower 48 states), 2001.



16 percent and 12 percent percent out of the unknown classification, reflecting the BLM's effort to develop a more complete inventory of the condition of riparian resources (see Table 3.5.2.1 and Table 3.5.2.2). In future years, the aggregate condition trend for streams should be more readily apparent with the relatively low mileage (4%) in the unknown classification.

3.6 Fire and Fuels

Recurring fires are often an essential part of the natural environment—as natural as the rain, snow, or wind (Hardy et al. 2001). Evidence of past fires can be found in charcoal layers of lakes, in fire scars on trees, and adaptations of many plants. Many ecosystems in North America are fire dependant (Heiselman 1978).

Before European settlement, fire was the most common influence on the landscape in the Intermountain West (Gruell 1983), and in most of the Southwest (Wright 1990). In the drier parts of the West, the significance of the effects of fire on vegetation is difficult to separate from the effects of drought (Wright 1990). Woody species have become dominant in areas where frequent fires used to inhibit them. A loss of species diversity and site degradation has occurred from human intervention in fire regimes. This has correlated into larger and more severe fires in the last few decades.

Table 3.5.2.1. Comparison of condition of lotic riparian habitat on BLM lands, 1998 vs. 2001.

Condition of Riparian Area	1998		2001		Change (%)
	Total Miles in Lower 48 States	(%)	Total Miles in Lower 48 States	(%)	
Proper Functioning Condition	13,230	36%	14,314	42%	+6%
Functioning-At-Risk	12,900	35%	14,657	43%	+8%
Non-Functional	3,251	9%	3,688	11%	+2%
Unknown	7,310	20%	1,478	4%	–16%

Source: BLM 2002c

Table 3.5.2.2. Comparison of lentic riparian–wetland habitat on BLM lands, 1998 vs. 2001.

Condition of Riparian Area	1998		2001		Change (%)
	Total Acres in Lower 48 States	(%)	Total Acres in Lower 48 States	(%)	
Proper Functioning Condition	147,923	41%	166,796	51%	+10%
Functioning-At-Risk	45,135	13%	48,320	15%	+2%
Non-Functional	7,557	2%	6,409	2%	0%
Unknown	166,819	44%	107,135	32%	–12%

After Europeans settled the West, grazing and cultivation reduced fuels and organized fire suppression began. Thus the number and size of fires was drastically decreased (Gruell 1983; Swetnam 1990). Fire exclusion has had the greatest affect on ecotones where naturally occurring fires previously removed woody species. Ferry and others (1995) concluded that altered fire regimes are the principal agent of change affecting the vegetative structure, composition, and biological diversity in five major plant communities totaling over 350 million acres in the United States. Leenhouts (1998) compared the estimated land area burned 200–400 years ago (preindustrial) to data in the contemporary contiguous United States. The result suggests that ten times more acreage burned annually in the preindustrial era than does in modern times.

For more than 50 years the fire policy of fire exclusion has had major effects on ecosystem health. The problems have been foreseen for some time. Sixty years ago Weaver (1943) reported that the "complete prevention of forest fires in the ponderosa pine region of California, Oregon, Washington, northern Idaho, and western Montana has certain undesirable ecological and silvicultural effects [and that]…conditions are already deplorable and are becoming increasingly serious over large areas." Also, Cooper (1961) stated, "…fire has played a major role in shaping the world's grassland and forests. Attempts to eliminate it have introduced problems fully as serious as those created by accidental conflagrations." Recently, concerns about the loss of biodiversity have surfaced as a result of the suppression of fire.

In 2000, the fire season was one of the worst on record and thus prompted then President Clinton to ask the Secretaries of Agriculture and Interior to prepare a report, known as the National Fire Plan, which recommended how best to respond to the year's severe wildfires, reduce the effects of those fires on rural communities, and ensure sufficient firefighting resources in the future. This report, prepared by the Department of the Interior and the Department of Agriculture in collaboration with the National Association of State Foresters, has shaped the role of fire management for the past few years. In August 2001, the Federal Land Management Agencies published the Ten-Year Comprehensive Strategy, thus setting the stage for fire management practices for the next 10 years. In this document, one of the five key goals is to restore fire-adapted ecosystems. Under this goal are the driving forces of fire and fuels treatments that are to enhance ecological health.

In August of 2002, President Bush visited the Squires fire in Oregon and announced his Forest and Rangeland Health Initiative. This Initiative is meant to help the Federal Land Management agencies conduct fuels projects more efficiently.

Another major factor affecting ecosystem health and fire frequency is the spread of flammable exotic annual grasses such as cheatgrass. The proliferation and spread of exotic annual grasses can largely be attributed to human activities such as farming, railroad activities, road production and fire after European settlement. Since the early 1900's, these annual grasses have spread across the West, occupying the open interspaces between the native grass, forb, shrub, and tree species. According to Young and Allen 1997 one cheatgrass plant per m^2 can produce as many seeds as 10,000 m^2. This is the significance of a few cheatgrass plants being able to establish and persist in high ecological condition perennial grass conditions. Young also states that most native perennial plants have irregular seed production, complex dormancies and/or low viability. This aids in the aggressive spread of cheatgrass. Once established, these highly flammable annual grasses provide a fuel source for uncharacteristically frequent fires. As fire frequency increases so do the annual grasses, which are more competitive for the limited moisture in the arid portions of the West than are the native grasses. Cheatgrass has the ability to take advantage of the post-fire nitrogen enriched soil conditions. With the increase in fire frequency and the increased competition from these flammable exotic grasses, more and more native rangeland converts to a more exotic dominated landscape. Fire frequency changes from a more historic 25–75 year cycle to a 3–5 year cycle. Once converted to an exotic annual vegetation type, these landscapes require major rehabilitation efforts of spraying the exotic annuals and reseeding to desirable perennial plant species to convert them to a fire regime that more closely resembles what occurred historically. Grazing did play a role in the initial dispersal of cheatgrass but its perpetuation has been aided by the human activities mentioned above. The increase of human caused ignitions over the last 50 years combined with cheatgrass' phonological ability to capitalize on fire events has contributed to its rapid rate of spread over the last three decades.

3.6.1 Fire Regimes

There are many different fire regimes throughout the West. These range from frequent, low-intensity fires to long fire return intervals with stand replacement fires. Fire regimes are classified as understory, mixed, and stand replacement.

3.6.2 Understory Fire Regimes

Fires were frequent and of low intensity. Light surface fires burned at intervals averaging less than 10 years and as often as every 2 years (Weaver 1951; Dieterich 1980). All material was consumed on the forest floor during a fire. Trees were not usually killed and the damage was highly variable (Paysen et al. 2000).

Over the past 100 years, the structural and compositional changes in ponderosa pine have been repeatedly documented (Cooper 1960; Biswell et al. 1973; Brown and Davis 1973). What was once an open, parklike ecosystem maintained by frequent, low-intensity fires is now a crowded, stagnated forest. In addition to stand changes, general fire absence has lead to uncharacteristically large accumulations of surface and ground fuels (Kallender 1969).

Pre-1900 and early 1900s photos document that ponderosa pine stands were much more open. Explorers, soldiers, and scientists described a forest quite different from that seen today. The open presettlement stands, characterized by well-spaced older trees and sparse pockets of younger trees, had vigorous and abundant herbaceous vegetation (Cooper 1960; Biswell et al. 1973; Brown and Davis 1973). Frequent, naturally occurring fires maintained this situation. Large woody fuels in the form of branches or tree boles, which fall infrequently, rarely accumulated over a large area. When they were present, subsequent fires generally consumed them, reducing grass competition and creating mineral soil seedbeds, which favored ponderosa pine seedling establishment (Cooper 1960).

In the early 1900s, forest practices and reduced incidence of fire led indirectly to stagnation of naturally regenerated stands and unprecedented fuel accumulation (Biswell et al. 1973). Stand stagnation occurs on tens of thousands of acres throughout the southwest (Cooper 1960; Schubert 1974) and still exists where mechanical treatments or fire have not taken place.

A combination of heavy forest floor fuels and dense sapling thickets acting as ladder fuels, coupled with drought conditions, frequent lightning, and human-caused ignitions, has resulted in a drastic increase in high-severity wildfires in recent years.

3.6.3 Mixed Fire Regimes

The pinyon–juniper woodlands cover about 47 million acres in the western United States (Evans 1988). Pinon–juniper woodlands in the United States are commonly divided into the Southwestern and the Great Basin woodland ecosystems on the basis of species composition (Paysen et al. 2000). True pinyon is common in the Southwest and is usually associated with one or several species of junipers, including one-seed, Utah, alligator, and Rocky Mountain junipers. Singleleaf pinyon is identified with the Great Basin and is generally associated with Utah juniper. Other species of pinyon occur in southern California, Arizona, south of the Mogollon Rim, along the United States–Mexico border, and in Texas (Bailey and Hawksworth 1988). Long-term fire frequencies for pinyon–juniper woodlands have not been clearly defined and are the topic of continuing study and discussion. However, there is an agreement that fire was the most important natural disturbance before the introduction of livestock, particularly the large herds of the nineteenth century (Gottfried et al. 1995). It is suspected that before the introduction of livestock use, large areas of savanna and woodland periodically burned. These fires could have occurring during dry years that followed wet years when substantial herbaceous growth developed (Rogers and Vint 1987; Swetnam and Baisan 1996).

In the Intermountain West, presettlement mean fire intervals of less than 15 years were documented in the sagebrush steppe where western juniper now dominates (Miller and Rose 1999). In three sample areas in New Mexico, pinyon trees have mean fire return intervals of 28 years with a range of 10–49 (Wilkins 1997). In areas of low productivity, fire return intervals could be greater than 100 years, and occurred more frequently in extreme conditions. However, where grass cover was more continuous, fire return intervals were more frequent (10 years; Paysen et al. 2000). In the Great Basin, fire susceptibility depends on the stage of stand development (Meeuwig et al. 1990). In young stands, ground cover may be sufficient to carry a fire, but in older stands ground cover is sparser and may not be sufficient to carry a fire.

In western oak forest, the fire regimes have historically been classified as frequent low intensity; however, in more recent times these have become more intense with longer return intervals.

3.6.4 Stand Replacement Fire Regimes

Vegetation types with this fire regime are varied. Broadly speaking, they include grassland and shrubland vegetation types. Shrublands consist of desert shrublands and the chaparral mountain shrub type.

Fire frequencies cannot be measured precisely, but most likely occurred every 4 to 20 years (Gruell 1985a). Lightning was probably more important in valleys surrounded by forests than in the grasslands (Gruell 1985b). Fires would burn over large areas in the grasslands, with only natural barriers or weather changes to stop them. These fires would sometimes cover hundreds of square miles (Paysen et al. 2000).

In Wyoming, big sage fire intervals ranged from 10 to 70 years (Young and Evans 1981; Vincent 1992). In arid land, fire history reports fire intervals between 5 and 100 years (Wright 1986). Griffiths (1910) and Leopold (1924) reported that before

1880, desert grasslands produced more grass and fire recurred at approximately 10-year intervals.

In chaparral, fire intervals for large fires (more than 5,000 acres) typically ranged from 20 to 40 years (Wright and Bailey 1982).

3.7 Soils

3.7.1 Upland Soils

Soils in the analysis area are highly diverse, reflecting the enormous range in environmental conditions found on public lands in the West. Soil development and formation are controlled by five, soil-forming factors:

1. climate, especially temperature and precipitation;

2. living organisms, such as native vegetation, microorganisms, and animals;

3. parent material properties, such as chemical and mineralogical composition, grain size, and resistance to weathering;

4. topographic variables such as slope steepness and shape, aspect, position on the landscape, and drainage pattern; and

5. the relative time soils are subject to the soil forming processes (Jenny 1961).

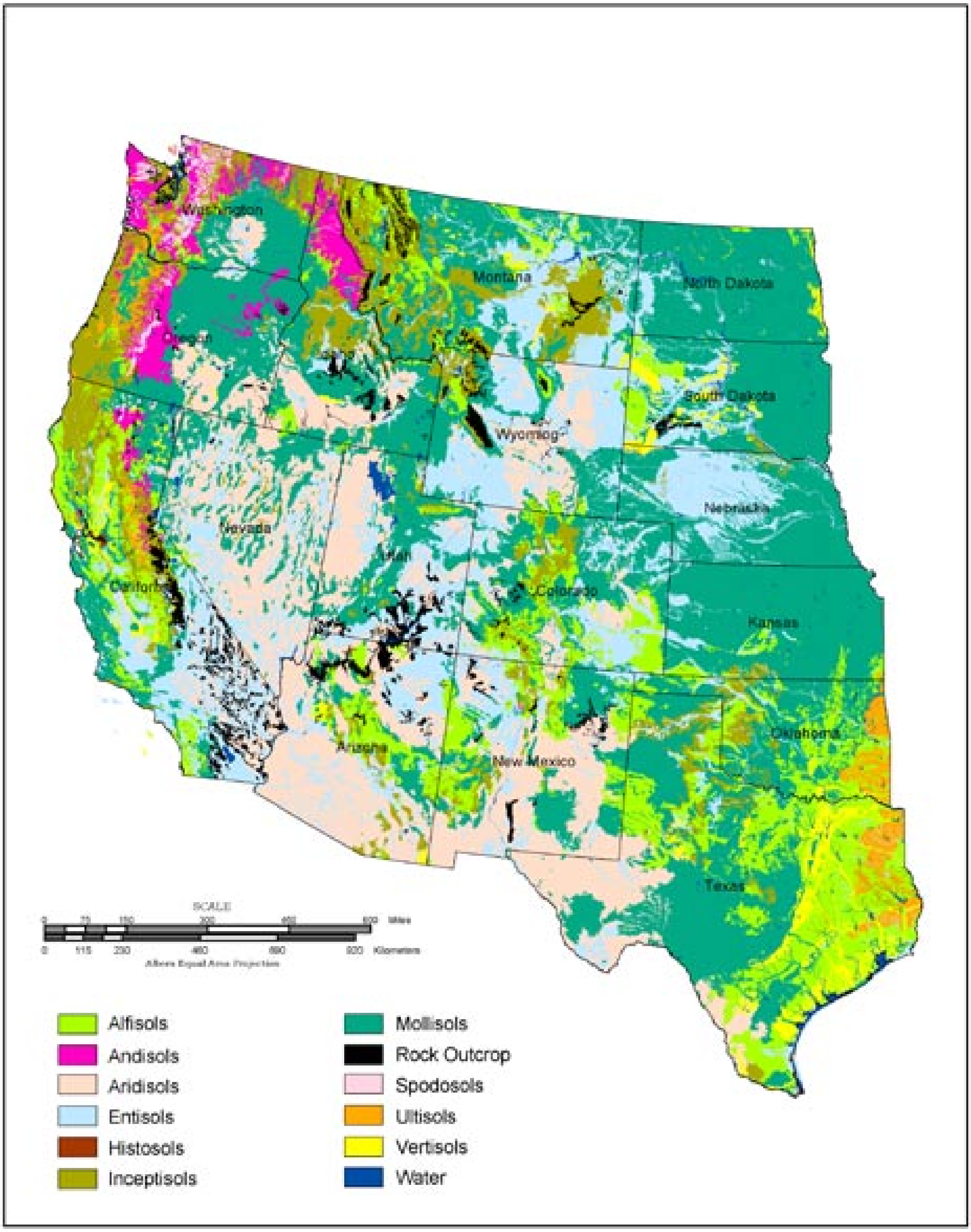
These soil-forming factors have combined in the development of seven major soil orders common on public lands in the West. The soils represented by these soil orders have unique properties that greatly influence the productivity, ability to respond to management, and susceptibility to degradation of the public lands of the West (Figure 3.7.1.1).

Alfisols are moderately leached forest soils that occur in cool, moist regions. They are moderately well developed soils that contain an appreciable clay accumulation in their subsoil. Alfisols are common in the coniferous and deciduous forests and mountain shrub communities at higher elevations, and areas influenced by moist maritime weather patterns in the West. These soils are relatively productive and respond favorably to improved land management practices.

Andisols are soils that formed in volcanic ash or other volcanic ejecta. The poorly crystalline volcanic glass composition give them unique chemical and physical properties, including high water-holding capacity and the ability to make large quantities of phosphorus unavailable to plants. These soils are mainly concentrated in forested mountains of the Marine and Temperate Steppe Divisions. They are highly productive and respond favorably to improved land management practices.

Aridisols are soils that developed in very dry conditions. They are light colored; low in organic matter; and may contain accumulations of calcium carbonate, soluble salts, sodium, or gypsum. Aridisols are extensively found in the Temperate Desert and Tropical–Subtropical Desert Divisions and drier regions of the Temperate Steppe and Tropical–Subtropical Steppe Divisions. They support millions of acres of rangeland vegetation communities such as desert shrub, sagebrush, and pinyon-juniper. Their dry moisture status much of the year and low organic matter content reduce their productivity. This results in a slower or decreased ability to respond favorably to improved land management practices. The typically harsh environmental conditions can also make them more susceptible to degradation from poor land management practices.

Figure 3.7.1.1. Generalized soil map.



Entisols are soils with weakly developed profiles and are considered young in terms of soil forming processes. They often occur in recently deposited material or on steep, highly erosive topographic positions. Entisols are very extensive on public lands in the West and are most common in the Temperate Desert and Tropical–Subtropical Desert Divisions arid and semiarid environments supporting desert shrub and sagebrush communities. These soils may respond more slowly to improved land management practices and are often susceptible to degradation from poor land management practices.

