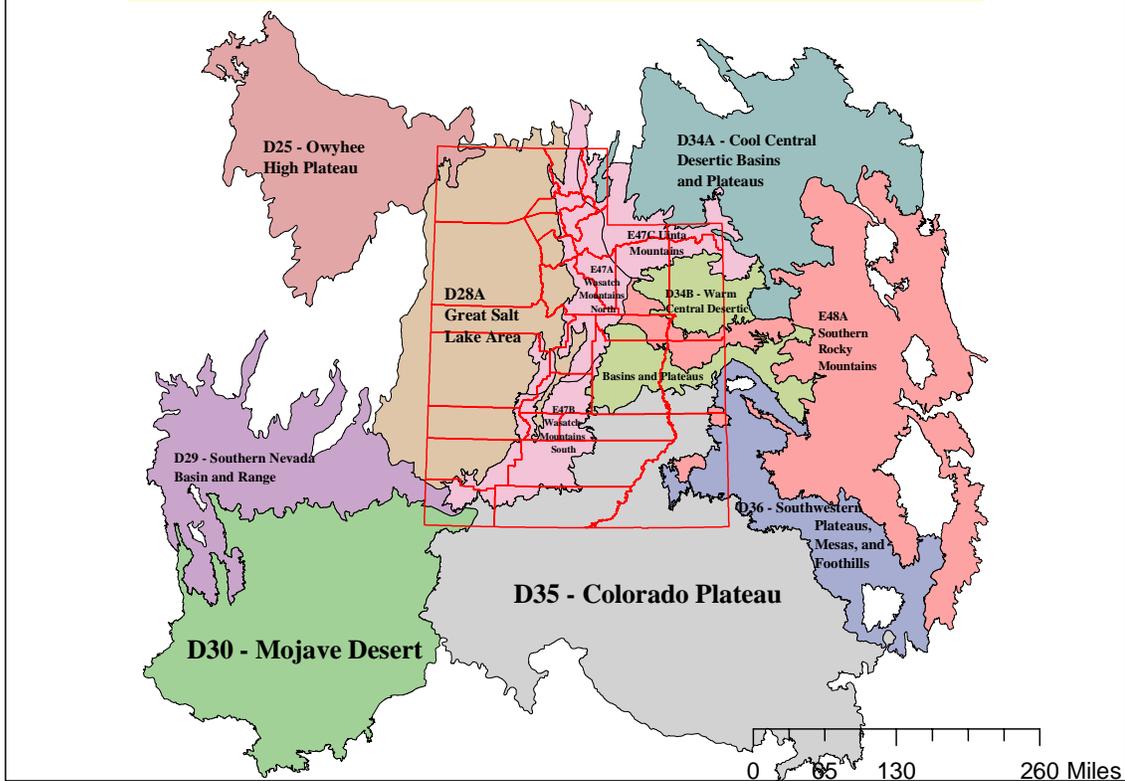
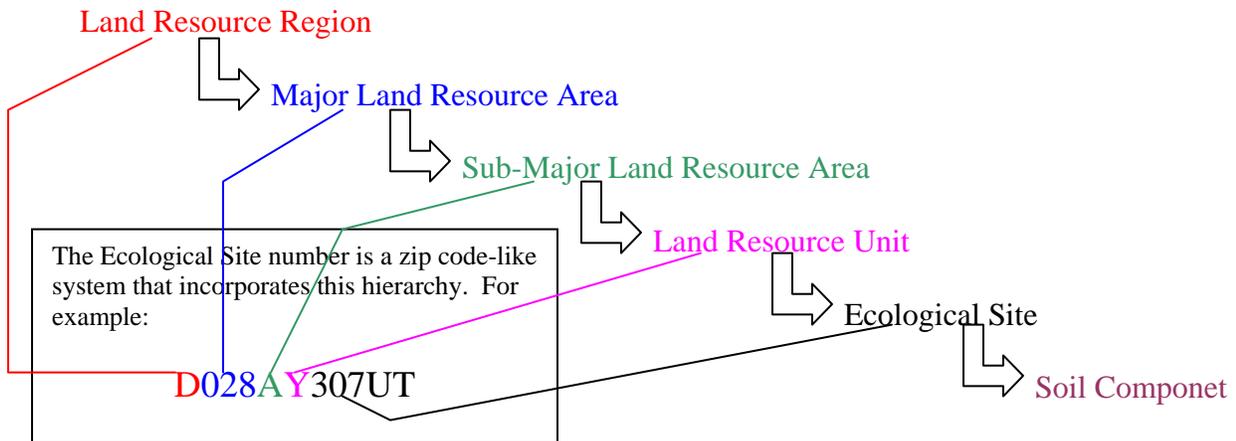


Major Land Resource Areas (MLRA) of Utah



Ecological Sites are part of a hierarchical, nested land classification system. Major Land Resource Areas (MLRAs) are a part of that system. From top to bottom, the system looks like this:

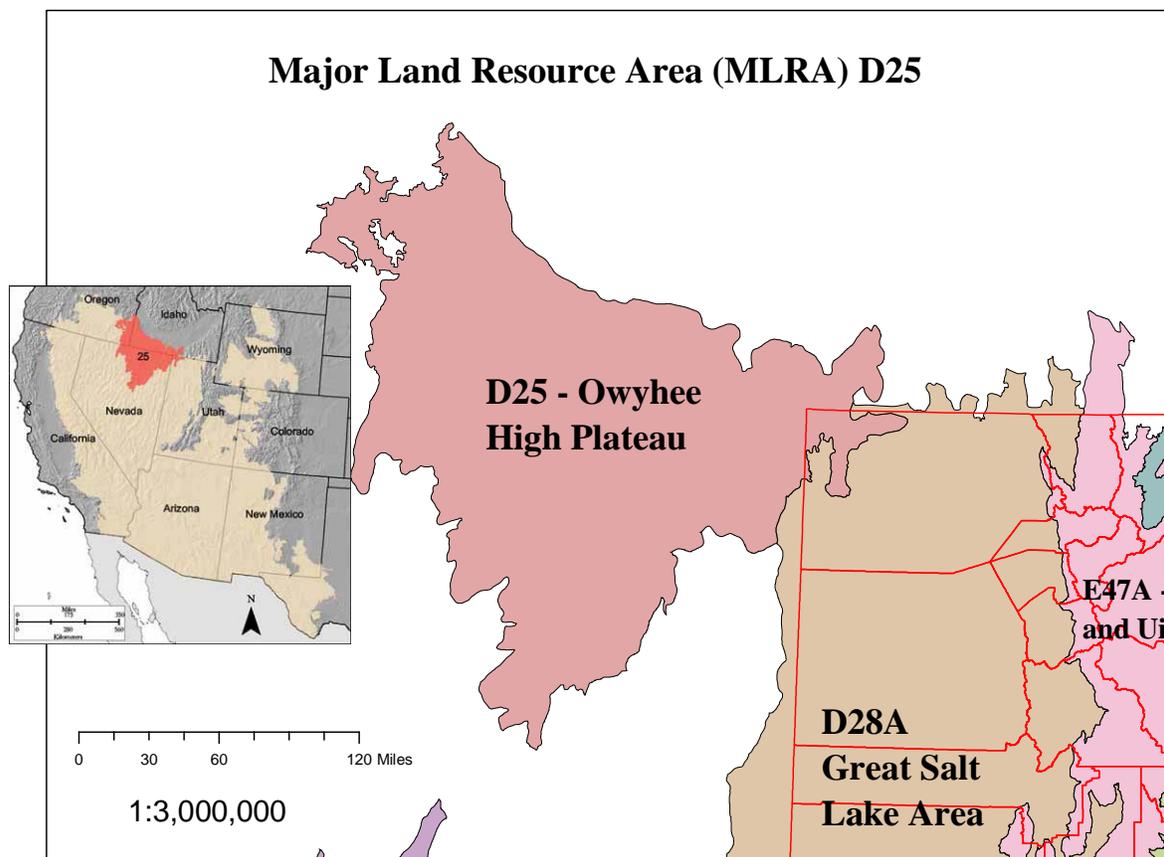


More information about this system and MLRAs can be found in Agricultural Handbook 36.

MLRA 25 – Owyhee High Plateau (Utah portion)

MLRA 25 – Owyhee High Plateau (Utah portion)

Ecological Zone	Upland	Mountain	High Mountain	Subalpine
Precipitation (inches)	12-17 inches	16-22 inches	16-22 inches	20-27 inches
Elevation	5,000 -7,000	6,000 – 8,600	8,000-9,000	9,000 - 9,300
Soil Moisture Regime	Typic Xeric	Typic Xeric	Typic Xeric	Udic
Soil Temp Regime	Mesic	Frigid	Cryic	Cryic
Freeze free Days	80-120	60 - 90	30 - 40	20 -35
Notes	Sagebrushes and browse 300 – 500 and 800 – 1000 lbs.ac	Mountain mahogany, Mountain big sagebrush 1,100-2,100 and 400-600 lbs/ac	Aspen, Mountain big sagebrush 2,400-2,500 lbs/ac	Subalpine Fir, Subalpine sagebrush
All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.				



25—Owyhee High Plateau

This area is in Nevada (52 percent), Idaho (29 percent), Oregon (16 percent), and Utah (3 percent). It makes up about 28,930 square miles (74,960 square kilometers). The city of Elko, Nevada, which is along Interstate

80, occurs in this MLRA. The Humboldt-Toiyabe and Sawtooth National Forests and numerous wilderness study areas also occur in this MLRA. Most of the wilderness study areas are in the high desert canyon lands of southern Idaho. The Duck Valley, South Fork, Ruby Valley, and Te-Moak Indian Reservations are in this area.

Physiography

All of this area lies within the Intermontane Plateaus. The southern half is in the Great Basin Section of the Basin and Range Province. This part of the MLRA is characterized by isolated, uplifted fault-block mountain ranges separated by narrow, aggraded desert plains. This geologically older terrain has been dissected by numerous streams draining to the Humboldt River. The northern half of the area lies within the Columbia Plateaus Province. This part of the MLRA forms the southern boundary of the extensive Columbia Plateau basalt flows. Most of the northern half is in the Payette Section, but the northeast corner is in the Snake River Plain Section. Deep, narrow canyons draining into the Snake River have been incised into this broad basalt plain. Elevation ranges from 3,000 to 7,550 feet (915 to 2,300 meters) on rolling plateaus and in gently sloping basins. It is more than 9,840 feet (3,000 meters) on some steep mountains. The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Middle Snake (1705), 49 percent; Black Rock Desert-Humboldt (1604), 28 percent; Upper Snake (1704), 15 percent; Great Salt Lake (1602), 5 percent; and Central Nevada Desert Basins (1606), 3 percent. The Humboldt River, route of a major western pioneer trail, crosses the southern half of this area. Reaches of the Owyhee River in this area have been designated as National Wild and Scenic Rivers.

Geology

The dominant rock types in the area are volcanic. They include andesite, basalt, and rhyolite. In the north and west parts of the area, Miocene volcanic rocks dominate and Cretaceous granitic rocks occur in the mountains. A Mesozoic igneous and metamorphic rock complex dominates the south and east parts of the area. Upper and Lower Paleozoic sediments, including extensive limestone deposits, occur in the mountains. Only a few narrow valleys occur in this area (2 to 3 percent of the land area). Alluvial fan and basin fill sediments occur in the valleys.

Climate

The average annual precipitation in most of this area is 7 to 16 inches (180 to 405 millimeters), but it can exceed 50 inches per year (1,270 millimeters) in the mountains. The amount of precipitation is lowest in the eastern part of the area and increases with elevation. Rainfall occurs in spring and sporadically in summer. Precipitation occurs mainly as snow in winter. The precipitation is distributed fairly evenly throughout fall, winter, and spring. The amount of precipitation is lowest from midsummer to early autumn. The average annual temperature is 35 to 53 degrees F (2 to 12 degrees C). The frost-free period averages 130 days and ranges from 65 to 190 days, decreasing in length with elevation. It is typically less than 70 days in the mountains.

Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 0.1%; ground water, 0.1%

Livestock—surface water, 0.2%; ground water, 4.8%

Irrigation—surface water, 49.8%; ground water, 35.5%

Other—surface water, 3.3%; ground water, 6.3%

The total withdrawals average 570 million gallons per day (2,155 million liters per day). About 47 percent is from ground water sources, and 53 percent is from surface water sources. The supply of water from precipitation and streamflow is small and unreliable, except along the Owyhee, Bruneau, and Humboldt Rivers. Streamflow depends largely on accumulated snow in the mountains. Surface water from mountain runoff is generally of excellent quality and is suitable for all uses. Precipitation is adequate for dryfarming in a few areas of deep soils in Idaho. The basin fill sediments in the narrow alluvial valleys between the mountain ranges provide some ground water for irrigation. The alluvial deposits along the large streams have the most ground water. Based on measurements of water quality in similar deposits in adjacent areas, the basin fill deposits probably contain moderately hard water with a concentration of less than 400 parts per million (milligrams per liter) total dissolved solids. The carbonate rocks in this

area are considered to be aquifers, but they are little used. The water in this aquifer is suitable for almost all uses. The concentrations of total dissolved solids are less than the Nevada drinking water standard of 1,000 parts per million (milligrams per liter). Springs are common along the edges of the limestone outcrops.

Soils

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic or frigid soil temperature regime, an aridic or xeric soil moisture regime, and mixed or smectitic mineralogy. They generally are well drained, clayey or loamy, and shallow or moderately deep. Haplodurids (Bioya and Coonskin series) formed in loess over alluvium on fan piedmonts and plateaus. Argidurids (Dacker, Bruncan, and Hunnton series) and some Durixerolls (Donna and Heckison series) formed in mixed loess and volcanic ash over alluvium on fan piedmonts and plateaus. Other Durixerolls (Stampede series) formed in alluvium on alluvial fans and fan piedmonts. Argidurids (Arbidge and Diawell series) formed in alluvium on fan piedmonts and stream terraces. Haplargids formed in residuum and colluvium on hills, mountain slopes, and plateaus (Vanwyper and Dougal series) and in alluvium on alluvial fans, ballenas, and plateaus (very deep Wieland and Owsel series). Some Argixerolls (shallow Cleavage, Gaib, and Ninemile series and moderately deep Quarz, Mulshoe, and Sumine series) formed in residuum and colluvium on hills, plateaus, and mountain slopes. Other Argixerolls (McIvey series) formed in alluvium or colluvium on fans, hills, and mountain slopes.

Biological Resources

This area supports Sagebrush Steppe vegetation characterized by big sagebrush or low sagebrush and by bluebunch wheatgrass, western wheatgrass, or Idaho fescue. Other important plants are Sandberg bluegrass, foxtail wheatgrass, penstemon, phlox, milkvetch, lupine, aster, and rabbitbrush. The high plateaus support juniper and curl-leaf mountain mahogany and an understory of dominantly snowberry and ceanothus. Conifers, aspen, and very large curl-leaf mountain mahogany are in the Owyhee, Ruby, and Jarbridge Mountains. The conifers include

whitebark pine, Douglas-fir, limber pine, Engelmann spruce, subalpine fir, and bristlecone pine. Some of the major wildlife species in this area are mule deer, bighorn sheep, pronghorn, mountain lion, coyote, bobcat, badger, river otter, mink, weasel, golden eagle, red-tailed hawk, ferruginous hawk, Swainson's hawk, northern harrier, prairie falcon, kestrel, great horned owl, short-eared owl, long-eared owl, burrowing owl, pheasant, sage grouse, chukar, gray partridge, and California quail. Reptiles and amphibians include western racer, gopher snake, western rattlesnake, sideblotched lizard, western toad, and spotted frog. The species of fish in the area include bull trout, red band trout, and rainbow trout.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 1%
Grassland—private, 22%; Federal, 73%
Forest—Federal, 2%
Water—private, 1%
Other—private, 1%

About three-fourths of this area is Federally owned. The rest is mainly in farms and ranches. Livestock production on rangeland is the main agricultural enterprise. A few areas in valleys are used for irrigated grain and forage for livestock. Small areas in Idaho are used for dry-farmed wheat. Open forests on mountain slopes at high elevations are grazed by livestock and wildlife. The major soil resource concerns include accelerated erosion, runoff, and sedimentation. Forest health and rangeland quality are additional concerns. Conservation practices on cropland generally include irrigation water management, pasture and hayland seeding, and weed control. The efficiency of irrigation water use can be improved by sprinkler systems and installation of gated pipe, field runoff management, and water source development. The plant species selected for seeding on pasture and hayland should be those that are suited to the various soil and environmental conditions. Weed control may include the removal of noxious and invasive plants followed by seeding with adapted forage species. Forest health can be enhanced by practices that include thinning, site preparation, forest stand improvement, and properly located and constructed forest roads and landings. Rangeland quality can be maintained or improved by developing livestock watering facilities, reseeding, prescribed burning, proper fencing, and weed control.