Inceptisols have more well-developed profiles than Entisols but are still considered young soils with weakly developed profiles. They are widely distributed and occur under a wide range of ecological settings, including steep slopes, young geomorphic surfaces, and resistant parent materials. Inceptisols are common in the coniferous and deciduous forests of mountainous portions of the Marine and Temperate Steppe Divisions, are fairly productive when provided adequate moisture, and respond well to improved land management practices.

Mollisols are characterized by a thick, dark surface horizon with high organic matter content. These fertile soils are extensive in the grasslands of the Temperate Steppe, Mediterranean, Temperate Desert and Tropical–Subtropical Steppe Divisions. Mollisols support the plains grassland, chaparral-mountain shrub, mountain and plateau grasslands, higher precipitation sagebrush steppe, and coniferous-deciduous forest community types with an appreciable grass understory. These soils are highly productive and respond well to improved land management practices.

Vertisols are soils very high in clay content that have extreme shrink-swell properties. These soils are found on minor acreage in the Mediterranean, Tropical–Subtropical Steppe, and Temperate Steppe Divisions. Vertisols support a variety of grassland and shrubland vegetation communities. These soils present considerable engineering problems, including fence building. Depending upon available rainfall, Vertisols can be productive and respond well to improved land management practices.

The long-term productivity and health of the soil depends on maintaining the soil's physical, chemical, and biological properties in a favorable condition. Water and wind erosion are influenced by climate, topography, soil properties and condition, watershed cover, and land use. Cover is especially important in protecting the soil from the erosive forces of water and wind. Live plant cover and litter intercept precipitation, reducing raindrop impact and overland flow, and allowing more infiltration and less runoff and erosion. Cover and soil surface roughness also reduce wind speed, thus minimizing wind erosion.

Upland rangeland water erosion processes include sheet-rill erosion, gully erosion, and landslides. Sheet-rill erosion is less noticeable but is very widespread and can slowly reduce the productivity of rangeland soils. Gully erosion is more noticeable and can alter the hydrology of the landscape. Uplands on many rangeland landscapes have an extensive gully network, replacing former grass-covered swales. This has altered water flow patterns, resulting in increases in size and frequency of runoff, and sediment yield to streams. Landslides mainly occur on very steep slopes with enough precipitation to saturate the soil to a restrictive layer and are not prevalent on the majority of rangelands.

Soil compaction can result from persistent trampling or vehicle traffic during periods when the soil is moist and least able to resist structural degradation. Soil compaction can reduce water infiltration, water movement through the soil profile, water availability to plants, and soil aeration, and it can increase runoff.

Soil organisms have a profound effect on the maintenance of soil productivity and health. Biological soil crusts play a critical role in carbon and nitrogen fixation, soil surface stability, and reduction of annual grass invasion in many rangeland ecosystems. They can also influence infiltration, runoff, and soil moisture retention depending on crust structural characteristics, soil surface texture, and other factors. Many rangeland shrubs and bunchgrasses depend on mycorrhizal fungi to help them obtain water and nutrients. Soil bacteria are important in nitrogen fixation and formation of stable soil aggregates on rangelands. Bacteria are capable of filtering and degrading a large variety of human-made pollutants in the soil and groundwater so that they are no longer toxic. Soil arthropods and other soil animals create large soil pores essential for infiltration and soil water movement. They also help mix soil layers and incorporate soil organic matter into the soil. These and other soil organisms help maintain the soil food web that is essential for cycling of nutrients and other vital functions on rangelands. As much as 90 percent of rangeland productivity occurs in the soil (Coupland and Van Dyne 1979). Soil organisms depend on soil organic matter to survive. Any activities that permanently reduce soil organic matter content will have a profound effect on rangeland health and long-term productivity.

3.7.2 Riparian Soils

Riparian soils are formed by sediment eroded from adjacent uplands and deposited in the valley bottoms, stream sediment deposition during overbank flooding, lateral deposition of sediment from stream meander migration, and sediment deposition on lake bottoms and shores. The pedogenic properties of riparian soils dominantly result from repeated periods of saturation, flooding, or ponding. Saturation combined with anaerobic (without oxygen), microbial activity often causes a depletion of oxygen in the soil. This process can result in the accumulation of organic matter and the reduction, translocation, or accumulation of iron, manganese, sulfur, or other reducible elements (USDA, Natural Resources Conservation Service 1998). These processes create complex patterns of soil characteristics, such as texture, age, and degree of formation, over relatively small areas in riparian systems.

Riparian soils are vitally important for capturing, storing, and releasing water in riparian areas, supporting productive vegetation communities, groundwater recharge, perching groundwater, streambank formation, storing nutrients, filtering pollutants, streambank erosion protection, and determination of sediment characteristics. Disturbances that result in reduction of plant cover or deep rooting characteristics, streambank sloughing, accelerated erosion, compaction, loss of the capability to perch water, or other soil characteristics can degrade the functional integrity of a riparian area.

3.8 Water Resources

3.8.1 Riparian Hydrology

The interaction between flowing water, the stream channel, hydrologic processes, riparian vegetation, and aquatic life is complex and interdependent. Vegetation overhanging streambanks helps regulate water temperature, indirectly maintaining dissolved oxygen levels needed for aquatic life. Streambank and floodplain vegetation slow runoff, stabilize stream banks, trap sediment, filter pollutants and allow groundwater to recharge. The alluvial floodplain stores winter runoff as groundwater, then releases the water into the stream during dry season, thereby extending perennial flow even during extended droughts.

Alluvial stream channel structure and stability are influenced by the adjacent riparian vegetation and soil characteristics. Channels respond to the energy of flowing water by adjusting channel features, including width and depth, streambed slope, and the roughness of the channel bed and banks. (Features such as vegetation, bed materials, and gravel bars cause roughness.) Soil characteristics such as texture or rock fragment content influence erodibility of streambanks and channel migration. Streams functioning in a state of dynamic equilibrium, in which there is a balance between erosion and deposition, experience no net loss or gain in sediment load. As flow and sediment supply vary, channel features adjust in an attempt to achieve a new balance. Stream channel adjustments are related to the dissipation or conservation of energy, and to the distribution of energy expenditure (Leopold 1994). Stream channels and riparian areas are resilient and naturally dynamic landforms, constantly adjusting to natural disturbances resulting from floods or changes to landscapes upstream such as fire.

Stream channels and riparian communities may be degraded as a result of local or off-site disturbance. Sensitive hydrologic interrelations exist between the condition of uplands and their associated riparian communities. Uplands in nonfunctioning condition often experience accelerated surface runoff, higher sediment yields, and increased erosion within the channel systems (DeBano and Schmidt 1989). Changes in the vegetative cover of floodplains and streambanks influence the function and stability of the riparian community.

Stream–riparian systems that experience increases in runoff and sediment from upland sources or increased susceptibility to erosion from direct disturbance often cannot adjust their channel features to achieve equilibrium. If sediment increases beyond the stream's ability to carry it, channels tend to aggrade and form multiple, interwoven braided channels. In another type of stream system, where channel erodibility or streamflow is increased, with relatively low sediment production, channels may erode. Streams with coarse-textured substrates and fine-textured banks tend to laterally erode, becoming shallower and wider, often creating braided conditions. Stream channels with fine-textured substrates, common at lower elevations, usually erode vertically, forming gullies.

When disturbance factors are manageged, most stream–riparian systems begin a relatively rapid recovery. Incised or laterally widened streams, however, with low sediment yields, with or without fluctuating flow patterns, recover slowly.

3.8.2 Water Quality

The primary water quality issues related to livestock grazing on Federal lands have been associated with nonpoint-sources of sediment, fecal coliform bacteria (used as an indicator for other fecal-borne pathogens), nutrients, and salinity. The leading causes of nonpoint-source water quality impairment are siltation (sediment), nutrients, bacteria, metals (primarily mercury), and oxygen-depleting substances.

The Water Quality Act of 1987 (P.L. 100-4) sets forth agency responsibility for nonpoint-source water quality management on public lands (Section 313).

It is recognized that Best Management Practices (BMPs) are the primary mechanism for enabling the achievement of water quality standards. The BLM strategy by which nonpoint source controls, including BMPs, are selected to achieve water quality standards includes the following iterative process: (1) design of BMPs based on site-specific conditions; technical, economic, and institutional feasibility; and the water quality standards of those waters potentially effected; (2) monitoring to ensure that practices are correctly designed and applied; (3) monitoring to determine a) the effectiveness of practices in meeting water quality standards, and b) the appropriateness of water quality criteria in reasonably assuring protection of beneficial uses; and (4) the adjustment of BMPs when it is found that water quality standards are not being protected to a desired level, or the possible adjustments of water quality standards on the basis of considerations in 40 CFR 131.

The Clean Water Act section 305(b) reports to the Environmental Protection Agency (EPA) in 2000 provide information concerning state assessments of water quality within their boundaries (EPA 2000). The state reports provide detailed information and are available from each state, or through links from the EPA online summary (EPA 2000). Assessment data from the 11 western States reports that stream water quality ranges from 15 percent of rivers and streams in good condition for aquatic life to 93 percent of rivers and streams in good condition for aquatic life (EPA 2000). However, this data is not comparable because the states do not use comparable criteria and monitoring strategies to measure water quality (EPA 2000). Nonpoint-sources of pollution from urban and agricultural lands are reported as the leading source of water quality impairment. Siltation, pathogens, nutrients, and metals are all frequently cited as being the primary contaminants.

The BLM participates in a Federal program directed by the Colorado River Salinity Control Act (PL 98-569) to reduce salt loading in the Colorado River. Salt concentrations on Federal lands are highest in marine shale geologic settings, where annual precipitation averages less than 12 inches.

It has been estimated that Federal land contributes 8 percent of the total salt load of the Upper Colorado River Basin from nonpoint-sources (BLM 1980). Salinity from nonpoint-sources increases with sediment yield. Vegetation cover is the most important management variable influencing runoff and sediment yields (BLM 1987). Salinity and vegetation management are a consideration in all projects initiated in the Colorado River Basin.

3.8.3 Water Rights

Each state is responsible for granting, adjudicating and administering appropriative water rights. All decisions regarding the qualifications of the applicant, what constitutes beneficial use, and quantity and place of use are addressed through state procedural and substantive law. The Federal Land Policy and Management Act of 1976 mandates that the public lands administered by the BLM be managed for multiple use benefits. Under the current grazing regulations the BLM applies for water rights from the states for multiple use benefits including livestock, wildlife, fisheries, wild horses and burros, riparian, and recreation where permitted by state law. The regulations include a provision that was part of the 1995 rulemaking directing the BLM to acquire stock water rights in the name of the United States to the extent allowed by state law. The preamble to the final rule in 1995 noted that "co-application or joint ownership of the water right [by the United States and

Table 3.8.3. Ownership of livestock water rights (by state).

State	Is Joint Ownership Allowed?	Can the BLM Own Livestock Water Rights?	Notes
Arizona	No	Yes; see Notes	The BLM can retain stockwater rights already in BLM's name, or transferred to BLM in a land transaction. Whether the BLM can apply for new stockwater rights has been pending in Arizona Superior Court since 1995.
California	Yes	Yes	California statute requires landowner permission prior to issuance of a stockwater permit.
Colorado	Yes	Yes	The state does not require co-holders to be land owners.
Idaho	Yes	Yes	The state allows for joint ownership, but the BLM usually seeks the water right in the name of the United States.
Montana	Yes	Yes	There has been no test of what would happen should either owner attempt to sever his or her portion of the water right from the property or transfer it to another location. Montana has Exempt Stockwater Permit Filings.[1]
Nevada	Yes; see Notes	No	Nevada allows individuals to have joint ownership, but not with BLM. A recent law prohibits the BLM from owning stockwater rights. The rational is that the BLM does not own the cattle so they cannot put the water to beneficial use.
New Mexico	Yes	Yes	Co-applicant (grazing permittee) must include proof of access to the property in the water right application.
North Dakota	Yes	Yes	
Oregon	Yes; see Notes	Yes	Individuals have filed and hold water rights in their names on BLM land. The BLM also owns stockwater rights. Joint ownership is allowed by the state, but there have not been many joint applications. Oregon statute requires landowner permission prior to issuance of a stockwater permit. There is an adjudication involving BOR that may be relevant when settled.[2]
South Dakota	Yes	Yes	
Utah	Yes; see Notes	Yes	Permittees can hold livestock water rights acquired in the past in their own names. Today, the state would not grant joint ownership if the BLM protested. The BLM would hold the water right in the name of the United States. However, co-ownership would be allowed if it was at BLM's request.

Table 3.8.3 (concluded). Ownership of livestock water rights (by state).

State	Is Joint Ownership Allowed?	Can BLM Own Livestock Water Rights?	Notes
Wyoming	Yes	Yes;see Notes	BLM normally does not want to have a co-applicant, but the state allows it. The state has an MOU with BLM - if the point of use is on BLM land they automatically add BLM as a co-applicant.

[1] Montana's exempt stockwater permit Filings (Montana form 605) allows for the construction of a stockwater impoundment of not more than 15 acre-feet capacity (30 acre-feet per year water right) prior to receiving a permit to appropriate water from the state. These impoundments may be constructed on a minimum 40-acre parcel and must be on land owned by or under the control of the applicant. The state of Montana considers a BLM grazing lease to be sufficient control of the lands to meet the requirements of the statute. This has resulted in the unauthorized construction of several reservoirs on public lands for which a private party holds the water right.

[2] There is a dispute over who owns the water rights in Klamath Lake—the Bureau of Reclamation or the irrigators who put it to beneficial use. If decided in favor of the irrigators, it potentially could lead to a policy similar to Nevada's regarding stockwater rights.

the grazing permittee] will be allowed where state policy permits it…" Table 3.8.3 summarizes the states' current rules for federal ownership and co-ownership of water rights.

Water rights are property rights of use conferred by the state. The current regulations directed BLM to apply for the water rights on public land in the name of the United States, because ownership of the appurtenant water, when available, gave public land managers and permittees flexibility in putting the land to use.

The regulations refer only to state appropriative water rights. Federal reserved water rights differ from state appropriative rights and are not addressed by the grazing regulations. Federal reserved water rights are granted by legislation or Executive Order(s) for a use on federal land by the designated federal agency. These water rights are limited to the amount of water needed to fulfill the purpose of the order or the act.

3.9 Air Quality

The Clean Air Act of 1990 (P.L. 101-549) required the EPA to develop standards for the maximum concentration of certain pollutants that should appear in healthy ambient air. These standards are called National Ambient Air Quality Standards (NAAQS). The EPA reevaluates the NAAQS periodically to ensure the limits accurately reflect the most up-to-date health data for air pollution.

Regions are required to monitor ambient area for compliance with NAAQS standards. If a region exceeds a standard for a pollutant, the EPA can designate the area as a nonattainment area. Nonattainment areas then must submit plans to EPA called State Implementation Plans (SIPs) that show the limits and regulations the region will impose, as well as modeling data to show EPA the SIP will bring the area into compliance with the NAAQS standard.

Attainment regions are regulated by Prevention of Significant Deterioration

(PSD) requirements. To ensure that the levels of pollutants in clean air areas do not rise unnecessarily, the Clean Air Act separates areas into PSD Classes I, II, and III designations, depending on the need for significant protection.

PSD Class I areas, predominantly National Parks and certain wilderness areas, have the greatest limitations. Virtually any degradation would be significant. Areas where moderate, controlled growth can occur are designated PSD Class II. PSD Class III areas allow the greatest degree of effects. All BLM-administered lands are classified as PSD Class II.

The air quality above most western Federal lands cannot be easily described, since monitoring data have not been gathered for most pollutants outside urban areas. In less-developed portions of the West, ambient pollutant levels are expected to be near or below the measurable limits. Air quality on public lands is directly affected by the protection of soil by vegetation. Where soil is exposed, there is a possibility for air quality problems as a result of dust caused by wind over exposed soil. Vegetative cover of soil is affected by many factors including, drought, fire, grazing by livestock and wildlife, disease, and insects.

3.10 Wildlife

3.10.1 Terrestrial

The Bureau of Land Management administers more than 262,000,000 acres of terrestrial wildlife habitat on the public lands in the western States. 160 million of these acres outside of Alaska are grazed by domestic livestock. These public lands sustain a nationally significant, rich heritage of diverse fish and wildlife by providing seasonal or permanent habitat for more than 3,000 species of mammals, birds, reptiles, amphibians, and fish that are significant for their aesthetic, recreational, and scientific values.

Increasing human populations in the West place ever-increasing consumptive and nonconsumptive demands on the wildlife and habitat. The settlement of the West has had a widespread and significant influence on wildlife habitats and species on the public and private lands. Urbanization, agriculture, roads, livestock grazing, and noxious weeds have been major factors affecting habitat for wildlife species. Grazing, when improperly managed, (such as during the uncontrolled grazing in the late 1800s through the mid-1930s), has had negative effects on the arid rangelands of the West and has reduced the quality of wildlife habitats.

Temperate Desert

The Temperate Desert generally occurs within the Columbia Plateau–Great Basin. This large, complex region is relatively arid due to its position in the rain shadow of the adjacent western mountain ranges (Cascade and Sierra Nevada Mountains). The vegetation complexes are dominated by sagebrush, pinyon–juniper woodlands, mountain shrub, ponderosa pine, lodgepole pine–subalpine fir forests, grasslands, and some very significant wetlands. Mammals typical of this region include pygmy rabbit (*Brachylagus idahoensis*), mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus canadensis*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*) mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), kit fox (*Vulpes velox*), and numerous species of squirrels and voles. Reptiles and amphibians typical of the region include sagebrush lizard (*Sceloporus graciosus*) and western rattlesnake (*Crotalus viridis*).