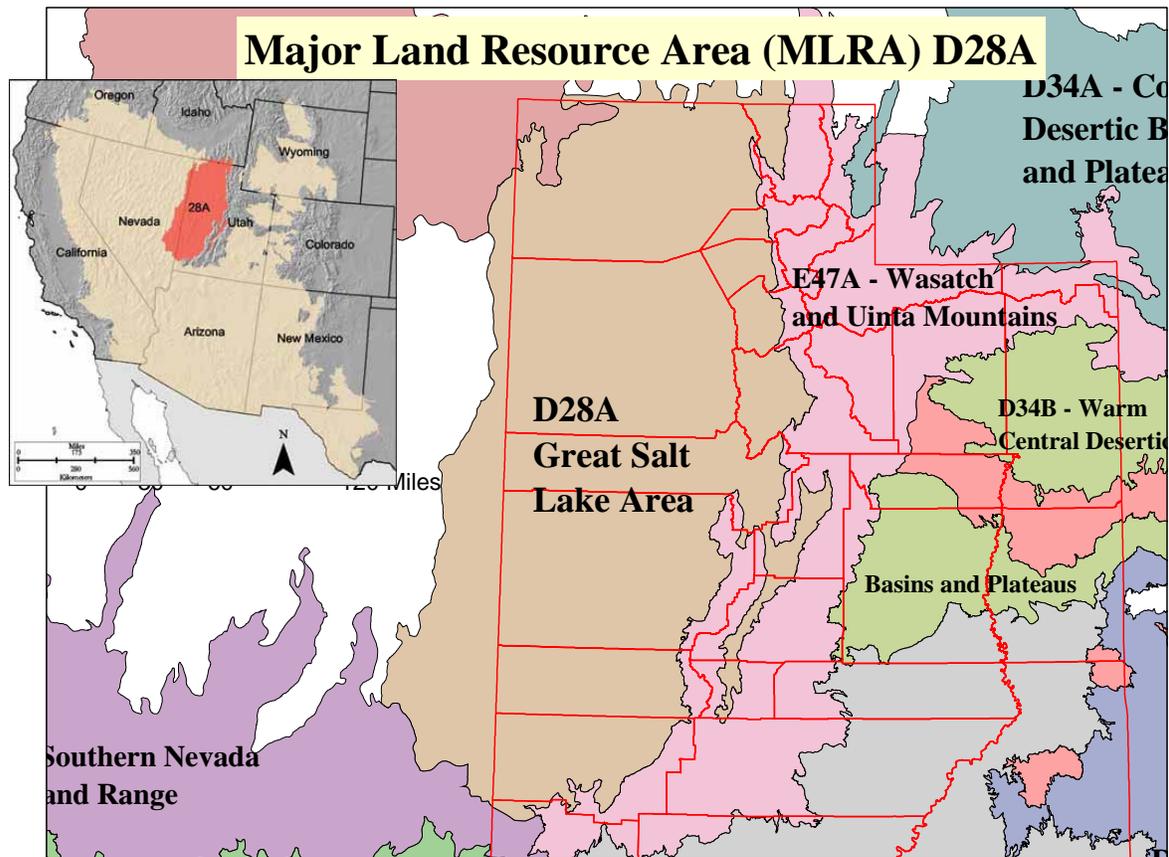
MLRA 28A - Great Salt Lake Area

MLRA 28A - Great Salt Lake Area

Ecological Zone	Desert	Semidesert	Upland*	Mountain*
Precipitation	0-8 inches	8-12 inches	12-16 inches	16-22 inches
Elevation	4,100-5,100	4,300-6,000	4,300-7,000	5,200-8,600
Soil Moisture Regime	Typic Ardic	Xeric Aridic	Typic Xeric	Typic Xeric
Soil Temp Regime	Mesic	Mesic	Mesic	Frigid
Freeze free Days	120-200	100-140	100-130	85-110
Notes	Salt desert shrub 250 -500 lbs/ac	Sagebrushes are typical. 500 – 800 lbs/ac	Pinyon and Utah juniper are present, Sagebrushes are typical 700 – 1,000 lbs.ac	Oak and Maple 2,000-2,300

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



28A—Great Salt Lake Area

This area is in Utah (82 percent), Nevada (16 percent), and Idaho (2 percent). It makes up about 36,775 square miles (95,300 square kilometers). Salt Lake City, Logan, Ogden, Provo, Richfield, and Cedar City, Utah, and

Malad and Preston, Idaho, occur in this MLRA. Interstate 80 crosses the northern end of the MLRA, and Interstate 15 parallels the eastern border. Interstate 84 crosses the northern tip, and Interstate 70 ends at Interstate 15 in the south end of the MLRA. Several national forests occur in this MLRA, including the Caribou, Dixie, Wasatch, Humboldt-Toiyabe, and Fish Lake National Forests. The Deseret Test Center and the Desert Range Experiment Station, including the Biosphere Reserve, occur in this area. The Hill and Wendover Air Force Ranges, the Tooele Military Depot, and the Dugway Proving Grounds also occur in this area. The Skull Valley Indian Reservation is in the area. The Bonneville Salt Flats Speedway, used by experimental cars for setting land speed records, also is in the area. The Golden Spike National Historic Site (joining point for the first transcontinental railroad) is in this MLRA.

Physiography

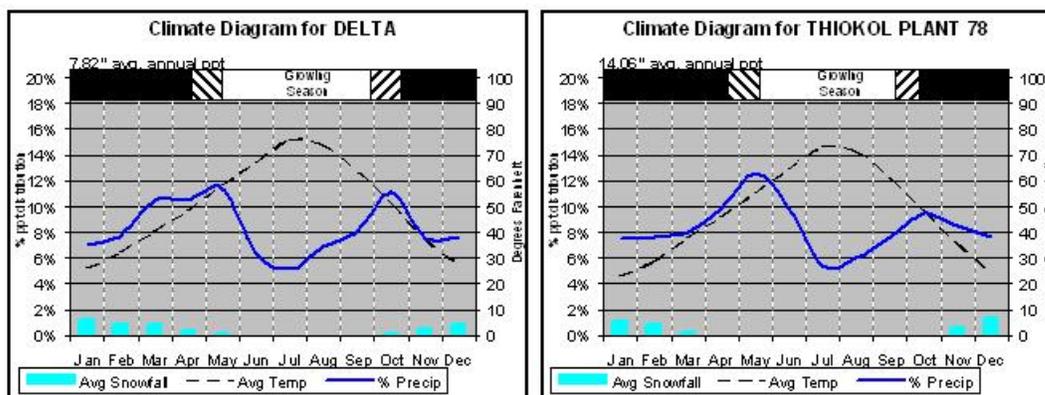
This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. They are not well dissected because of low rainfall in the MLRA. A large salt desert playa is south and west of Great Salt Lake. Most of the valleys in this MLRA are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,205 to 2,000 meters) in the basins and from 6,560 to 11,150 feet (2,000 to 3,400 meters) in the mountains. The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Great Salt Lake (1602), 58 percent; Escalante Desert-Sevier Lake (1603), 28 percent; Central Nevada Desert Basins (1606), 6 percent; Bear (1601), 5 percent; and Lower Colorado-Lake Mead (1501), 3 percent. The Jordan, Bear, and Weber Rivers, the main rivers in this area, all terminate in Great Salt Lake. The Sevier River is in the south half of the area. Numerous creeks drain the Wasatch Mountain front directly east of Salt Lake City, and many terminate in Great Salt Lake directly west of Salt Lake City.