Temperate Steppe

The temperate steppe, generally occurring within the Colorado Plateau–Wyoming Basin, is a complex of mountain ranges dominated by a variety of coniferous forest types, interspersed with aspen communities, pinyon–juniper woodlands, and separated by the tablelands of the Colorado Plateau. The Colorado Plateau–Wyoming Basin is also occupied by mule deer, Rocky Mountain elk, and pronghorn.

Tropical–Subtropical Steppe

The Tropical–Subtropical Steppe in the rainshadow of the Rocky Mountains is characterized by shortgrass prairie with its greatly reduced vegetation stature and diversity, and the significant playa lakes shorebird and waterfowl wintering areas. Precipitation increases from west to east and temperature increases from north to south. These climatic gradients have created the lush, tallgrass prairie east of the 100th Meridian, midgrass prairie in the northwestern plains, and shortgrass prairie in the west-central plains (Bailey 1978). Improper livestock grazing, through consumption of fire fuels, has encouraged woody plant invasions by reducing the natural frequency and intensity of wildfires (Bock et al. 1993). Historically, American bison (*Bos bison*) played a significant role in the ecosystem that favored shortgrass-preferring species such as mountain plover (*Charadrius montanus*) and burrowing owl (*Athene cunicularia*). The shortgrass prairie was also home to the wolf (*Canis lupus*), as well as elk.

Tropical–Subtropical Deserts (Mojave, Sonoran, and Chihuahuan)

The Tropical–Subtropical Deserts include the Mojave, Sonoran, and Chihuahuan deserts that are composed of arid scrublands and grasslands at the lower elevations, and oak–juniper woodlands and coniferous forests in the higher elevations. While grazing by native ungulates tended to be widely scattered and of low intensity, historical improper livestock grazing was heavier and degraded many grasslands into permanent desert scrub (Schlesinger et al. 1990). Historically, pronghorn occurred in all of the major valleys; wild turkey (*Meleagris gallopavo*) and grizzly bears (*Ursus arctos*) occurred in all major riparian areas; and wild turkey and black bear (*Ursus americanus*) in all mountain ranges. Reptiles include the desert tortoise (*Gopherus agassizzi*).

3.10.2 Migratory Birds

Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) recognized that migratory birds are of great ecological and economic value to the United States and many other countries. Migratory birds bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada 1916, the Convention for the Protection of Migratory Birds and Game Mammals—Mexico 1936, the Convention for the Protection of Birds and Their Environment—Japan 1972, and the Convention for the Conservation of Migratory Birds and Their Environment—Union of Soviet Socialist Republics 1978. These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats. Through the Migratory Bird Treaty Act, the United

States has implemented these migratory bird conventions with respect to the United States.

Birds are particularly affected by changes in their physical environment (i.e., nesting and foraging habitat; Cody 1985). When improper livestock grazing results in physical changes in the environment, such as conversion of grassland habitats to shrublands, native avian populations may be adversely affected. Table 3.10.2.1 is a list of the U.S. Fish and Wildlife Service (FWS) Western Regions (FWS Regions 1, 2, and 6) Birds of Conservation Concern 2002 (BCC 2002). The BCC 2002 is a result of the 1988 amendment to the Fish and Wildlife Conservation Act mandate to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The BCC 2002 is primarily derived from assessment scores from three major bird conservation plans: Partners in Flight, the United States

Table 3.10.2.1. U.S. Fish and Wildlife Service birds of conservation concern 2002.

Region 1 (Pacific Region)	Region 2 (Southwest Region)	Region 6 (Mountain-Prairie Region)
Black-footed Albatross	Reddish Egret	Northern Harrier
Ashy Storm-Petrel	Swallow-tailed Kite	Swainson's Hawk
Swainson's Hawk	Northern Harrier	Ferruginous Hawk
Peregrine Falcon	Gray Hawk	Golden Eagle
Prairie Falcon	Common Black-Hawk	Peregrine Falcon
Greater Sage-Grouse (Columbia Basin population only)	White-tailed Hawk	Prairie Falcon
Yellow Rail	Ferruginous Hawk	Gunnison Sage-Grouse
Black Rail	Peregrine Falcon	Lesser Prairie-Chicken
Snowy Plover (except where Endangered)	Lesser Prairie-Chicken	Yellow Rail
Mountain Plover	Yellow Rail	Black Rail
Black Oystercatcher	Black Rail	American Golden-Plover
Whimbrel	American Golden-Plover	Snowy Plover
Long-billed Curlew	Snowy Plover	Mountain Plover
Marbled Godwit	Wilson's Plover	Solitary Sandpiper
Black Turnstone	Mountain Plover	Upland Sandpiper
Red Knot	American Oystercatcher	Long-billed Curlew
Short-billed Dowitcher	Long-billed Curlew	Marbled Godwit
Gull-billed Tern	Hudsonian Godwit	Buff-breasted Sandpiper
Elegant Tern	Red Knot	Wilson's Phalarope

Table 3.10.2.1 (continued). U.S. Fish and Wildlife Service birds of conservation concern 2002.

Region 1 (Pacific Region)	Region 2 (Southwest Region)	Region 6 (Mountain-Prairie Region)
Black Skimmer	Stilt Sandpiper	Black-billed Cuckoo
Xantus's Murrelet	Buff-breasted Sandpiper	Flammulated Owl
Yellow-billed Cuckoo	Gull-billed Tern	Burrowing Owl
Flammulated Owl	Least Tern (except where Endangered)	Short-eared Owl
Burrowing Owl	Black Skimmer	Lewis's Woodpecker
Black Swift	Red-billed Pigeon	Red-headed Woodpecker
Lewis's Woodpecker	Yellow-billed Cuckoo (western BCRs only)	Williamson's Sapsucker
Williamson's Sapsucker	Flammulated Owl	Red-naped Sapsucker
Red-naped Sapsucker	Whiskered Screech-Owl	White-headed Woodpecker
White-headed Woodpecker	Ferruginous Pygmy-Owl (Texas only)	Loggerhead Shrike
Olive-sided Flycatcher	Elf Owl	Bell's Vireo
Loggerhead Shrike (except where Endangered)	Burrowing Owl	Gray Vireo
Gray Vireo	Broad-billed Hummingbird	Bewick's Wren
Elepaio (except where Endangered)	Buff-bellied Hummingbird	Sprague's Pipit
Horned Lark (strigata ssp. only)	Lucifer Hummingbird	Virginia's Warbler
Crissal Thrasher	Elegant Trogon	Cassin's Sparrow
Le Conte's Thrasher	Lewis's Woodpecker	Brewer's Sparrow
Brewer's Sparrow	Red-headed Woodpecker	Grasshopper Sparrow
Tricolored Blackbird	Arizona Woodpecker	Baird's Sparrow
Lawrence's Goldfinch	Gilded Flicker	Henslow's Sparrow
	Northern Beardless-Tyrannulet	Le Conte's Sparrow
	Greater Pewee	Nelson's Sharp-tailed Sparrow
	Buff-breasted Flycatcher	McCown's Longspur
	Scissor-tailed Flycatcher	Chestnut-collared Longspur
	Rose-throated Becard	Dickcissel
	Loggerhead Shrike	Bobolink

Table 3.10.2.1 (continued). U.S. Fish and Wildlife Service birds of conservation concern 2002.

Region 1 (Pacific Region)	Region 2 (Southwest Region)	Region 6 (Mountain-Prairie Region)
	Bell's Vireo	
	Gray Vireo	
	Brown-headed Nuthatch	
	Sedge Wren	
	Bendire's Thrasher	
	Crissal Thrasher	
	Le Conte's Thrasher	
	Sprague's Pipit	
	Olive Warbler	
	Colima Warbler	
	Tropical Parula	
	Black-throated Gray Warbler	
	Grace's Warbler	
	Prairie Warbler	
	Cerulean Warbler	
	Prothonotary Warbler	
	Worm-eating Warbler	
	Swainson's Warbler	
	Louisiana Waterthrush	
	Kentucky Warbler	
	Red-faced Warbler	
	Rufous-winged Sparrow	
	Cassin's Sparrow	
	Bachman's Sparrow	
	Botteri's Sparrow	
	Black-chinned Sparrow	
	Sage Sparrow	
	Lark Bunting	
	Baird's Sparrow	
	Henslow's Sparrow	
	Le Conte's Sparrow	
	Nelson's Sharp-tailed Sparrow	

Table 3.10.2.1 (concluded). U.S. Fish and Wildlife Service birds of conservation concern 2002.

Region 1 (Pacific Region)	Region 2 (Southwest Region)	Region 6 (Mountain-Prairie Region)
	Seaside Sparrow	
	Harris's Sparrow	
	McCown's Longspur	
	Smith's Longspur	
	Chestnut-collared Longspur	
	Varied Bunting	
	Painted Bunting	
	Hooded Oriole	
	Altamira Oriole	
	Audubon's Oriole	

Shorebird Conservation Plan, and the North American Waterbird Conservation Plan.

Temperate Steppe and Temperate Desert

Birds typical of this region include greater sage-grouse (*Centrocercus urophasianus*), Gunnison sage-grouse (*Centrocercus minimus*), sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*), loggerhead shrike, and Brewer's sparrow (*Spizella breweri*) in the terrestrial environment and American white pelican (*Pelecanus erythrorhynchos*), cinnamon teal (*Anas cyanoptera*), gray vireo (*Vireo vicinior*), northern pintail (*Anas acuta*), tundra swan (*Cygnus columbianus*), American avocet (*Recurvirostra americana*), black-necked stilt (*Himantopus mexicanus*), willet (*Catoptrophorus semipalmatus*), Wilson's phalarope, eared grebe (*Podiceps nigricollis*), mountain plover, snowy plover (*Charadrius alexandrinus*), white-faced ibis (*Plegadis chihi*), and California gull (*Larus californicus*) in the wetlands.

The response to grazing depends on the avian species. Among the species that respond positively to grazing are the golden eagle (*Aquila chrysaetos*), brown-headed cowbird (*Molothrus ater*), and sage sparrow. Species such as the northern harrier (*Circus cyaneus*), swainson hawk (*Buteo swainsoni*), savannah sparrow (*Passerculous sandwichensis*), grasshopper sparrow (*Ammodramus savannarum*), white crowned sparrow (*Zonotrichia leucophrys*), Brewer's sparrow, vesper sparrow (*Pooecetes gramineus*), ferruginous hawk (*Buteo regalis*), burrowing owl, short-eared owl (*Asio flammeus*), western (*Sturnella neglecta*) and eastern (*S. magna*) meadowlarks respond adversely to improper grazing (Bock et al. 1993).

Tropical–Subtropical Steppe

Birds typical of this region include mountain plover, McCown's longspur (*Calcarius mccownii*), long-billed curlew, ferruginous hawk, burrowing owl, and lesser prairie-chicken (*Tympanuchus pallidicinctus*). Playa lakes in this region are significant for a myriad of wintering ducks, sandhill cranes, and shorebirds, as well as breeding habitat for snowy plover (*Charadrius alexandrinus*).

Livestock grazing has resulted in varied responses by neotropical migratory birds who breed and winter in the Tropical–Subtropical Steppe region. Species such as killdeer (*Charadrius vociferans*), mountain plover, burrowing owl, common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), northern mockingbird (*Mimus polyglottos*), lark sparrow (*Chondestes grammacus*), black-throated sparrow (*Amphispiza bilineata*), and McCown's longspur may often respond positively. Among the species that usually respond adversely to improper grazing are northern harrier, short-eared owl, Botteri's sparrow (*Aimophila botterri*), Cassin's sparrow (*Aimophila cassinii*), savannah sparrow, Baird's sparrow (*Ammodramus bairdii*), Henslow's sparrow (*Ammodramus henslowii*). Species such as the sandpiper (*Bartramia longicauda*), Sprague's pipit (*Anthus spragueii*) dickcissel (*Spiza Americana*), lark bunting (*Calamospiza malanocorys*), grasshopper sparrow, chestnut collard longspur (*Calcarius ornatus*), bobolink (*Dolichonix oryzivorus*), red-winged blackbird (*Agelaius phoeniceus*), and eastern and western meadowlarks respond negatively to heavy grazing (Bock et al. 1993).

Tropical–Subtropical Deserts (Mojave, Sonoran, and Chihuahuan)

Birds typical of this region include Gambel's quail (*Callipepla gambelii*), scaled quail (*Callipepla squamata)*, Montezuma quail (*Cyrtonyx montezumae*), Swainson's and ferruginous hawks, lesser nighthawk (*Chordeiles acutipennis*), Chihuahan raven (*Corvus crypoleucus*), verdin (*Auriparus flaviceps*), cactus wren (*Campylorhynchos brunneicapillus*), pyrrhuloxia (*Cardinalis sinuatus*), and crissal (*Toxostoma crissale*), Le Conte's (*Toxostoma lecontei*), and curve-billed (*Toxostoma curvrostre*) thrashers.

Riparian–Wetlands Birds

Riparian–wetland areas, with a broad mixture of grass, forb, and sedge species, support the most diverse native plant and animal populations of any region. Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands) recognize the importance of these areas and direct the BLM to avoid, to the extent possible, both short- and long-term adverse effects associated with the destruction or modification of wetlands and riparian areas.

While riparian–wetland ecosystems have always been a relatively minor component of the landscape in the West, Chaney et al. (1990) reported that riparian habitats are also the most modified land type in the West. Agricultural and urban development have been responsible for the decline of more than 80 percent of the riparian–wetland ecosystems in the West. Improper livestock grazing, and the fragmentation frequently associated with it, is of great concern to the conservation of riparian–wetlands due to their vulnerability to disturbance and high wildlife value (Thomas et al. 1979; Knopf et al. 1988). In the San Pedro National Conservation Area, Arizona, when livestock were excluded from a study area, changes in avian populations were demonstrated: 42 species increased, 26 significantly; and 19 species decreased, 8 significantly (Table 3.10.2.2).

Conservation of neotropical migratory birds in the West depends very much on the protection and eventual restoration of riparian ecosystems. Southwestern riparian habitats host the highest breeding densities in all of North America (Carothers and Johnson 1975; Ohmart and Anderson 1982; Rice et al.

Table 3.10.2.2. Species with increasing and decreasing trends during the breeding season on the San Pedro Riparian National Conservation Area, Arizona, before and after removal of cattle in late 1987, sorted by significance level of the trend.

Trend and species	Detections per kilometer					Annual change[a]
	1986	1987	1988	1989	1990	
Increasing Species						
Cassin's Sparrow (*Aimophila cassinii*)	0.06	0.92	5.19	5.15	2.15	2.42
Dusky-capped Flycatcher (*Myiarchus tuberculifer*)	0.03	0.07	0.09	0.32	0.31	1.93
N. Beardless-Tyrannulet (*Camptostoma imberbe*)	0.06	0.04	0.17	0.25	0.46	1.82
Yellow Warbler (*Dendroica petechia*)	3.21	6.05	8.77	17.68	16.71	1.55
Western Wood-Pewee (*Contopus sordidulus*)	1.51	1.62	2.18	3.23	4.17	1.31
Summer Tanager (*Piranga rubra*)	3.73	5.91	5.81	10.61	10.13	1.29
Abert's Towhee (*Pipilo aberti*)	6.14	7.28	8.63	13.11	15.43	1.28
Great Blue Heron (*Ardea herodias*)	0.24	0.65	0.42	0.43	0.97	1.27
Mallard (*Anas platyrhynchos*)	0.80	0.61	1.07	0.92	1.81	1.23
Blue Grosbeak (*Guiraca caerulea*)	2.92	5.20	4.46	6.19	7.22	1.22
Ash-throated Flycatcher (*Myiarchus cinerascens*)	1.81	2.36	2.41	3.66	3.74	1.21
Cassin's Kingbird (*Tyrannus vociferans*)	3.46	3.93	3.06	6.07	5.54	1.15
Common Yellowthroat (*Geothlypis trichas*)	1.27	3.24	5.36	12.95	14.71	1.87
Brown-headed Cowbird (*Molothrus ater*)	3.47	5.03	5.58	6.21	8.11	1.21
Vermilion Flycatcher (*Pyrocephalus rubinus*)	2.35	3.22	3.40	5.40	7.30	1.32
White-winged Dove (*Zenaida asiatica*)	1.93	2.69	3.37	7.54	10.78	1.56
Bewick's Wren (*Thryomanes bewickii*)	10.87	10.85	9.82	14.34	14.97	1.10
Yellow-breasted Chat (*Icteria virens*)	5.35	6.60	7.94	17.17	20.58	1.44
Lesser Goldfinch (*Carduelis psaltria*)	5.08	5.17	3.73	7.00	6.13	1.07
Gray Hawk (*Asturina nitida*)	0.57	0.92	0.54	0.84	1.15	1.14
Hooded Oriole (*Icterus cucullatus*)	0.00	0.17	0.21	0.20	0.41	1.86
Brown-crested Flycatcher (*Myiarchus tyrannulus*)	2.07	2.32	2.43	3.34	3.54	1.16
Mourning Dove (*Zenaida macroura*)	1.05	1.41	1.80	5.30	4.09	1.50
Common Raven (*Corvus corax*)	0.02	0.01	0.17	0.13	0.24	2.18
House Finch (*Carpodacus mexicanus*)	2.17	1.39	1.71	2.80	3.12	1.15

Table 3.10.2.2 (continued). Species with increasing and decreasing trends during the breeding season on the San Pedro Riparian National Conservation Area, Arizona, before and after removal of cattle in late 1987, sorted by significance level of the trend.