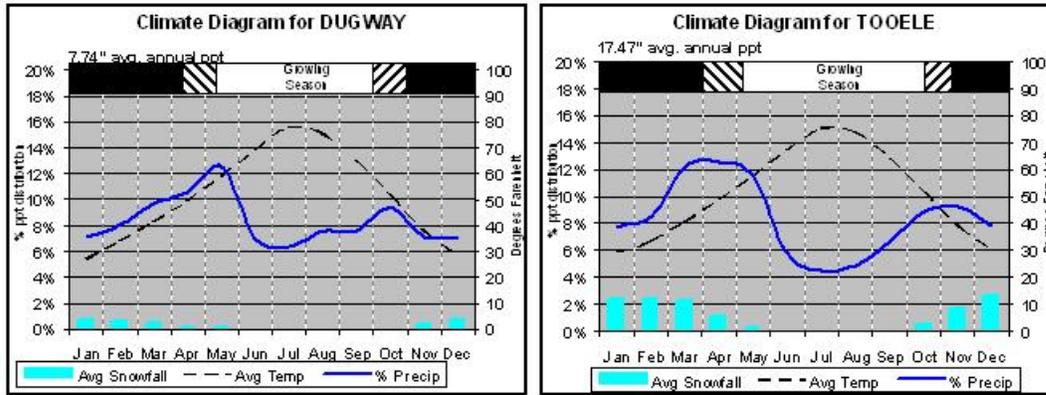
Geology

Most of this area has alluvial valley fill and playa lakebed deposits at the surface. Great Salt Lake is all that remains of glacial Lake Bonneville, which covered this area during the most recent ice age. A level line on some mountain slopes indicates the former extent of this glacial lake. The uplifted mountains have exposed some Precambrian rocks at their margins. Most of the mountains in the interior of this area consist of tilted blocks of marine sediments from Cambrian to Mississippian age. There are no rocks representing the Mesozoic era in this area. Scattered outcrops of Tertiary continental sediments and volcanic rocks are throughout the area. These units are concentrated on the east and west edges of the area. The Tertiary intrusives are the dominant rock types at the southern end of the MLRA.

Climate

The average annual precipitation is 5 to 12 inches (125 to 305 millimeters) in the valleys and is as much as 49 inches (1,245 millimeters) in the mountains. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The driest period is from midsummer to early autumn. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 degrees F (4 to 12 degrees C). The frost-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with elevation.





Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 5.5%; ground water, 8.5%

Livestock—surface water, 1.2%; ground water, 0.8%

Irrigation—surface water, 65.3%; ground water, 14.5%

Other—surface water, 1.0%; ground water, 3.2%

The total withdrawals average 3,575 million gallons per day (13,530 million liters per day). About 27 percent is from ground water sources, and 73 percent is from surface water sources. Water is scarce. For the most part, streams are small and intermittent and depend on sources in the higher mountains. Reservoirs are used to store water in the mountains east of this

area for irrigation in the flatter areas of this MLRA. As an example, the Sevier River, in the southern part of this area, is the most heavily used river in the United States. Almost 99 percent of its total flow is used before it reaches its terminus in the mostly dry Sevier Lake. The surface water from the mountains is of good quality, and its use generally is not limited. Irrigation return flows raise the levels of dissolved salts and suspended sediments, causing some contamination. Both surface water and ground water are used for irrigation. Use of deep wells is limited by a high cost. Shallow wells in the basin and valley fill aquifers provide almost all of the ground water used in this area. This shallow ground water generally contains less than 1,000 parts per million (milligrams per liter) total dissolved solids. Along the northeastern border of this area, near the Wasatch Front where the alluvial aquifers are recharged, ground water is much lower in dissolved salts (typically less than 250 parts per million) and is a primary source of drinking water for the populated areas all along the Wasatch Front. The ground water becomes almost saline near the playa lakes west of the recharge zone. A basin fill deposit near Sevier Lake contains high levels of arsenic.

Soils

The dominant soil orders in the MLRA are Aridisols, Entisols, and Mollisols. The soils in the area dominantly have a mesic or frigid soil temperature regime, an aridic or xeric soil moisture regime, and mixed mineralogy. They generally are well drained or somewhat excessively drained, loamy or loamyskeletal, and very deep. Calcixerolls formed in alluvium on alluvial fan remnants and lake terraces (Abela series) and in alluvium and lacustrine sediments on lake terraces (Collinston series). Moderately deep Haploxerolls (Middle series) formed in residuum on mountain slopes. Deep and very deep Haploxerolls (Ririe and Rexburg series) formed in loess and silty alluvium on fans, terraces, foothills, and basalt plains. Shallow Haploxerolls (Hymas series) to very deep Haploxerolls (Hondoho series) formed in colluvium and residuum derived from limestone on mountains and foothills. Torriorthents formed in alluvium on alluvial fans and beach plains (Cliffdown series) and in alluvium mixed with lacustrine sediments on alluvial flats and fans, lake terraces, and lake plains (Timpie and Tooele series). Poorly drained Aquisalids (Saltair series) formed in alluvium and lacustrine sediments on lake plains and basin floors. Torripsamments (Yenrab series) formed in sandy eolian material on dunes. Haplocalcids formed in residuum on hills and mountains (shallow Amtoft series); in alluvium and colluvium on alluvial fans, terraces, and hills (Hiko Peak series); in mixed alluvium and lacustrine sediments on alluvial fans, terraces; and lake plains (Taylorsflat series); and in lacustrine sediments on lake terraces (Thiokol series). Natrargids (Skumpah series) formed in alluvium on alluvial fans and flats.