Trend and species	Detections per kilometer					Annual change[a]
	1986	1987	1988	1989	1990	
Increasing Species (continued)						
Black Phoebe (*Sayornis nigricans*)	0.27	0.15	0.10	0.51	0.92	1.44
Black-chinned Hummingbird (*Archilochus alexandri*)	0.57	0.57	0.50	0.71	1.63	1.26
Indigo Bunting (*Passerina cyanea*)	0.02	0.02	0.27	0.54	0.58	2.73
Lucy's Warbler (*Vermivora luciae*)	13.80	14.68	13.76	16.03	20.81	1.10
Bell's Vireo (*Vireo bellii*)	0.91	1.50	1.22	1.89	2.69	1.27
Phainopepla (*Phainopepla nitens*)	0.11	0.10	0.78	0.16	0.64	1.47
Yellow-billed Cuckoo (*Coccyzus americanus*)	0.43	0.63	0.78	0.96	1.19	1.28
Common Ground-Dove (*Columbina passerina*)	0.08	0.18	0.07	0.54	0.41	1.57
Red-winged Blackbird (*Agelaius phoeniceus*)	0.08	0.01	0.16	0.12	0.31	1.71
Song Sparrow (*Melospiza melodia*)	1.09	0.80	1.39	3.00	4.18	1.49
Turkey Vulture (*Cathartes aura*)	0.51	0.00	3.68	1.37	0.85	1.40
Ladder-backed Woodpecker (*Picoides scalaris*)	1.52	1.67	1.62	1.59	2.10	1.06
Gila Woodpecker (*Melanerpes uropygialis*)	2.63	2.41	2.47	3.07	2.79	1.04
Bullock's Oriole (*Iceterus bullockii*)	1.55	1.67	1.56	2.21	1.69	1.05
Botteri's Sparrow (*Aimophila botterii*)	1.83	2.61	1.47	4.21	2.40	1.11
White-breasted Nuthatch (*Sitta carolinensis*)	1.24	1.72	1.30	1.66	1.50	1.03
Decreasing Species						
Great Horned Owl (*Bubo virginianus*)	0.43	0.42	0.21	0.47	0.33	0.96
Northern Cardinal (*Cardinalis cardinalis*)	0.46	0.20	0.25	0.43	0.25	0.95
Killdeer (*Charadrius vociferus*)	1.43	0.67	0.57	0.56	0.50	0.80
European Starling (*Sturnus vulgaris*)	0.64	0.72	0.70	0.55	0.21	0.78
House Sparrow (*Passer domesticus*)	0.34	0.49	0.38	0.09	0.00	0.51
Greater Roadrunner (*Geococcyx californianus*)	0.72	0.43	0.33	0.21	0.26	0.76

Table 3.10.2.2 (concluded). Species with increasing and decreasing trends during the breeding season on the San Pedro Riparian National Conservation Area, Arizona, before and after removal of cattle in late 1987, sorted by significance level of the trend.

Trend and species	Detections per kilometer					Annual change[a]
	1986	1987	1988	1989	1990	
Decreasing Species (continued)						
Black-throated Sparrow (*Amphispiza bilineata*)	1.86	0.91	0.89	0.64	0.76	0.81
Verdin (*Auriparus flaviceps*)	0.69	0.79	0.33	0.10	0.34	0.71
Red-tailed Hawk (*Buteo jamaicensis*)	0.22	0.17	0.16	0.20	0.09	0.84
Cactus Wren (*Campylorhynchus brunneicapillus*)	0.53	0.55	0.40	0.39	0.18	0.78
Crissal Thrasher (*Toxostoma crissale*)	0.93	0.44	0.60	0.68	0.44	0.90
Cooper's Hawk (*Accipiter cooperii*)	0.26	0.10	0.07	0.16	0.14	0.92
Bushtit (*Psaltriparus minimus*)	2.16	1.23	1.85	1.89	1.31	0.94
Gambel's Quail (*Callipepla gambelii*)	3.12	2.52	1.28	2.64	1.79	0.90
Northern Mockingbird (*Mimus polyglottos*)	1.72	1.34	1.28	1.17	1.05	0.89
Western Kingbird (*Tyrannus verticalis*)	2.08	1.52	1.56	1.61	1.70	0.97
Northern Flicker (Colaptes auratus)	1.83	1.85	1.45	1.77	1.66	0.98
Canyon Towhee (*Pipilo fuscus*)	0.52	0.39	0.37	0.51	0.36	0.96

(Source: Krueper et al. 2003)

1983). In Idaho, 60 percent of all breeding neotropical migratory birds are found in riparian habitats (Saab and Groves 1992). In Colorado, 82 percent of all nesting species use riparian areas (Knopf 1985).

As in the Tropical–Subtropical Steppe region, avian species utilizing riparian–wetland regions vary in their response to livestock grazing. Species such as killdeer, Lewis' woodpecker (*Melanerpes lewis*), house wren (*Troglodytes aedon*), mountain bluebird (*Sialia currucoides*), American robin (*Turdus migratorius*), Brewer's blackbird (*Euphagus cyanocephalus*), pine siskin (*Carduelis pinus*), and brown-headed cowbird usually responded positively to grazing while species such as the Calliope hummingbird (*Stellula calliope*), willow flycatcher (*Empidonax traillii*), cedar waxwing (*Bombycilla cedrorum*), yellow-rumped warbler (*Dendroica coronata*), MacGillivray's warbler (*Oporornis tolmiei),* savannah sparrow, chipping sparrow (*Spizella passerine*), Lincloln's sparrow (*Melospiza lincolnii*), Wilson's warbler (*Wilsonia pusilla*), Bullock's oriole (*Icterus bullockii*), and Cassin's sparrow responded adversely to grazing (Bock et al. 1993).

3.10.3 Riparian, Wetland, and Aquatic Communities

Riparian ecosystems are extremely productive and offer a unique combination of habitat niches critical to fish and wildlife. Riparian communities provide abundant food, cover, nesting sites, and water and are used extensively by wildlife at all stages of their life history. Riparian ecosystems are important for a wide range of physical and biological features, including:

- Dense vegetation cover for shelter, shade, nesting, and resting
- Presence of surface water and abundant soil moisture
- Diverse vegetation structure which provides a range of habitat types
- Linear nature which provides protected pathways for wildlife migration

Because of their importance to a wide range of both terrestrial and aquatic species, riparian ecosystems serve as repositories for biodiversity throughout the West. In the arid West, riparian habitats comprise less than 1 percent of the total acreage of public lands, but are utilized by approximately 72 percent, 77 percent, 80 percent, and 90 percent of all reptiles, amphibians, mammals, and bird species, respectively. Approximately 30 percent of the bird species in the region use wetlands and other aquatic areas exclusively. Riparian areas attract a disproportionate number of migrating birds and provide primary habitat for waterfowl and shorebirds (BLM 1994).

Riparian areas are critical to a wide variety of species, including many special status species. For example, wet meadow areas and riparian zones serve as critical feeding and watering sources for sage grouse (Hockett 2002). Larger vertebrate species depend on riparian areas. Mule deer and elk use riparian areas for food and cover and for travel and migration corridors (Thomas et al. 1979). Pronghorn use riparian areas extensively in summer (Cooperrider et al. 1986). Invertebrate species such as the springsnails, species that occur primarily as relict populations of formerly widespread species, also rely on riparian ecosystems (BLM 2001).

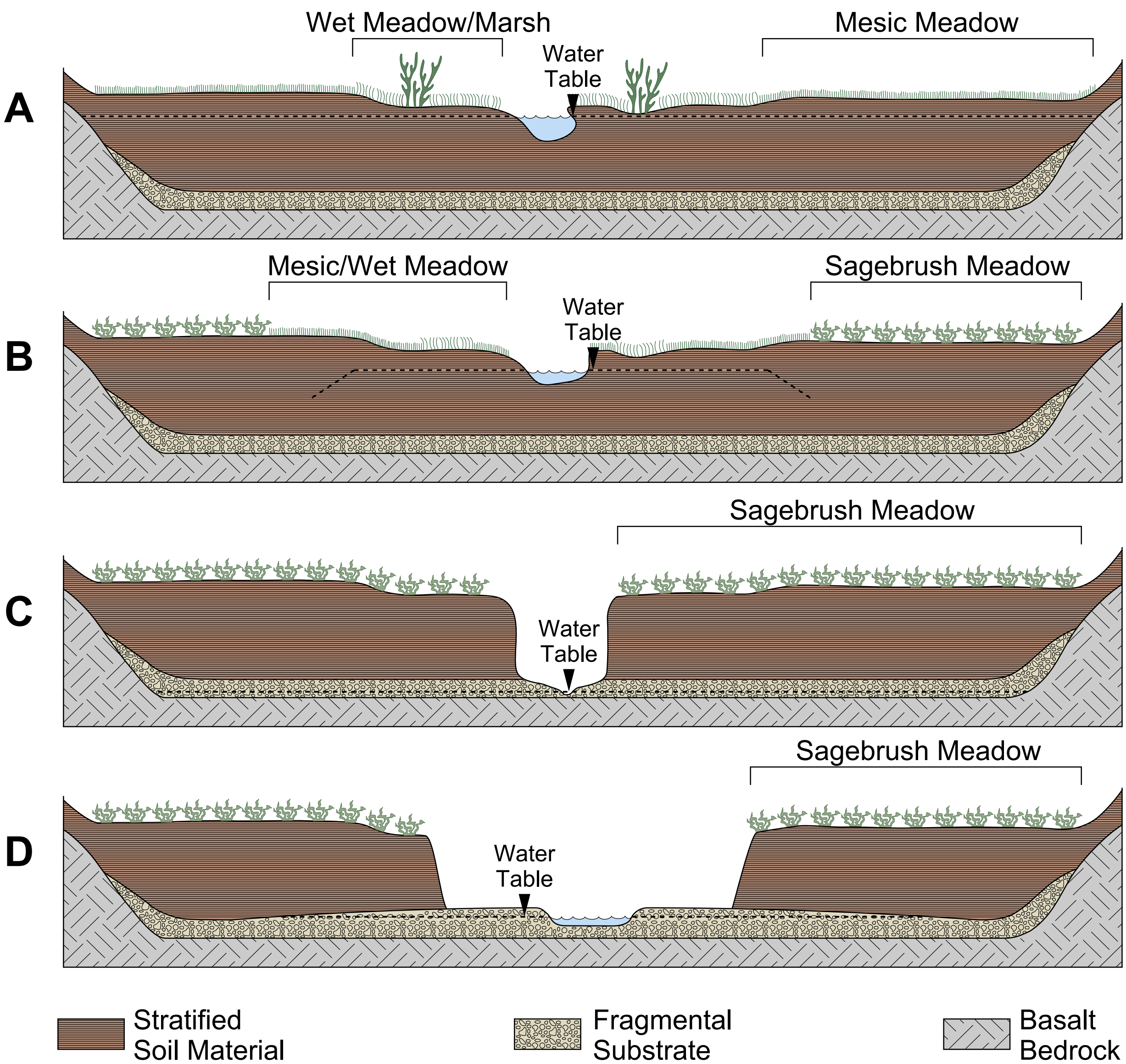
3.10.3.1 Cold Water Fisheries

Fish populations are directly affected by changes in riparian habitat. Numerous studies document reduced trout populations as a result of habitat loss and degradation caused by improper livestock grazing (Platts 1991; Behnke 1992). The native cutthroat trout population in Huff Creek, Wyoming, increased from 36 fish per mile to 444 fish per mile in response to livestock exclusion followed by improved livestock management (Chaney et al. 1990). Measurements showed that Huff Creek’s channel narrowed by about one-third and doubled in depth, and water temperatures declined in response to changes in livestock management (Chaney et al. 1990). Studies have shown that improper livestock grazing that causes changes in riparian and aquatic habitat, such as increased sediment loads and higher summer water temperatures resulting from riparian degradation, may give exotic, introduced trout species a competitive advantage over native trout (Griffith 1988; Stefferud 1988).

Excessive improper streamside grazing may remove vegetation, leading to higher water temperatures due to loss of shade, and higher levels of sediment in the stream as a result of increased soil erosion. Increased sediment can smother fish eggs in spawning areas, decreasing the abundance of young fish. Further, improper livestock grazing can remove vegetative cover and compact soils, slowing the rate of water percolation and infiltration and resulting in unnaturally high and frequent run-off. The increased erosion and subsequent frequent flooding can, in turn, alter cold-water fish habitat by filling pools and substrate with silt, uprooting riparian vegetation, widening stream channels, and lowering water tables (Bock et al. 1992). There is a clear and documented connection between the health of upland vegetation and the health of riparian communities and aquatic habitat. Chaney et al. (1993) noted that accelerated runoff from uplands triggers downcutting of soft substrate streams. The downcutting lowers both the streambed and water table, desiccates the riparian area, destabilizes streambanks, increases erosion, and further accelerates runoff. Downcutting may in turn lead to fish passage problems if the downcutting works its way to a grade control, such as bedrock or a culvert, often resulting in an impasse to migration.

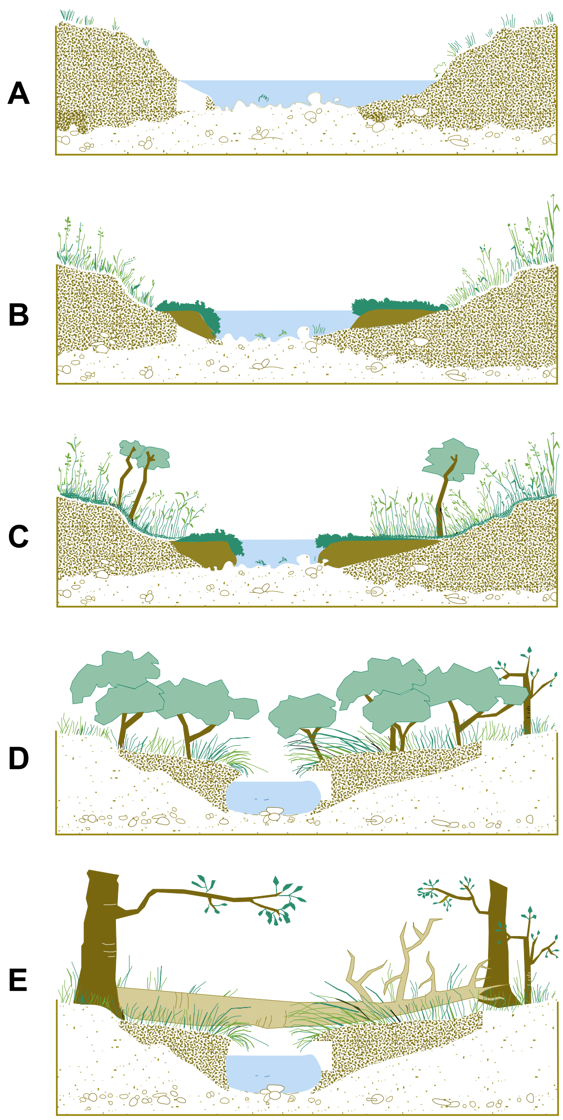
Figure 3.10.3.1.1 shows the sequential degrading of a stream channel and its

Figure 3.10.3.1.1. Sequential degrading of a stream channel and its associated riparian community (BLM 1993).



associated riparian community (BLM 1993). A healthy riparian community protects streambanks from erosion and maintains a high water table and productive habitat for fish and aquatic invertebrates (State A in Figure 3.10.3.1.1). As the stream channel erodes, the wet meadow areas become disconnected from the water table and dry out (State B in Figure 3.10.3.1.1). Sagebrush and rabbitbrush encroach on the site, resulting in a reduction in the amount and quality of forage. In the absence of protective riparian vegetation, the stream channel is likely to become incised and form a new base level (State C in Figure 3.10.3.1.1). Once the channel becomes incised, it is classified as nonfunctional. Over time, the incised channel widens and a new floodplain begins to develop at the new base level (State D in Figure 3.10.3.1.1). Figure 3.10.3.1.2 shows the stages in the recovery of a stream-associated riparian area.

Figure 3.10.3.1.2. Stages in the recovery of a stream-associated riparian area.



Source: BLM 1993g

3.11 Special Status Species

Even though it is preferable to manage native plant and animal communities or ecosystems, the ESA necessitates that threatened and endangered species be managed by the BLM, species by species. Species that are considered special status species include species that are officially listed under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) as threatened or endangered; are proposed for listing or are candidates for listing as threatened or endangered under the provisions of the Endangered Species Act (ESA); listed by a state in a category such as threatened or endangered, implying potential endangerment or extinction; and those designated by each BLM State Director as BLM-sensitive. Appendix B provides the most up-to-date list of BLM special status species in each western state. The species included in Appendix B may change at any time according to changes in the listings by the FWS, updated data from recent investigations, and further verification of a species presence on public land.

The BLM Special Status Species Management Policy (Manual 6840) provides policy and guidance, consistent with appropriate laws, for special status species conservation with two primary policies: conserving listed species and the ecosystems on which they depend and ensuring that actions authorized or approved by the BLM do not contribute to the need to list further special status species as threatened or endangered. To this end, the 6840 manual provides that it is policy of the BLM to conserve federally listed species and designated critical habitat using existing authorities. It is also the policy of the BLM that candidate species be managed so that no action authorized or funded by the BLM contributes to the need to list the species.

Improper livestock grazing has the potential to directly and indirectly affect special status species. The effects of improper livestock grazing on native plant and animal communities depend on the particular plant or animal. Factors which are important to management of livestock grazing for protection of special status species are grazing intensity, season of use, and long-term weather patterns (Milchunas et al. 1988). Direct grazing effects include livestock consumption of palatable special status plants and direct trampling of special status species. Indirect grazing effects may result from removing palatable forage and affecting nesting areas and cover for species such as desert tortoise and sage-grouse.