Biological Resources

This area supports desert shrub, Sagebrush Semidesert, and woodland vegetation. In areas where the average annual precipitation is less than about 200 millimeters, the soils support shadscale, winterfat, black sagebrush, and associated grasses, such as Indian ricegrass and squirreltail. Greasewood and Nuttall saltbush grow on soils having a high content of salts or sodium. In areas where the average annual precipitation is 200 to 300 millimeters, the soils support big sagebrush, shadscale, winterfat, and associated grasses, such as bluebunch wheatgrass, Indian ricegrass, and bluegrasses. In areas where the average annual precipitation is more than 300 millimeters, the soils support Utah juniper, singleleaf pinyon, big sagebrush, bluebunch wheatgrass, bluegrasses, and needleandthread. A large, nearly barren area west of Great Salt Lake has a very sparse cover of pickleweed, sapphire eriastrum, seepweed, and greasewood. Some of the major wildlife species in this area are mule deer, jackrabbit, cottontail, Cooper's hawk, American kestrel, redtailed hawk, prairie falcon, rough-legged hawk, Swainson's hawk, and chukar. Brine shrimp occur in Great Salt Lake and warm-water species of fish occur in other freshwater lakes in the valleys. Mountain streams in the Wasatch Mountains are inhabited by trout.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 6%
Grassland—private, 21%; Federal, 44%
Forest—private, 2%; Federal, 12%
Urban development—private, 2%
Water—private, 7%; Federal, 2%
Other—private, 4%

About three-fifths of this area is Federally owned land, large tracts of which are used for training and testing purposes by the Armed Forces and the Nuclear Regulatory Commission. A large area west and southwest of Great Salt Lake is a salty playa. The rest of the area is in farms and ranches. Livestock production on rangeland is a principal agricultural enterprise in the west. The production of desert shrubs and grasses is very low. In most of the area, the extent of the livestock industry is determined largely by the amount of hay, pasture, and grain that can be produced under irrigation from limited water supplies. About 5 percent of the area is irrigated cropland or hayland used for alfalfa, small grain (wheat, barley, oats, and triticale), Austrian winter peas, corn for grain or silage, potatoes, vegetables (onions, pumpkins, sweet corn, peas, and squash), and fruits (apples, peaches, pears, apricots, and cherries). A small portion of the irrigated land is used for pasture. About 5 percent is used for production of dryland winter wheat and safflowers. The management concerns on rangeland include forage production and the efficient use of range vegetation. The rangeland in the area is increasingly impacted by invasive nonnative plants. The management concerns on dry-farmed cropland include productivity, wind erosion, water erosion, moisture management, and weed control. The management concerns on irrigated cropland and hayland include productivity, the efficient use of limited water supplies, control of irrigation induced erosion, and nutrient and pest management. Soil tilth, compaction, and maintenance of the content of organic matter in the soils are additional concerns on irrigated and dry-farmed cropland. The management concerns on irrigated pasture include productivity, proper grazing use, efficient use of limited water supplies, nutrient management, and weed control. Conservation practices on rangeland generally include brush management, rangeland seeding, prescribed grazing, fencing, development of watering facilities, and erosion control. Conservation practices on dry-farmed cropland generally include terraces, sediment-control basins, summer fallow tillage, crop residue management, pest management, and nutrient management. Conservation practices on irrigated cropland and hayland include irrigation system improvement, irrigation water management, no-till hayland planting, forage harvest management, nutrient management, windbreaks, and pest management. Conservation practices on irrigated pasture generally include irrigation system improvement, irrigation water management, pasture planting, development of watering facilities, fencing, prescribed grazing, nutrient management, and pest management.

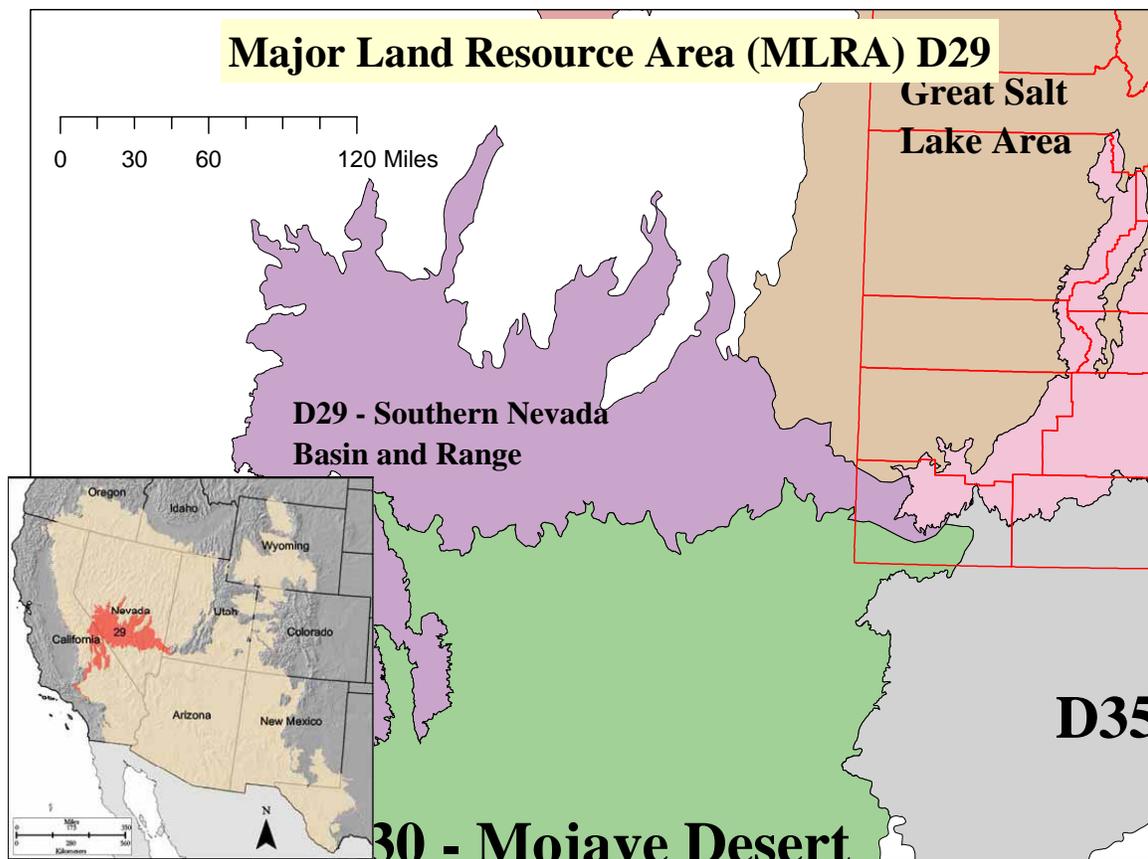
MLRA 29 - Southern Nevada Basin and Range