Animals

BLM management of the public lands is becoming become increasingly complex because of the listing of additional species as threatened or endangered under the ESA in the West. With the last decade's dramatic increase (more than 200%) in ESA-listed species on BLM lands, the BLM is now responsible for managing more than 300 federally proposed or listed species and large tracts of other species' habitat, such as greater than 50 percent of the sage-grouse's remaining habitat. Once listing occurs, land management processes become more cumbersome and land uses become more restricted and the resulting restrictions affect the land manager, permittees or lessees, and other public land users. Appropriate and timely conservation measures for candidate species and other species of concern are critical for preventing decline of at-risk populations to the level where listing is necessary. Of special concern is the ability to make timely and effective grazing decisions with respect to Gunnison and greater sage-grouse, pygmy rabbits, mountain plover, and mountain quail. These species may be affected by improper grazing practices across their range and are all being considered for listing in the future. The BLM is presently in the draft stage of developing a "Sage Grouse Habitat Conservation Strategy." This strategy will be closely tied in to all grazing activities.

The mountain plover (*Charadrius montanus*) provides a recent example of the significance of proactive conservation. On September 9, 2003, the U.S. Fish and Wildlife Service (FWS) published a Federal Register notice withdrawing their proposal to list the mountain plover as threatened. The species had been proposed for listing in 1999 and 2002 because the best data available at the time indicated that breeding populations were declining due to the loss of appropriate habitat from grassland conversion, prairie dog declines, and agricultural practices. After collecting additional data for 4 years, the FWS determined that listing the mountain plover under the Endangered Species Act (ESA) was not warranted. The five listing factors that must be considered in the determination of threatened or endangered status are (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3)

disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or human-caused factors affecting the species' continued existence. A key factor to the "not warranted" listing determination was the greater involvement in mountain plover management on the part of the Federal land management agencies, state and county governments, and the private sector.

The BLM carefully coordinates with other Federal agencies, land managers, and interested public to implement appropriate special status species management. When grazing permits are issued, BLM offices are required to review the adequacy of existing environmental analyses. At this time, if it is determined that federally listed threatened or endangered species may be affected, a Section 7 consultation is performed. All interested parties, to the extent practical, have the opportunity to review, comment, and give input on Biological Assessments. Timely implementation of effective grazing decisions for correcting environmental damage may benefit wildlife and result in healthier ecosystems. If a species becomes federally listed after the issuance of a grazing permit, additional conservation measures may be added.

3.12 Wild Horses and Burros

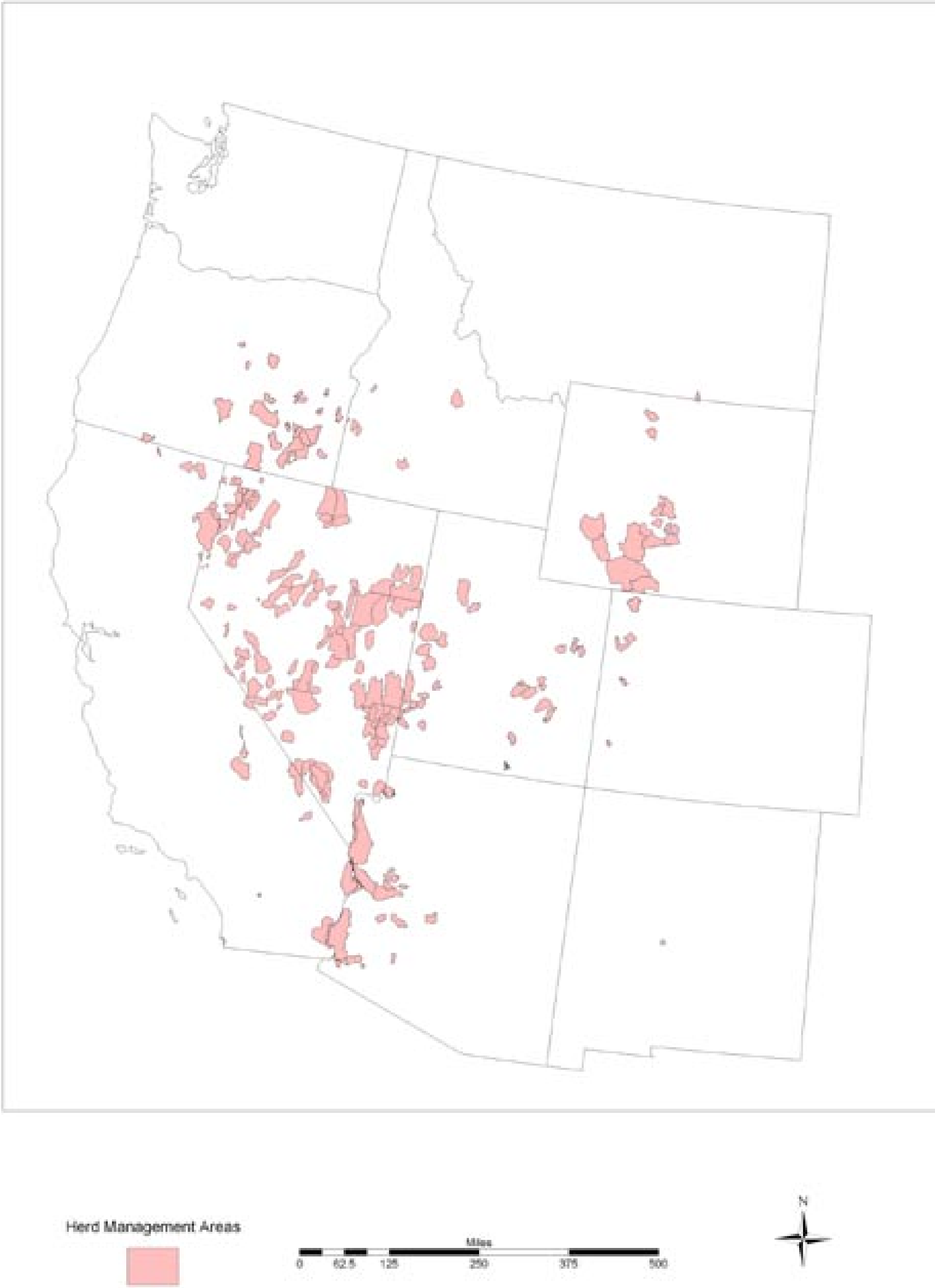
The Wild and Free Roaming Horse and Burro Act of 1971, as amended, states that wild horse and burros are living symbols of the historic West and as such contribute to diversity of life forms within the Nation. It is the policy of Congress that wild and free-roaming horses and burros shall be protected and managed for a thriving natural ecological balance within areas they were found in 1971. These Herd Management Areas (HMAs) are found in 10 western States—Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming. BLM's strategic goal is to establish Appropriate Management Levels (AMLs) for all Herd Management Areas. The estimated AML for the Bureau is 25,732 horses and 3,117 burros. Removals are conducted on HMAs that exceed appropriate levels, and excess animals are either adopted to qualified publics or transported to long-term holding facilities in the Midwest to live out their lives. Management on the range to reduce and maintain viable populations consists of selective removals, fertility control, population modeling, gathering genetics information, and research applications.

At the end of the 2002–2003 gather season (July to February), there were 32,145 horses and 5,041 burros occupying 206 HMAs. Horses are not removed during the foaling season, March through June. Burros are not removed during peak summer months (July through August) because of the heat.

Wild horses use the same forage species—usually grasses and forbs—and water sources as domestic livestock. Wild horses and burros range significant distances from water to graze. Burros tend to be browsers, using shrubs, forbs, and some grasses. Wild horses normally move in bands, with numbers ranging from 2 to 40 animals. Burros are more solitary, but will form small bands of jennies and their offspring. Within an HMA, wild horses move into the higher country in the summer (because temperature and insects) and lower country in the winter (to avoid snow). Most of the burros are located in southern California, southern Nevada, and Arizona. Their movements are temperature-related, mostly looking for shade in the summer. During the rainy season they will disperse in search of available forage.

Wild horses and burros will affect upland and riparian areas when their numbers

Figure 3.12.1. Herd management area.



are not kept in balance with the available resources. Achieving and maintaining AML is an important component of any management system. A map of the herd management areas managed by the BLM is shown in Figure 3.12.1.

3.13 Recreation

Public lands managed by the BLM provide important recreational opportunities in the western United States in the form of camping, sightseeing, hiking, horseback riding, off-highway vehicle activities, water activities, hunting, fishing, snow activities, and other specialized or newly emerging interests. The recreational setting varies from primitive, nonmotorized access onto the public lands to dispersed motorized activities and to highly developed access on paved scenic drives and overlooks. Most recreational uses depend on the natural qualities of the land and some facilities to aid in use or access. Some recreational activity includes use of livestock for riding or packing and may include grazing of those animals on the public lands.

The effect rangeland conditions have on recreation activities varies as widely as the activities vary. More highly developed recreational activities tend to be less affected by rangeland conditions. More dispersed recreational activities tend to be more affected by rangeland conditions. Studies suggest that recreationists perceive that grazing detracts from, or is compatible with, their activity on the public lands in roughly equal numbers.

The availability of the public lands for recreation contributes to many regional economies in the West. In 2002, recreational use on BLM-administered lands exceeded 67 million visitor use days. Demand for new developed sites and facilities and greater general availability of public lands for dispersed recreational activities is increasing in some areas. Increasing demand is most evident in regions near urban areas and where populations are rapidly growing.

Concentrated recreation occurs at approximately 2,700 developed sites. Less than 1 percent of BLM-administered rangeland contains developed recreation sites and facilities. More than half of all recreational visits to the public lands are dispersed visits. Dispersed recreation depends on open landscapes, with few developments, that allow for self-initiated exploration and discovery. Most areas providing dispersed recreation opportunities are used for livestock grazing. Where water and adjacent riparian areas exist, recreational use occurs during all or a portion of many visits. Riparian areas account for approximately 1 percent of BLM-administered rangeland.

Recreational use permits are issued for competitive and commercial activities. These include off-highway vehicle races, outfitter and guide services, equestrian races, sightseeing tours, and festivals. Recreational use permits are also issued for individuals and groups at many developed sites, high-use areas, and environmentally sensitive areas. Permits may limit the number of visitors to an area at any one time. Recreation permits usually require a fee and, in 2002, brought revenues of more than $9 million to BLM.

Public lands administered by the BLM contain diverse scenic and visual resources. In many areas, expansive views, steep terrain, colorful and varied geology, or appealing plant communities create highly scenic settings. In areas where scenery may be plain, openness and limited development create a pleasing aesthetic. These qualities attract visitors for the purpose of sightseeing, as well as to form the backdrop for many outdoor recreation activities.

3.14 Special Areas

The Bureau of Land Management (BLM) provides special management consideration for public lands possessing unique and important historical, anthropological, ecological, biological, geological, and paleontological features. These lands include undisturbed wilderness tracts, critical habitat, natural environments, open spaces, scenic landscapes, historic locations, cultural landmarks, and paleontologically rich regions. Management designations for public lands containing special features are created by Congress, presidential proclamation, or established under BLM administrative procedures. The BLM manages these special areas to preserve, protect, and evaluate significant components of our national heritage.

3.14. 1 National Landscape Conservation System

The Bureau of Land Management (BLM) provides special management consideration for public lands possessing unique and important historical, anthropological, ecological, biological, geological, and paleontological features. These lands include undisturbed wilderness tracts, critical habitat, natural environments, open spaces, scenic landscapes, historic locations, cultural landmarks, and paleontologically rich regions. Management designations for public lands containing special features are created by Congress, presidential proclamation, or established under BLM administrative procedures. The BLM manages these special areas to preserve, protect, and evaluate significant components of our national heritage.

The National Landscape Conservation System (NLCS), established in June 2000 by the BLM, provides guidance, organization, and leadership for protecting many of the Nation's most remarkable and beneficial working landscapes (Figure 3.14.1). The NLCS consists of National Monuments, designated by the President, and congressionally designated National Conservation Areas, National Wilderness Areas, Wilderness Study Areas (also designated by agency), National Wild and Scenic Rivers, and National Scenic and Historic Trails (descriptions follow). The NLCS contains 828 units totaling approximately 15 percent (42 million acres) of BLM-managed public land—an area larger than the State of Florida. These NLCS units provide preservation, protection, conservation, and enhancement of open space; solitude; recreation opportunities; and scientific, cultural, educational, and ecological values, while allowing compatible resource uses.

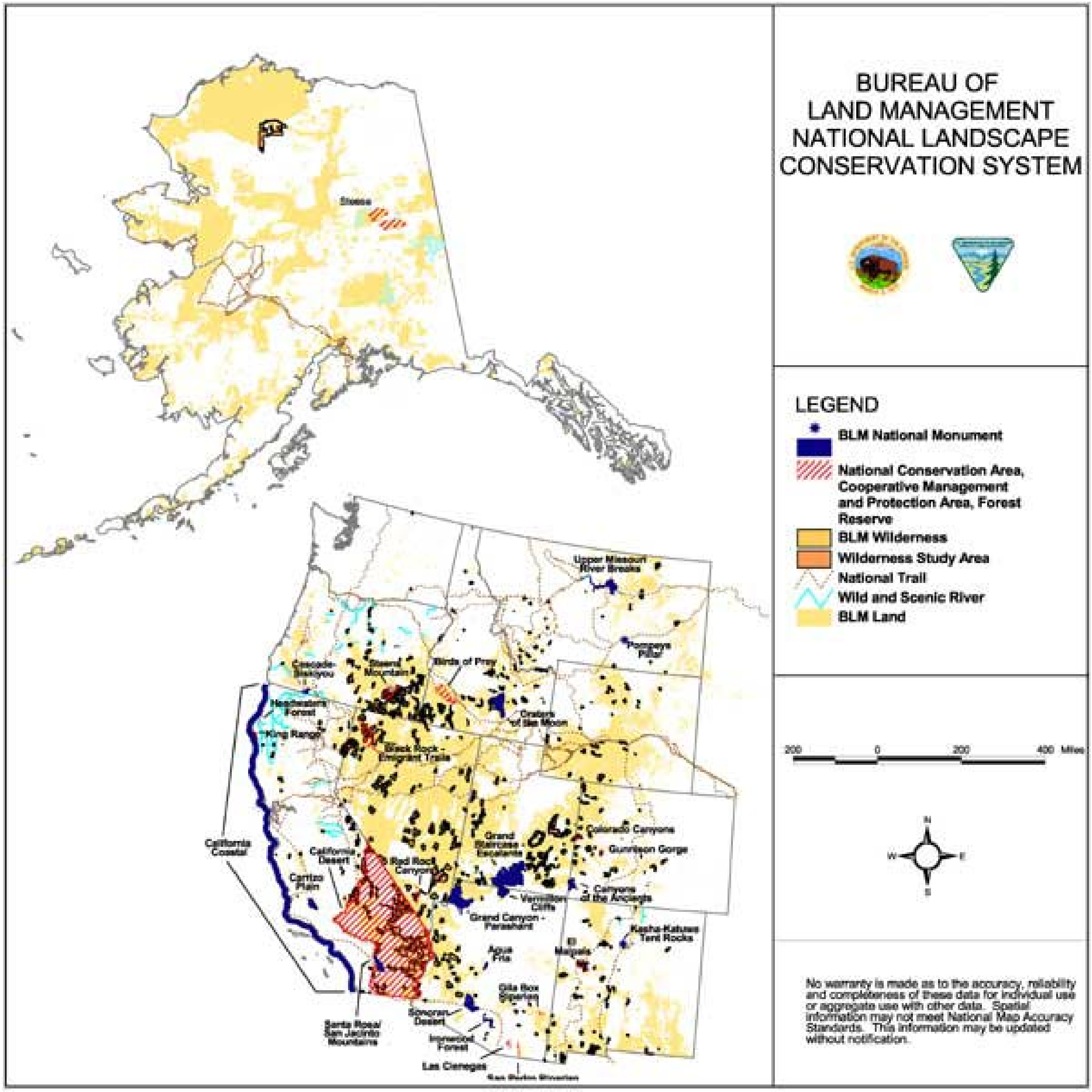
NLCS remote wildlands and working landscapes, managed within the BLM multiple-use framework, provide sources of livelihood as well as havens of solitude and peacefulness. Specifically, livestock grazing, an authorized activity within the NLCS, is managed through existing applicable law, regulation, and proclamation.

The following definitions briefly describe the NLCS units:

National Monument: An area designated by the President, under the authority of the Antiquities Act of 1906, to protect objects of scientific and historical interest that are located on Federal lands.

National Conservation Area: An area designated by Congress to provide for the conservation, use, enjoyment, and enhancement of certain natural, recreational, paleontological, and other resources, including fish and wildlife habitat. The BLM presently manages 13 National Conservation Areas encompassing a total of nearly 4 million acres.

Figure 3.14.1. Bueau of Land Management National Landscape Conservation System.



Wilderness: An area designated by Congress and defined by the Wilderness Act of 1964 as a place "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Designation is aimed at ensuring that these lands are preserved and protected in their natural condition. Wilderness areas, which are generally at least 5,000 acres or more, offer outstanding opportunities for solitude or a primitive and unconfined type of recreation; such areas may also contain ecological, geological, or other features that have scientific, scenic, or historical value. The BLM manages 148 Wilderness Areas encompassing 6.3 million acres.

Wilderness Study Area: An area designated by a Federal land management agency (Bureau of Land Management, Forest Service, National Park Service, or the Fish and Wildlife Service) as having wilderness characteristics, thus making it worthy of consideration by Congress for wilderness designation. While Congress considers whether to designate a Wilderness Study Area (WSA) as permanent wilderness, the Federal agency managing the WSA does so in such a way as to prevent impairment of the area's suitability for wilderness designation. The BLM manages 604 WSAs encompassing 17.2 million acres.

Wild and Scenic River: A river or river section designated by Congress or the Secretary of the Interior, under the authority of the Wild and Scenic Rivers Act of 1968, to protect outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and to preserve the river or river section in its free-flowing condition. The law recognizes three classes of rivers—wild, scenic, and recreational. The BLM manages 36 Wild and Scenic Rivers (20 percent of the national system) amounting to 2,056 miles of river, equaling about 1 million acres.

National Scenic Trail: A trail designated by Congress under the National Trails System Act of 1968 as an extended trail that offers maximum outdoor recreation potential and provides enjoyment of the various qualities—scenic, historical, natural, and cultural—of the areas through which the trail passes. The BLM manages portions of the Continental Divide and Pacific Crest National Scenic Trails, amounting to 641 miles of trail.

National Historic Trail: A trail designated by Congress under the National Trails System Act as an extended trail that follows as closely as possible the original trails or routes of travel with national historical significance. Designation identifies and protects historical routes and their historical remnants and artifacts for public use and enjoyment. A designated trail must meet certain criteria, including having a significant potential for public recreational use or interest based on historical interpretation and appreciation. The BLM manages nine National Historic Trails totaling 3,623 miles, including the Iditarod, Juan Bautista De Anza, California Immigrant, Nez Perce, Lewis and Clark, Oregon, Mormon Pioneer, Pony Express, and the El Camino Real de Tierra Adentro.

The BLM manages other special designation areas outside of the NLCS, including Areas of Critical Environmental Concern, Research Natural Areas, National Natural Landmarks, and National Recreation Trails.

3.14.2 Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) are BLM designations meant to highlight public lands where special consideration is warranted. The BLM establishes and manages ACECs to protect and prevent irreparable damage to historical, cultural, and scenic values; fish or wildlife resources; as well as other natural systems or processes. ACECs can also be established to protect human life and provide safety from natural hazards. The designation recognizes that an area has significant values, and that those values will be protected through planned special management measures. ACEC resources and values must be accommodated as directed through their designation documents when planning for future management actions and land use proposals.

3.14.3 Research Natural Areas

Research Natural Areas (RNAs) contain important ecological and scientific values and are managed for minimum human disturbance. RNAs are primarily used for nonmanipulative research and baseline data gathering on relatively unaltered community types. Since natural processes are allowed to dominate, RNAs also make excellent controls for similar communities that are being actively managed. In addition, RNAs provide an essential network of diverse habitat types that will be preserved in their natural state for future generations. The BLM manages 152 RNAs containing more than 300,000 acres.

3.14.4 National Natural Landmarks

The BLM cooperates with the National Park Service to implement the National Natural Landmarks Program. The program recognizes and encourages the conservation of outstanding examples of natural history. Landmarks are designated by the Secretary of the Interior and are the best examples of biological and geological features in both public and private ownership. The program includes 45 landmarks comprising more than 4,000,000 acres.

3.14.5 National Recreation Trails

The Recreational Trails Program provides funds for developing and maintaining recreational trails and trail-related facilities. The program supports both nonmotorized and motorized recreational trail pursuits.

3.15 Heritage Resources: Paleontological and Cultural Resources (Properties)

3.15.1 Paleontological Resources

Paleontological resources are the remains of plants and animals preserved in soils and sedimentary rocks. They are important for understanding past environments, environmental change, and the evolution of life. Federal legislation (e.g., Federal Land Policy and Management Act) directs agencies to manage paleontological resources to preserve them for scientific and public uses.

The BLM has more than 25 million acres of sensitive, fossil-bearing geological deposits on western BLM-administered land. The fossils range in age from the Precambrian (more than 500 million years ago) to the recent (the last 10,000 years) and include examples of all extinct and living phyla.

Paleontological remains range from mammoths associated with the Ice Ages about 10,000 years ago to the microorganisms associated with the earliest evidence of life some 2.8 billion years ago. Paleontological items discovered on Federal land include dinosaur remains in Nevada, Utah, Colorado, Wyoming, California, and Montana; fossil fish deposits from the Green River Formation; insect and plant fossils found in Nevada; and large petrified trees in Arizona and Nevada.

Paleontological resources can be found in any sedimentary formation or soil deposition context, but badlands shale, sandstone, limestone outcrops, fault scarps, and eroded lands have a high potential for containing fossils.

3.15.2 Cultural Resources

Cultural resources (cultural properties) are definite locations of human activity, occupation, or use which include archaeological, historic, or architectural sites, structures, or places with important public and scientific uses. Cultural resources may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Traditional values are a social or cultural group's traditional systems of religious belief, cultural practice, or social interaction, and may represent abstract, nonmaterial, ascribed ideas that may only be discovered through discussion with members of the group. Traditional values frequently provide the context for the interpretation and evaluation of cultural resources, but are not the same thing as cultural resources. Traditional values are further discussed in the sections on social conditions (e.g. Section 3.17).

About 15,475,300 acres of the 264,200,000 acres of BLM-administered lands have had cultural resource inventories. The results of cultural resource inventories are shown in Table 3.15.2.1 and significant areas are listed by designation in Table 3.15.2.2.

Cultural resources are managed through several legal authorities, but mainly through the Section 106 (National Historic Preservation Act) compliance process. Other legal authorities include the Antiquities Act of 1906, Recreation and Public Purposes Act of 1926, Historic Sites Act of 1935, Executive Order 11593 ("Protection and Enhancement of the Cultural Environment"), American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, Native American Graves Protection and Repatriation Act of 1990, Executive Order 13007 ("Indian Sacred Sites"), and Executive Order 13287 ("Preserve America"). Before authorizing surface disturbance, the BLM must identify cultural properties eligible for inclusion on the National Register of Historic Places and consider the effects of the proposed undertaking through the consultation process in Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. This process is implemented in accordance with 36 CFR 800. In many States, procedures for adapting the process to local needs have been developed through programmatic agreements between the BLM, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

Table 3.15.2.1. Bureau of Land Management cultural resource inventory data.

Total BLM-administered lands (acres)	264,200,000
Total acres inventoried	15,475,300
Percentage of lands inventoried	5.9%
Number of cultural properties recorded	255,252
Number of cultural properties eligible for the National Register of Historic Places	13,952

From "Public Land Statistics 2001"

Table 3.15.2.2. Bureau of Land Management significant cultural resource areas.

Designation	**Number**
National Historic Trails	9 (total mileage: 3,650 miles)
Properties listed on the National Register of Historic Places	4,247
National Historic Landmarks	21

Source: BLM Cultural and Fossil Resources and Tribal Consultation Group.

Section 106 of NHPA does not prohibit disturbing cultural resources. In fact, an authorized officer may permit activities that damage or destroy them. In addition, mitigation is required only if disturbance would affect a property's attributes that make it eligible for the National Register.

In recent years, with an awareness and appreciation of cultural properties, the inventory, protection, stabilization, and enhancement of cultural resources have become integral parts of BLM management practices and planning initiatives.

3.15.3 Cultural Resources Through Time

Cultural resources in the United States extend back to the earliest human migrations to the Western Hemisphere, some 15,000 years ago. These resources range from isolated artifacts, to small-scale habitation sites, to complex agricultural villages and densely populated pueblos, to natural landscape features of special significance. Prehistoric human occupations were rarely uniform over large areas, particularly where there were significant ecological changes over short distances. Consequently, site types, sizes, and densities are extremely variable.

Across the western region, however, water was (and continues to be) one of the most important factors affecting human settlement and survival. As such, many prehistoric, historic, and modern era cultural properties are located near or around water sources.

Prehistoric cultural resources have been organized into early, middle, and late periods, with the early period commonly referred to as Paleoindian (15,000–8,000 years ago), the middle period as Archaic (8,000–2,000 years ago), and the final period as Late Prehistoric (2,000–200 years ago).

Cultural resources from the Paleoindian period are found in high-elevation coniferous and deciduous forests as well as lower elevation plains grasslands and in areas of the desert Southwest, mainly near water sources and in alluvial and colluvial soil deposits. People surviving during this period often hunted megafauna, such as mammoth and giant bison, that are now extinct.

Prehistoric cultural resources from the Archaic period reflect a shift from an exploitation of megafauna to an emphasis on hunting and collecting a variety of resources, such as fish, large and small game, and edible plants and nuts. Hunting sites, plant gathering sites, and temporary camps are probably scattered in most western ecosystems.

Beginning about 2,000 years ago, the Archaic period phased into the Late Prehistoric period with the introduction of agriculture, ceramics, the bow and arrow, and sedentary lifeways as major adaptive elements. In general, site types and patterns were similar during archaic times except where lifeways shifted to an agricultural base.

The Prehistoric era began blending into the Historic era in 1492 when Europeans started migrating to and settling in the Americas; however, the Historic era did not start at the same time everywhere across the West. In the Southwest, the historic period began in the 1500s with the Spanish *entrada*. In the Pacific Northwest and the Great Basin, significant Euro-American migrations did not begin before the middle of the 1800s; in the Rocky Mountains and Plains the Historic era did not begin until the exploitation of the region by the fur trade in the late 1700s and early 1800s. As many Euro-Americans moved north and west, they took with them a lifeway emphasizing livestock ranching; in the Southwest, ranching began as early as the 1600s, whereas in the northern areas it began in the 1850s. The identity of many small towns and communities in the West is associated with this tradition.

Cultural properties related to the Historic era continue to include indigenous remains such as Indian agency buildings and missions. A majority of historic resources in the West, however, are artifacts, sites, and landscapes associated with early Euro-American exploration, the fur trade, mining, logging, ranching, farming, transportation, manufacturing, and early urban development.

Beginning about 1900, the Historic era merged into modern times. At the turn of the century, the picture of the "Wild West" was changing; the people and places that characterized the "western frontier"—the cowboys, outlaws, Indians, prospecting miners, and military cavalry—were all fading into memory as stories and icons of a bygone era. American society began to shift from a largely rural society to a more urban society. People moved off of farms and ranches into the big cities with increasing industrialization. Native Americans were settled onto reservations with a government policy of assimilation and acculturation. Many mining towns boomed only to become busted ghost towns within a few decades.

These recent changes can be seen in an array of cultural resources and traditional cultural properties. Depression and later era mining camps, abandoned rural hamlets and post offices, World War II bases and installations, artifacts and objects left behind by migrant sheep herders, Civilian Conservation Corps construction works and camps, or even the Interstate Highway System, all document the changing West.

Despite attempts at assimilation and settlement, many Native American tribes have held onto their traditional lifeways and beliefs. They have continued to use their environment to gather native plants, animals, and minerals for use in religious ceremonies, folk medicine, subsistence, and crafts. They have maintained treaty rights into the Modern era to exploit traditional plant gathering and hunting areas. For Native American tribes and individuals, any environment can contain specific places that are significant for spiritual purposes. Those sacred places embodying spiritual values are often associated with indigenous rock art, medicine wheels, rock cairns and effigy figures, spirit trails and spirit gates, caves, rock formations, and springs or lakes. Contemporary use areas are associated with traditional plant and mineral collection locales, vision quest sites, sun dance grounds, shrines, and traditional trails.

Notwithstanding the radical and sometimes rapid changes undergone in the West in the twentieth century, the western ranching way of life has carried forward a significant part of the world's image of America and America's image of itself. Modern western ranching communities have traditional activities, social behaviors, and values that are part of the Nation's historical and cultural heritage. This way of life is represented on the landscape through numerous cultural resources, including developed springs, wells and watering tanks, fence lines, wild horse traps, corrals, ranch houses, sheep herding camps, shearing pens, loading chutes, grange halls, and one-room school houses.

3.16 Economic Conditions

General Economic Conditions and Trends

The population of the western United States has been growing faster than any other region of the country in both urban and rural areas. During the 1990s, the rural West grew by 20 percent—twice the national average. Moderate climates, scenic features, and other natural amenities spurred much of this growth, especially rural growth in the Rocky Mountain West (USDA Economic Research Service 2003).

This population growth has been accompanied by economic growth and diversification of western States' economies. The agriculture industry in general, and livestock production in particular, has declined in relation to the growth of other industries in the region (USDA ERS 2000). However, livestock production remains an important contributor to many rural economies of the West, particularly in areas where population growth has not occurred or where populations continue to decline.

While agriculture has declined in relative importance, other industries have increased their importance to rural and urban areas of the West. With respect to economic uses of public lands, outdoor recreation in particular has increased in importance (USDA ERS 2002). Outdoor recreation of all types, including hunting, fishing, wildlife viewing, OHV use, mountain biking, hiking, camping, have been contributing to significant increases in spending and employment. Many of the multiple-use management conflicts occurring on public lands in recent years are due to increased recreation use in relation to other activities such as livestock grazing.

Livestock Grazing on Public Lands

BLM grazing statistics for 2002 show there were 18,142 permits and leases for livestock grazing with a total of about 12.7 million active AUMs (PLS 2002) in the 15 western States. Most of these permits and AUMs are located in the 11 western-most States, while Nebraska, North Dakota, Oklahoma, and South Dakota have relatively few permits and leases. Because many livestock operators hold more than one permit, the total number of operators is less than the number of permits. About 95 percent of the operators graze cattle, 8 percent graze sheep and goats, and another 7 percent graze horses and burros (PLS 2002). These percentages do not add to 100 percent because many operators run more than one kind of livestock. Table 3.16.1 shows, by state for 2002, the number of permits or leases and AUMs.

Table 3.16.1. Permits, leases, and authorized use, 2002.

State	Permits or Leases	Active AUMs	Billed AUMs	Nonuse AUMs	Percent Nonuse
Arizona	770	684,270	369,164	315,106	46%
California	608	375,246	178,879	196,367	52%
Colorado	1,603	643,520	341,751	301,769	47%
Idaho	1,939	1,317,041	843,937	473,104	36%
Montana	4,297	1,370,028	1,053,142	316,886	23%
Nevada	2,312	1,865,779	1,321,494	544,285	29%
New Mexico	642	2,162,719	1,131,608	1,031,111	48%
Oregon	1,624	1,067,465	711,816	355,649	33%
Utah	1,557	1,237,940	746,236	491,704	40%
Wyoming	2,790	1,973,173	1,174,792	798,381	40%
Total	18,142	12,697,181	7,872,819	4,824,362	38%

Note: Montana includes North and South Dakota, New Mexico includes Oklahoma, Oregon includes Washington, and Wyoming includes Nebraska. Source: PLS 2002.

Source: BLM 2002c.

Table 3.16.2. Number of permits or leases and active or nonuse AUMs since 1996.

Year	Permits or Leases	Active AUMs	Billed AUMs	Nonuse AUMs	Percent Nonuse
1996	18,795	13,086,335	9,738,638	3,347,697	26%
1997	18,769	13,070,176	9,445,482	3,624,694	28%
1998	18,698	13,015,303	10,353,032	2,662,271	20%
1999	18,468	12,994,883	10,087,988	2,906,895	22%
2000	18,393	12,810,487	9,837,588	2,972,899	23%
2001	18,382	12,776,369	8,112,008	4,664,361	37%
2002	18,142	12,697,181	7,872,819	4,824,362	38%

Source: BLM 2002c.

Of the 12.7 million active AUMs in 2002, about 4.8 million were in nonuse, for a westwide average of 38 percent. Nonuse ranged from 23 percent in Montana to 52 percent in California. Many factors contribute to operators' reasons to take nonuse, but drought and financial conditions are among the most important. Table 3.16.2 shows the trend since 1996 of the number of permits or leases, active AUMs, and nonuse AUMs.

Table 3.16.3 shows a downward trend in numbers of permits or leases and active use, as well as an increase in nonuse. The downward trend in numbers of permits or leases and active use reflects the continuation of a decades-long trend both for public lands livestock operators as well as the livestock industry as a whole. The industry as a whole continues to experience consolidation and a trend toward fewer but larger operations.

The livestock-raising subsector of the agriculture industry in the western United States still depends on public lands in a variety of ways, including local economic activity, types of animals grazed on public lands, rancher dependence on Federal forage, and size of ranch operations with Federal permits.

Table 3.16.3. Percent Dependency of Counties in Eleven Western States on Federal Forage

Dependency Level	Number of Counties	Percentage of Total	Cumulative Percentage of Total
0–0%	258	62%	62%
10–30%	82	20%	82%
30–50%	36	9%	91%
50–80%	27	6%	97%
80–100%	13	3%	100%
Total	416	100%	100%

Source: USDA ERS 2002

In a recent study of public lands and western communities, the Economic Research Service grouped 416 Counties in the 11 western States according to the share of total countywide AUMs estimated to come from Federal lands, including both BLM and Forest Service (USDA ERS 2002). That analysis shows that about 9 percent of all Counties are 50–100 percent dependent on public lands, whereas 91 percent were less than 50 percent dependent on public lands (see Table 3.16.3). Counties showing more than 50 percent dependence on Federal lands tend to be among the least densely populated Counties.

The importance of Federal rangelands also varies by the type of animal grazed. In a 1989 study of forage demand by cattle, Federal lands (including both BLM and Forest Service) were estimated to make up about 7 percent of beef cattle forage and about 2 percent of the total feed consumed by beef cattle in the lower 48 States (Joyce 1989). In the 11 western States, Federal land grazing was estimated to make up about 25 percent of beef cattle forage. About a third of beef cattle in the West graze at least part of the year on Federal rangelands. In a 1991 study of forage demand by sheep, Federal lands grazing was estimated to make up less than 20 percent of forage demand (Shapouri 1991).

Rancher dependency on Federal forage is another measure of the importance of Federal rangelands. Average dependency of permittees on Federal forage is highest in Arizona (60 percent) because of the large amount of Federal land in relation to private lands, the availability of yearlong grazing, and the relatively high number of operators with both BLM and Forest Service permits. Montana has the lowest average dependency (11 percent) because it has seasonal grazing and more private than Federal forage. Table 3.16.4 shows average dependency for operators in each of the 11 western States. Note that these are statewide averages; individual rancher dependency within each state would vary substantially.