MLRA 29 - Southern Nevada Basin and Range (Utah portion)

Ecological Zone	Desert	Semidesert *	Upland*	Mountain
Precipitation		9-11 inches	12-14 inches	
Elevation	NONE	3,500 – 6,500	4,000 – 6,800	NONE
Soil Moisture Regime		Ustic Aridic		
Soil Temp Regime		Mesic	Mesic	
Freeze free Days		170-190	100-170	
Notes		Blackbrush	Pinyon / Juniper stands and live oak	

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



29—Southern Nevada Basin and Range

This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). The towns of Lone Pine, California, and Tonopah, Nevada, occur in this MLRA. U.S. Highways 6, 95, and 395 cross this area. Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Many wilderness study

areas and wildlife refuges are in this MLRA. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also occur in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.

Physiography

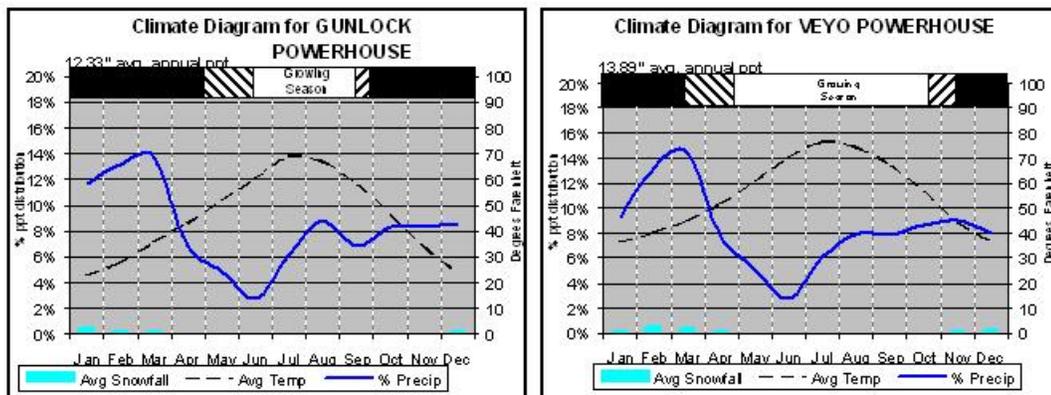
This area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Owens Valley and Death Valley in California mark the farthest western extent of the Great Basin Section in the Basin and Range Province. This MLRA is an area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and terraces. The mountains are uplifted fault blocks with steep side slopes. They are not well dissected because of a low amount of rainfall in the MLRA. Most of the valleys in this MLRA are closed basins containing sinks or playa lakes. Elevation ranges from 1,950 to 5,600 feet (595 to 1,705 meters) in the valleys. On some high mountain peaks, it is more than 9,400 feet (2,865 meters). The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Central Nevada Desert Basins (1606), 58 percent; Northern Mojave-Mono Lake (1809), 28 percent; Lower Colorado-Lake Mead (1501), 11 percent; Central Lahontan (1605), 2 percent; and Tulare-Buena Vista Lakes (1803), 1 percent. The Owens River and Owens Lake occur in this MLRA. Intermittent and ephemeral streams in Nevada typically end in dry playa lakes.

Geology

The mountains in this area are dominated by Pliocene and Miocene andesite and basalt rocks. Paleozoic and Precambrian carbonate rocks are prominent in the mountains. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill, but playa deposits are at the lowest elevations in the closed basins. The alluvial valley fill consists of cobbles, gravel, and coarse sand near the mountains in the apex of the alluvial fans. Sands, silts, and clays are on the distal ends of the fans.

Climate

The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It ranges from 12 to 29 inches (305 to 735 millimeters), however, on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August. The average annual temperature is 28 to 72 degrees F (-2 to 22 degrees C), decreasing with elevation. The frost-free period averages 205 days and ranges from 80 to 335 days, decreasing in length with elevation.



Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 0.0%; ground water, 0.0%

Livestock—surface water, 0.1%; ground water, 1.7%

Irrigation—surface water, 34.5%; ground water, 53.3%

Other—surface water, 0.6%; ground water, 9.7%

The total withdrawals average 220 million gallons per day (815 million liters per day). About 65 percent is from ground water sources, and 35 percent is from surface water sources. Precipitation is sparse. Most of the streams are small and intermittent and depend on sources in the higher mountains. The surface water from the mountains is generally of good quality, and its use is not limited near the mountains. The quality of this water is naturally degraded by dissolved salts picked up as streams cross areas of valley fill to their terminus in a playa lake. Irrigation return flows raise the levels of dissolved salts and suspended sediments in some streams, causing some contamination. Historically, the Owens River flowed into Owens Lake in this MLRA. Today, most of the Owens River is diverted into the Haiwee Reservoir, bypassing Owens Lake, and then is diverted into the Los Angeles Aqueduct for use as drinking water in southern California coastal cities. Ground water in this area is scarce but is being rapidly developed. Most of the ground water in California is controlled by Los Angeles and is not available for local use. Shallow wells in the basin and valley fill aquifers provide almost all of the ground water used in this area. This shallow ground water generally contains less than 1,000 parts per million (milligrams per liter) total dissolved solids. On the alluvial fan deposits near the mountains, where the valley fill aquifers are recharged, ground water is much lower in dissolved salts (typically less than 500 parts per million). The ground water becomes almost saline near the playa lakes far away from the recharge zone. A volcanic rock aquifer is in the south-central part of this area. It is used very little, and no data about quality of the water are available. The carbonate rocks in this area also are considered to be aquifers. Use of these aquifers is limited. Water from the carbonate rocks is suitable for most uses and is considered to be hard or very hard. The concentrations of total dissolved solids are generally less than the Nevada drinking water standard of 1,000 parts per million (milligrams per liter).