Characteristics and Profitability of Livestock Operations on Public Lands

Public land ranches are highly individualized operations, but there are also some similarities from which general characteristics can be drawn. Ranches in the western United States, where BLM public lands ranchers are located, tend to be larger than operations in other regions of the country. The majority are cow–calf operations that operate seasonally on public lands, although operations in some areas are

Table 3.16.4. Average Dependency Level for Cattle and Sheep by State for the 11 Western States (includes both BLM and Forest Service rangelands).

State	Average Cattle Dependency	Average Sheep Dependency
Arizona	60%	[1]
California	15%	24%
Colorado	25%	37%
Idaho	23%	35%
Montana	11%	35%
Nevada	36%	43%
New Mexico	44%	49%
Oregon	23%	27%
Utah	35%	47%
Washington	13%	[1]
Wyoming	23%	29%

[1] Sheep budgets were not prepared since few sheep graze on Federal land in these States.
Source: Forest Service and BLM 1992.

year-round. The average size of cow–calf operations in the West is 146 bred cows and 132 weaned calves. The region with the next highest average size, the Southern Plains, had an average herd size of 79 bred cows and 60 weaned calves. Although 10 percent of the nation's cow–calf operations are in the western United States, they produce 20 percent of the weaned calves (Short 2001).

An earlier study of cow–calf production costs made a further distinction between operations with Federal permits versus those without permits (USDA ERS 1991). In general, permittees were found to have lower per-cow cash receipts than nonpermittees, but they also had lower per-cow cash expenses and lower capital expenses. Overall net cash returns were higher for permittees, on average, than for nonpermittees. The more recent study of cow–calf production costs (Short 2001) shows that cow–calf operations in the West generally have some significant cost advantages over operators in other regions, though these data are not broken out for permittees and nonpermittees.

Ranching tends to be a low- or negative-profit enterprise, and public land ranchers are no exception. Recent cow–calf production costs and returns data show that operations in all regions had, on average, negative returns above operating and ownership costs (i.e., all costs), but in the West, these negative returns were lower than for other regions (Short 2001). Considering strictly returns above operating costs (i.e., not including ownership costs), the western United States had, on average, higher positive returns than all other regions.

Others have studied profit motives of ranchers, and public lands ranchers in particular. Van Tassell et.al. (2001) found that profitability is one among several issues considered by ranchers with public lands grazing permits. Torell et.al. (2001), found that in many instances, profit ranks behind such things as family, tradition, and a desirable way of life as factors in ranch purchase decisions. Torell notes that studies have shown that western ranches will not "pencil out," and that there seem to be many reasons other than profit that motivate ranchers to stay in business.

Tanaka and Gentner (2001) surveyed public lands ranchers and gauged their responses to three policy questions related to public land grazing. They grouped the respondents into eight categories based on specific characteristics and noted each group's response to potential policy changes to see if they differed according to each group's motivations for holding Federal grazing permits (see Social Conditions section of the DEIS for further discussion of these groups, or "clusters"). One interesting finding was that for all eight groups, the objectives of "owning land and ranch is consistent with my family's tradition, culture, and values," and a "ranch is a good place to raise a family" ranked first or second as the most important reasons for continuing in ranching, ahead of the profit motive.

In summary, it seems that profit is one of many reasons that ranchers may continue to hold Federal grazing permits, and that the importance of profit varies by type of operation.

3.17 Social Conditions

Demographic Trends

The West is the fastest growing region in the United States. Table 3.17.1 indicates that the populations of all but two of the States in the West grew at rates greater than the nation as a whole from 1990 to 2000. The populations of five States grew faster than 25 percent during this period, with Nevada growing by more than 66 percent. In addition, the West as a region grew faster than other regions in the country. While the nation as

Table 3.17.1. State and regional population change in the West, 1990 to 2000.

State	Population 1990	Population 2000	Change 1990 to 2000 (%)
Nevada	1,201,833	1,998,257	66.3
Arizona	3,665,228	5,130,632	40.0
Colorado	3,294,394	4,301,261	30.6
Utah	1,722,850	2,233,169	29.6
Idaho	1,006,749	1,293,953	28.5
Washington	4,866,692	5,894,121	21.1
Oregon	2,842,321	3,421,399	20.4
New Mexico	1,515,069	1,819,046	20.1
California	29,760,021	33,871,648	13.8
Montana	799,065	902,195	12.9
Wyoming	453,588	493,782	8.9

Regions and Nation	Population 1990	Population 2000	Change 1990 to 2000 (%)
West	52,786,082	63,197,932	19.7
South	85,445,930	100,236,820	17.3
Midwest	59,668,632	64,392,776	7.9
Northeast	50,809,229	53,594,378	5.5
Nation	248,709,873	281,421,906	13.2

Source: United States Census Bureau 2003

a whole grew about 13 percent, the West grew more than 19 percent, far outpacing the Northeast and Midwest in population growth.

As a region, the West is the most urbanized area in the United States. Urbanization is the proportion of a population that lives in urban areas. Table 3.17.2 shows that more than 88 percent of the population of the West lived in urban areas in 2000. This proportion is even greater than the heavily urbanized northeastern region. Nationally, 79 percent of the population lived in urban areas in 2000. Seven States in the West exceeded the national urban proportion, with six States having more than an 80 percent urban population. This proportion grew rapidly for some western States. Urban populations in Idaho and Oregon grew at 9 percent and 8 percent, respectively, between 1990 and 2000. Where growth occurs will significantly determine its effect on uses of and involvement in the politics of public lands. Growing pressure to use public lands for recreation and solitude will continue to come from population growth in both urban centers and rural places.

A relevant trend is the relation between the amount of public land and population growth in western Counties. In creating a typology of rural Counties, the Economic Research Service (ERS) of the U.S. Department of Agriculture designated a county as a “Federal Lands County” if federally owned lands made up 30 percent or more of a County’s land area in 1987. In the eleven western States in 1994, ERS classified 89 Counties as metropolitan Counties; 128 as nonmetropolitan, nonpublic land Counties;

Table 3.17.2. Rural and urban populations in the West, 1990 and 2000.

State	Urban 1990 (%)	Rural 1990 (%)	Urban 2000 (%)	Rural 2000 (%)	Urban change 1990 to 2000 (%)
California	92.6	7.4	94.4	5.6	1.8
Nevada	88.3	11.7	91.5	8.5	3.2
Utah	87.0	13.0	88.2	11.8	1.2
Arizona	87.5	12.5	88.2	11.8	0.7
Colorado	82.4	17.6	84.5	15.5	2.0
Washington	76.4	23.6	82.0	18.0	5.6
Oregon	70.5	29.5	78.7	21.3	8.3
New Mexico	73.0	27.0	75.0	25.0	2.0
Idaho	57.4	42.6	66.4	33.6	9.0
Wyoming	65.0	35.0	65.1	34.9	0.1
Montana	52.5	47.5	54.1	45.9	1.5

Nation by region	Urban 1990 (%)	Rural 1990 (%)	Urban 2000 (%)	Rural 2000 (%)	Urban change 1990 to 2000 (%)
West	86.3	13.7	88.6	11.4	2.4
Northeast	78.9	21.1	84.4	15.6	5.5
Midwest	71.7	28.3	74.7	25.3	3.0
South	68.6	31.4	72.8	27.2	4.2
Nation	75.2	24.8	79.0	21.0	3.8

Source: United States Census Bureau 2003

Table 3.17.3. Metropolitan, nonmetropolitan, and public land county population change in western States, 1990 to 2000.[1]

County type	Population 1990	Population 2000	Proportion of population 1990 (%)	Proportion of population 2000 (%)	Population change 1990 to 2000 (%)
Nonmetropolitan, nonpublic land counties	2,728,251	3,139,775	5.3	5.1	15.1
Metropolitan counties	44,476,002	53,251,277	86.9	86.8	19.7
Nonmetropolitan public land counties	3,974,974	4,968,411	7.8	8.1	25.0

[1] Totals do not include Hawaii and Alaska. Source: United States Census Bureau 2003 (Cook and Mizer 1994).

and 194 as nonmetropolitan, public land Counties (Cook and Mizer 1994). Population growth rates from 1990 to 2000 differed for these three categories of Counties. Table 3.17.3 displays population change during this period for metropolitan, nonmetropolitan, and nonmetropolitan public land Counties in the West. The proportion of the population in western States accounted for by metropolitan Counties was stable at about 87 percent from 1990 to 2000. However, nonmetropolitan public land Counties grew by 25 percent more than the period, much faster than the other two types of Counties. While the West was growing rapidly as a region, public land Counties were growing faster as a group than other Counties. Such growth is changing the social context of ranching throughout the West (Sheridan 2001).

Ranchers

These population trends, their cause and numerous arguments concerning their effect on communities are well documented. Migration is clearly the major force underlying this population growth (Nord and Cromartie 1997; McGranahan 1999). In addition, the role of physical amenities, quality of life, proximity to designated wilderness, and other arguments are frequently forwarded as both a cause of migration to public land Counties and as a policy goal (Clark and Murphy 1996; Duffy-Deno 1998; McGranahan 1999; Deller et al. 2001; Hansen et al 2002; Lorah and Southwick 2003).

The effect of these population changes on ranches is difficult to generalize because ranchers and ranch operations in the West present a very heterogeneous population. The local and regional variations in terrain, climate, and ecological systems are almost matched by local and regional differences in the social, economic, and institutional contexts within which ranches operate (Gentner and Tanaka 2002). Each ranch has a unique economic structure, participates in a certain type of regional economy, has a particular type of family relationship to the business, and maintains certain types of ties to a local community and a larger regional, possibly urban, area (Darden et al. 2001). Ranchers make decisions in different ways for different reasons, and will therefore experience differing social effects from changes in their economic, social, and institutional relations. This heterogeneity must be accounted for to understand potential social effects on ranchers, their operations, and their communities.

Gentner and Tanaka (2002) provide a comprehensive classification of public land grazing permittees. A random sample of 2,000 ranchers was drawn from more than 21,000 Bureau of Land Management (BLM) and U.S. Forest Service (USFS) permittees and evaluated by using a mail survey. A set of rancher attributes was used to capture goals and objectives of ranchers, educational attainment, business organization, number of livestock, sources of labor, income by source, debt load and financial stress, and other social and economic indicators. Cluster analysis identified eight groups of ranchers on the basis of these attributes. Two general groups emerged—hobby ranchers (50.5 percent) and dependent ranchers (49.5 percent). The two main groups are differentiated most notably by their dependence on ranch income for their livelihoods: the hobby group received less than 22 percent of their family income from the ranch, whereas the dependent group received more than 72 percent of their income from the ranch (see Table 3.17.4). This detachment of the ranch operation from the majority of household income for more than half of this sample has social ramifications. Part-time and hobby ranchers may retain attitudes and local social ties

Table 3.17.4. Ranch income by source.[1]

Rancher type	Ranch Income by Source		
	Ranch (%)	Other Agriculture/Forestry (%)	All Other (%)
Dependent Family Rancher	84.7	6.0	9.2
Sheep Rancher	80.8	2.1	17.0
Diversified Family Rancher	74.9	10.4	14.4
Corporate Rancher	71.9	9.2	18.8
Retired Hobbyist	21.5	21.4	56.3
Trophy Rancher	21.1	7.7	70.6
Working Hobbyist	18.2	2.3	79.5
Small Hobbyist	13	5	84

[1] Totals may not sum due to rounding. Source: (Gentner and Tanaka 2000).

similar to full-time ranchers and be relatively immune to the economic fluctuations of ranching. The motivation and ability of these ranchers to remain in ranching even under difficult economic circumstances may actually be higher than those relying directly on the ranch for their livelihood.

The general characteristics and percentage of the Gentner and Tanaka (2002) sample for each group are as follows:

- Small Hobbyist (11%): Small operations, small herds, lowest dependence on ranch income, high dependence on off-ranch income, highly educated, slightly lower dependence on Federal forage.
- Retired Hobbyist (18%): Older, small operations, higher dependence on ranch income, very high dependence on retirement income, slightly lower dependence on Federal forage.
- Working Hobbyist (15%): Highest dependence on off-ranch income, youngest, small operations, ranching the longest, highest dependence on Federal forage among hobbyists.
- Trophy Hobby Rancher (6%): Large operations, large deeded acreage, highest use of hired labor among hobbyists, highest reliance on corporate organizations among hobbyists, highly educated.
- Diversified Family Rancher (13%): Dependent on ranch income, more diversified into other nonranching income sources, smallest herd size among professional ranches, relative dependence on family labor, highest reliance on sole proprietorship as business organization, higher reliance on Federal forage.
- Dependent Family Rancher (19%): Highest dependence on ranch income, lowest diversification into other income sources, least educated, highest debt load, highest reliance on formal partnerships for ranch business organization, higher reliance on Federal forage.
- Corporate Rancher (13%): High reliance on ranch income, largest herd size, large deeded acreage, lowest reliance on Federal forage among professional

ranches, high reliance on corporations as business organization.

- Sheep Herder Rancher (4%): Depend on sheep for primary ranching operations, large herds, large deeded acreage, highest use of hired labor, highly dependent on ranch income, highest dependence on Federal forage.

Clearly, permittees have very different attributes, motivations, and goals. An important question concerns whether ranchers seek to maximize profit or whether other factors as important or even primary in explaining why ranchers continue in a difficult environment. Many studies lead to a firm conclusion that most ranchers do not hold maximizing profit as their sole, or even primary, goal in ranching (Smith and Martin 1972; Harper and Eastman 1980; Bartlett, et al. 1989; Torell et al. 2001; Rowe et al. 2001). Smith and Martin (1972) used such terms as "farm fundamentalism" to describe social motivations for ranching when economic returns were consistently poor. Bartlett et al. (1989) found that an ethic of the land and the role ranching plays in family life were important to Colorado ranchers. Rowe et al. (2001) provided a confirmation that rural ways of life coupled with family concerns were more important to ranchers in two Colorado Counties than profit alone.

Gentner and Tanaka (2002) found that professional ranchers valued family tradition, ranching as a good way to raise a family, living closer to friends and families, desire to pass the ranch on to children, and return on investment more than did hobby ranchers (See Table 3.17.5). Maintaining a

Table 3.17.5. Goals and objectives for ranching.[1]

Rancher type	Family Tradition	Raise Family	Close to Friends	Pass to Children	Profit	Lack Skills	Environmental Purposes
Hobbyists							
Small Hobbyist	3.7	3.7	2.8	1.5	2.6	1.5	2.4
Retired Hobbyist	4.6	4.6	3.9	4.3	3.7	2.3	2.2
Working Hobbyist	4.5	4.6	3.5	4.2	3.6	1.8	2.3
Trophy Rancher	3.4	3.3	2.1	4.0	2.6	1.3	2.1
Professionals							
Diversified Family Rancher	4.1	4.2	2.9	2.3	3.7	2.0	1.9
Dependent Family Rancher	4.9	4.9	4.4	4.8	4.2	3.3	2.3
Corporate Rancher	4.5	4.5	3.5	4.1	3.6	2.3	2.0
Sheep Rancher	4.4	4.5	3.2	3.8	3.5	2.3	2.0
P - value	ns	0.0001	0.001	ns	0.0001	0.001	0.001

[1] Average on a scale of 1 = low to 5 = high. Source: (Gentner and Tanaka 2002).

family tradition and passing the ranch on to children were the most highly ranked goals for both categories of ranchers, resulting in no significant statistical difference between categories. Other goals did show significant differences. Professional ranchers strongly believed that ranches were a good place to raise a family, to stay near friends and family, as well as to pursue profit. Hobby ranchers did not hold these goals as strongly.

Significant family labor is required for some of the ranchers in this sample. Table 3.17.6 shows that most of the professional ranchers require from 20 to 27 months of family labor to run the ranch. This is mixed with very different levels of hired labor. Diversified and dependent professional ranchers use little hired labor in relation to use by corporate and trophy ranchers. The nature of sheep ranching requires significant hired labor in addition to the two full-time family laborers required to run a modern operation.

Table 3.17.6. Months of labor required to run the ranch (Gentner and Tanaka 2000).

Rancher type	Family laborer (months)	Hired laborer (months)
Sheep Rancher	27.5	45.3
Corporate Rancher	26.7	32.0
Dependent Family Rancher	24.6	3.6
Diversified Family Rancher	20.7	4.3
Retired Hobbyist	17.2	4.8
Working Hobbyist	14.9	2.3
Trophy Rancher	13.5	28.2
Small Hobbyist	10.5	4.5

Source: (Gentner and Tanaka 2002).

The social environment of ranching therefore has multiple dimensions. With the exception of the trophy hobbyists, the permittees in the Gentner and Tanaka survey had family tenure on their ranches of well over 20 years, with most having tenure of 30 years or more. Most of these permittees have ranched as Federal grazing permittees for decades and are familiar with the growing complexities and stress associated with being a public land grazer.

This willingness to accept low economic returns to meet other goals is also reflected in the economics of ranch real estate. Torell and Bailey (2000) estimated that only 27% of the value of New Mexico ranches is related to their livestock productivity. Thus, recent buyers of New Mexico ranches are motivated not by their value to produce livestock, but rather by a host of other values commonly associated with ranches. Torell and Bailey found wildlife amenities, proximity to a population center, and type of terrain were more important determinants of ranch sale prices than cattle operations. These new ranchers, along with new residents, bring different demands for space as an amenity (Huntsinger et al. 1997; Bastian et al. 2002; Inman et al. 2002). Even in this environment, many ranches continue to operate with the knowledge that the ranch can be sold at a significant premium to people with other interests in the land.

Communities

As mentioned previously, populations in the rural West have grown dramatically over the last decade. Population growth complicates any assessments of how changes in public land policy might affect ranches and the communities in which they operate. To understand the broader implications range policy changes may have for a community, a discussion of four general social forces affecting communities is necessary. These four community social organization processes occur within and are affected by the social interactions in rural communities, their social and economic histories, and other factors.

Differentiation is the process of expanding the range of values and interests represented in a community. In the West, this is presently influenced by population growth and the decreasing reliance on traditional resource industries for employment. As population increases, social diversity increases and brings about differentiation in the needs, demands, and expectations people have of their community. Economic and employment changes can result in greater differentiation of occupational characteristics in the community, along with shifts between interest groups that enter into community interaction. This process often produces short-run social conflict as those seeking some ideal about their rural community clash with those who lives are not compatible with that ideal (Walker 2003). In addition, conflict over how to view “nature,” ranching, and landscapes in general seems to be inherent in the process of differentiation (Chilson 1997; Eisenhauer et al. 2000; Hull et al. 2001; Sheridan 2001; Paolisso 2002; Bieling and Plieninger 2003).

Extra-local linkage is a process through which resources and demands flow back and forth between communities and the larger society. This is best viewed as the extent to which local institutions, economies, and decision makers are influenced by people and social processes outside of the community, and the extent to which they might call upon those resources for support. Issues like public land management are highly visible and increase local linkages to extra-local social units. In this sense, public land controversy engenders a higher degree of extra-local linkages to outside groups. Population growth stemming from the conscious choice to move to a public land community implies that people will bring their extra-local social networks with them, complete with values, attitudes, and beliefs. Further, the very nature of the Federal public land management process engenders significant extra-local involvement in decisions affecting local communities. The opportunities of many different groups, local and extra-local, to become directly involved in decisions affecting even small changes in management is much greater in this arena than are opportunities to affect private land decisions.

Stratification refers to the differential distribution of access to resources for meeting needs among populations. This is one of the most important processes—perhaps the most important process. It has wide-ranging implications for local populations. A primary social process affected by public land policies is the distribution of access to local economic opportunity. As traditional resource industries (timber, mining, ranching) are supplanted by the new resource industries (commodification of nature and its amenities), the economic opportunity structure, family status, and arrangements of social power in communities change as well. For example, ranching communities have historically been stratified by access to and control of property (Stinchcombe 1961). Ranchers continue to hold property in greater proportion to most local people, but many landowners now have significant access to land, wealth, and political power, both local and extra-local. In addition, this change is accompanied by a shift in the nature of the local economy. This shift puts significant pressure on ranchers and other residents: “The irony of the New West is that newcomers attracted to diverse imaginaries of rural lifestyles often make real rural livelihoods unavailable” (Walker 2003; see also Jobes 1987). Thus, significant dimensions of stratification now include access to employment that allows families to live well and remain in the community.

Integration is the process by which relations among people in a community are coordinated and interconnected. This is the most complex and rich aspect of social organization, for it focuses on the process of organizing and focusing the activities of various elements of a community. Cohesion, attachment, density of acquaintanceship, social capital, and sense of place are all examples of social relations either derived from or dependent on social integration. Increased differentiation and extra-local linkages present specific challenges for integration, but also carry the potential for new forms of integration to emerge. The degree of integration in a community before the implementation of a policy determines, to a great degree, the ability of that community to take any actions necessary to manage change (Harp et al. 2001). Sufficient community integration is a necessary condition for communities to take action to mitigate social and economic effects of policy decisions (Wilkinson 1970, 1991). Low levels of integration are often associated with community discussions and decisions being dominated by small groups whose interests may not be attributable to the community as a whole. This is historically the situation in rural communities dominated by one industry, such as timber. However, the question is less one of dominance than it is one of the generalized legitimacy of the decisions being made. Hence, a small group may make a decision and the community as a whole generally agrees with both the process and the outcome of the decision. Thus, social integration plays a part in the legitimization of the decisions.

These organization processes overlap and interact, sometimes working in concert and other times not. Examples of their application to ranching communities are presented in Table 3.17.7. Few empirical studies of how these processes play out in ranching communities are available. These processes and their relations to local economic processes in ranching are reviewed in Harp et al. (1998).

One related example is a study that examined the relations between social network ties and community cohesion, integration, and attachment in Owyhee County, Idaho (Harp et al. 2001). Seven communities were examined and survey methods were used to estimate the importance of social networks and to construct scales of community cohesion, community integration, and community attachment. Cohesion is high when social relations between people produce a sense of belonging to a group with shared beliefs and common behavioral assumptions, and a feeling of recognition as members of that group (Buckner 1988; Jensen 1998; McClure and Broughton 2000; Rajulton, et al. 2003). In essence, people come to see themselves as part of a larger social group that shares their own beliefs and actions. Integration is high when people do not feel isolated or anonymous in their community, and can participate actively in community life (Brown et al. 1989). Activities that are evidence of integration include visiting, and borrowing and lending between neighbors. When integration is high, people are more willing to trust their neighbors in both a social and material fashion (Brown 1993; Cowell and Green 1994). Attachment is high when people feel a strong sense of social connection to their community that makes them reluctant to leave or withdraw from social relations (Kasarda and Janowitz 1974; Goudy 1990; Brown 1993; Liu et al. 1998).

Social networks are patterns of repeated relations between social actors. They have a number of conceptually useful attributes, such as the number or strength of social ties

Table 3.17.7. Example of social organization process in ranching communities.

Social Organization Process			
Differentiation	**Extra-Local Ties**	**Stratification**	**Integration**
Dilutes local economic and social power of ranchers and their values	Globalization of industry reduces value of local economic ties	Stratification becomes an actionable value, e.g. ranchers criticism of new economy	Highly capable of incorporating community-oriented values into actions
Differentiation goes up, web of affiliation for ranchers can narrow or expand—often has community focus	Extra-local ties can increase value of local social networks	Equitable stratification reduces utility of status or creates social leveling	High integration facilitates community-oriented actions by ranchers
Reduces value of group membership; can extend to rancher unwillingness to see community as locus of support	Extra-local ties include increased conflict between ranchers and nonlocal groups	New dimensions of stratification reduce community as source of mutual support for ranching	Degree of integration affects extent and density of local social networks

to family and friends. The standard measure of “density of acquaintanceship” was applied. This is the most empirically important single network measure used in community research. It is measured simply by the proportion of close friends a respondent has living in his or her community. The higher the proportion, the more “dense” the local social network for an individual. In other words, the more friends you have where you live, the more likely you will be to see your community in a positive light and choose to interact with people there (Goudy 1990; Stinner et al 1990; O’Brien and Hassinger 1992; Beggs et al. 1996; Sharp 2001). In addition, respondents were asked whether they had a friend in the ranching business or one who ran a local business. This tied these economic activities to local social networks.

Having more of your friends living in the same community as you, having ranchers and local business owners in your social network, being White, and which community you live in all increased respondents’ beliefs that theirs was a cohesive and highly integrated community. The significant indicators of attachment attitudes were the size of community the respondent resided in until age 18, respondent’s community, density of acquaintanceship, close friends having a business, and how far they drove to work. Hence, the positive social role of ranching was to raise the attitude that the community is a cohesive and integrated place, though not for non-Whites. This is not surprising in the West, given that Latino and Hispanic people are generally stratified into a lower visibility rank with little social or political power. Moreover, this would not be a surprising result even if ethnic groups were themselves ranchers (Raish and McSweeney 2001). Finally, ranching had little effect on the degree to which respondents felt attached to their communities.

There is little doubt that public land ranching and its relation to the land is a social process (Huntsinger and Hopkinson 1996). The relation between social, economic, and ecological issues has been recognized for many years (Adams 1916; Simpson 1975; Abruzzi 1995; Raymond 2002). In many small communities, ranchers play an important social role as decision makers, volunteers, elected officials, and as socially relevant commodity interests. As populations grow, ranches change hands, and this generation of ranchers fades, this role will change. However, the need to recognize community social organization in making management decisions remains important (Curtin 2002).

National Attitudes

National attitudes toward ranching in general tap into social and political institutions that may affect public land grazing management. Three studies of attitudes toward grazing are pertinent, although only one is national.

Brunson and Steel (1996) used a national sample and two Oregon samples to examine how attitudes toward Federal rangeland management vary across the country. First, they split the national sample into eastern and western groups. They found slight differences in regional variations of attitudes and concluded that "...differences in support were slight, and never did one region support a policy that the other rejected."

Second, they used the two samples from Oregon to create comparisons among the Nation, western Oregon, and eastern Oregon. This allowed for comparisons between urbanized areas in general and rural regions where rangelands are more prominent in the landscape and in the local economy. They concluded, "In all cases, residents of the grazing-dependent region of eastern Oregon were more supportive than the national or statewide samples of statements advocating traditional or utilitarian uses, and less supportive of statements urging greater protection of non-forage resources."

Finally, Brunson and Steel concluded that attitudes toward range management are frequently simplistic, consisting of dichotomies of good and bad. Thus, entire sets of attitudes were reduced to a "...poorly developed cognitive structure rooted in simplistic, value-based ideas about the goodness or badness of range practices and conditions." Part of this finding is related to a lack of specific knowledge of rangelands on the part of many people. This produces a disconnection between their attitudes and what they actually know about the issue (Lybecker et al. 2002).

Brunson and Gilbert (2003) studied visitor attitudes toward grazing in the Grand Staircase-Escalante National Monument, Utah. They looked at the relations between visitors' personal characteristics and their reports of how livestock grazing and multiple-use management affect recreation experiences. Hunters saw more effects from grazing but were not put off by them, whereas hikers saw fewer effects but were more likely to say that their experience was degraded by seeing evidence of livestock grazing. Designation of the area as a monument was seen to have little direct effect on attitudes.

Mitchell et al. (1996) found that almost equal proportions of visitors to a Colorado national forest believed that the presence of grazing enhanced their visit (34%) or detracted from it (33%). Local residents, rural residents, and campers at developed campsites were more tolerant of grazing than those using more remote areas.

Finally, many organized public interest groups apply pressure to remove grazing from public land. This debate is certainly polarized (Knight et al. 2002; Wuerthner and Matteson 2002). Nonetheless, this has an effect on local areas in that national, regional, and local groups seeking to reduce or end grazing on BLM and U.S. Forest Service lands are involved routinely in political and legal processes down to the allotment level. The effect of these activities on ranching communities is difficult to quantify, although they may be anecdotally cited by local ranchers as a source of personal and family stress.

Many advocates for the end of public land grazing argue that ranchers often have social and political clout greatly out of proportion to their numbers (Fennemore and Nelson 2001). There is a general assumption that agencies, particularly the BLM, are "captured agents" of the livestock industry and have been since their inception (Cawley 1993; Klyza 1994; Wilkinson 1994). This approach assumes that the agencies were set up to protect livestock industries and that they continue to do so. Though this attitude still prevails, it has recently been challenged with evidence from the creation of the BLM (Welsh 2002).

All of these diverse attitudes compel various national, regional, and local groups to become involved with public land grazing and the ranching industry in many ways. In general, they have significantly raised the level of scrutiny characterizing grazing decisions. It is fair to generalize a conclusion that these attitudes and activities have an effect on ranchers, communities, and larger social institutions, but that this effect is difficult to discern or estimate.

Case Study of a Small Community: Leadore, Idaho

Many permittees and a few others comment frequently about the role ranching and public land grazing play in the economic and social stability of their communities. This short case study of Leadore, Idaho, is intended to illustrate how the social process discussed in this section can be applied to a very ranch-dependent community in a concrete fashion.

Leadore, Idaho, is situated in the southern reaches of the Lemhi River valley in Lemhi County. The Lemhi Mountains sit to the west of Leadore and the Continental Divide and Montana border it to the east. It is a fairly isolated area about 45 miles south of the county seat in Salmon and about 120 miles north of Idaho Falls. The terrain consists generally of river bottoms, sage steppe and forested slopes at higher elevations. The Bureau of Land Management and U.S. Forest Service manage the majority of the land in the area. Leadore's mining heritage is long gone, and the geography remains dominated by cattle ranching.

Idaho's population growth of recent years has not affected Leadore to the extent it has the remainder of Lemhi County. While Lemhi County as a whole grew 13 percent from 1990 to 2000, Leadore's growth was slower, at 7 percent. The Patterson area of the county is even more remote than Leadore, yet its population grew even faster, at 27 percent. Growth, even at low levels, will increase social differentiation within the community. People moving to Leadore include retirees and the wealthy. These groups bring potentially differing perspectives and ideas to the community.

The economic and social influence of ranching in this area is significant. It is the primary axis defining stratification in the community. According to the 1997 Census of Agriculture, 36 of the 40 farms (90%) in the Leadore postal code area sold cattle and calves; for 22 of the farms (55%), these sales exceeded $50,000. Few agricultural products other than cattle and sheep are sold from this area, with the possible exception of buying or selling hay. Total agricultural sales were greater than $100,000 for 30 percent of the farms.

In 1991, ranching was estimated to constitute 85 percent of the direct and induced earnings in the Tendoy-Leadore area, and 77 percent of direct and indirect employment (Robison 1997; Harp et al. 2000). More than 70 percent of the jobs held in the area by residents were related directly or indirectly to agriculture. Retail, restaurants, and some small manufacturing augment the Federal, state and local government employment in the area.

Interviews reported in that research confirmed that almost all commercial agricultural activity derived from cattle ranching. Direct interviews with producers and others estimated the production cow herd to be just more than 14,500 head in the Leadore Census subdivision in 1992 (Harp et al. 2000). At that time, dependence on Federal forage was estimated at 28 percent. This was split almost evenly between BLM and U.S. Forest Service permits. Since that time, a considerable number of ranches have been consolidated. Recent interviews indicate that one person has purchased all or part of six ranches in the last decade and consolidated them into one operation. Another consolidation in the area combined four ranches. Many of the previous owners and their families are no longer in the community. This is changing the nature of economic stratification in the community.

This focus on ranching has an effect on extra-local ties. Many of the challenges to BLM and Forest Service grazing come from conservation and environmental groups well outside of the local area. In addition, ranchers have social and economic ties that take them well outside of the community in the process of doing business.

Community integration processes such as cohesion and community actions are identifiable as well. One of the dominant social features of Leadore is its social commitment to support a K-12 school district, Southern Lemhi District 292. This is a small, rural district with a predominantly agricultural tax base. Table 3.17.8 displays

Table 3.17.8. Recent population change in census subdivisions, Lemhi County, Idaho.

Census Subdivision	Population		
	1990	2000	% Change
Forney	67	53	-20.9%
Leadore	594	638	7.4%
Patterson	387	493	27.4%
Salmon	5,851	6,622	13.2%
Lemhi County Total	6,899	7,806	13.1%

Source: U.S. Census 2003

enrollment, graduates, and local tax support for the South Lemhi and Salmon Districts of Lemhi County, and for the State of Idaho as a whole. School enrollments fluctuated from a low of 115 to a high of 171. Similarly, the number of graduates ranged from 7 to 23 over the period. This district has two elementary schools and a high school, with a total of 16 teachers and 1 administrator. In addition, it is not a wealthy district. Table 3.17.9 shows that local taxes per average daily attendance (ADA) are well below the state average for Idaho. Although low in relation to the state, local taxes are roughly equivalent to the other major district in the county in Salmon. Leadore's enrollment is very low in relation to its tax base, with $421,148 of base per ADA, whereas Salmon (a much larger community) has $340,254 per ADA.

The seasons of ranching and those of the school are primary points of social organization in this community. The dominance of ranches, both economically and socially, fosters a common social view that the entire community's social future is tied to the fate of ranchers. For example, everyone feels exhausted during calving and its progress dominates discussion at school athletic events. Even for those who own no cattle, social discourse can often consist of talking about cattle. Grappling with the challenges of ranching becomes a social event that fosters a sense of integration and ultimately a sense of community. The social fate of the school district is also seen as being tied to ranching. This is not a fiscal issue. Someone will own the land and pay the taxes to the district. Rather, people in Leadore credit ranchers with a willingness to volunteer for many roles in the schools, including service on the school board. People find the resources to support sports teams and other activities. The reality of social cohesion is apparent in the willingness of the community to act to maintain its social

Table 3.17.9. Attendance, graduates, and local taxes per ADA, 1995 to 2002.

	School Year						
	2001–2002	**2000–2001**	**1999–2000**	**1998–1999**	**1997–1998**	**1996–1997**	**1995–1996**
Average Daily Attendance	115	146	147	166	171	156	138
High School Graduates	7	23	9	15	6	8	8
Adjusted Local Taxes Per ADA[1]							
South Lemhi District	$ 1,233	$ 1,119	$ 1,100	$ 1,001	$ 899	$ 901	$ 1,020
Salmon District	$ 1,101	$ 1,100	$ 1,118	$ 997	$ 947	$ 811	$ 810
State of Idaho	$ 1,644	$ 1,627	$ 1,561	$ 1,482	$ 1,416	$ 1,250	$ 1,256

[1] 1996 = 100.
Source: Idaho Department of Education.

relations regarding the school and the ranching industry.

Both ranchers and other community members firmly believe that the combination of ranch families, community cohesion, and a social commitment to Leadore as a ranch community provide the social organization necessary to maintain the school district. The view held by many permittees is that ranching is a source, if not the source, of social and economic stability for their communities. The ability of ranches to keep paying the taxes and contributing time and other resources to keep a small school district functioning reinforces this view. They also firmly believe that the economic loss of the ranches might keep the local tax base intact but that the school itself will not survive. Put another way, the social stability of the community depends on who is operating the ranch rather than on who owns the ranch.