Soils

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols also are important in the mountainous areas. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed mineralogy. They generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy-skeletal or sandy-skeletal. Haplargids formed in alluvium on alluvial fans and fan piedmonts (Ardivey and Unsel series) and in residuum and colluvium on hills, mountains, and plateaus (Downeyville, Gabbvally, and Stewval series). Haplocalcids (Candelaria series) formed in alluvium on ballenas and fan piedmonts. Haplocambids (Koyen series) formed in alluvium on fan piedmonts and alluvial fans. Argidurids (Handpah and Zadvar series) and Haplodurids (Ursine series) formed in alluvium on fan piedmonts and fan remnants. Torriorthents formed in residuum and colluvium on hills and mountains (Blacktop, Kyler, and Pintwater series) and in alluvium on alluvial flats, fans, and fan piedmonts (Gynelle and Wardenot series). Torrifluvents (Cirac series) formed in alluvium on alluvial flats and fans. Shallow Argixerolls formed in residuum and colluvium on hills and mountains (Bellehelen series).

Biological Resources

This area supports desert shrub vegetation. The major vegetation consists of saltbush and greasewood. Shadscale is widespread. It is associated with bud sagebrush, Bailey greasewood (in the west), gray molly kochia, spiny hopsage, wolfberry, ephedra, dalea, fourwing saltbush, winterfat, horsebrush, galleta, and Indian ricegrass. On the warmer sites, shadscale is associated with white bursage, spiny menodora, Joshua-tree, and blackbrush. Black greasewood is dominant on low-lying saline-alkali soils. In areas of higher precipitation, big sagebrush and black sagebrush are common and are associated with Indian ricegrass and galleta. Pinyon-juniper woodland is prevalent in the mountains. Associated plants include black sagebrush, big sagebrush, blackbrush, bitterbrush, cliffrose, and other shrubs and a variety of grasses and forbs. Some of the major wildlife species in this area are mule deer, coyote, kit fox, bobcat, jackrabbit, cottontail, kangaroo rat, snakes, lizards, golden eagle, hawks, and chukar. The species of fish in the area include brook trout, brown trout, and bass.

Land Use

Following are the various kinds of land use in this MLRA:

Grassland—private, 4%; Federal, 86%

Forest—Federal, 9%

Other—private, 1%

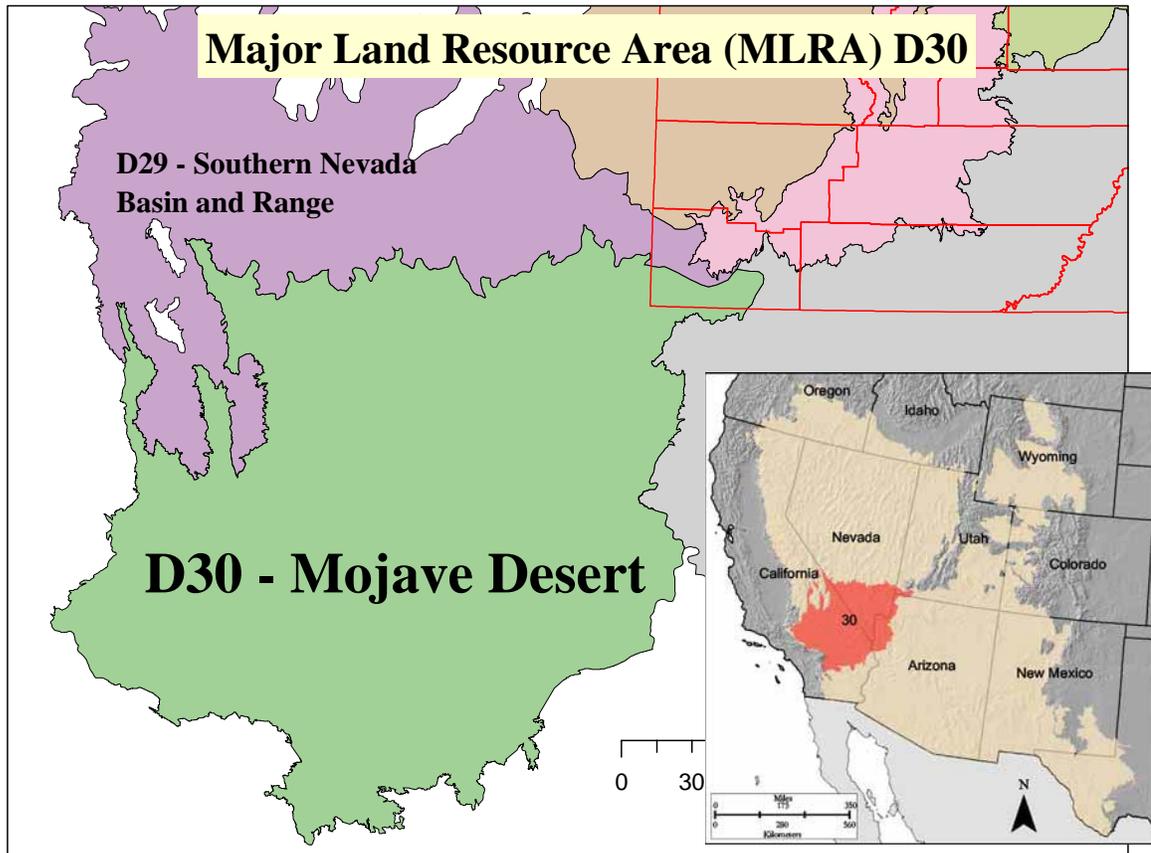
Nearly all of this area is Federally owned land, much of which is used for training and testing purposes by the Armed Forces and the Nuclear Regulatory Commission. Less than 1 percent of the area, mostly in the valleys, is irrigated. Much of the irrigated acreage is used for hay and grain for livestock. High mountain areas consist of pinyon-juniper woodland. Native grasses and shrubs in areas of rangeland are grazed by livestock. The major soil resource concerns in this area are control of wind erosion and reduction of the content of salts and sodium in the soils. Management concerns include proper use of rangeland, erosion control, and efficient use of the scarce water supplies. Conservation practices on cropland generally include irrigation water management and toxic salt reduction. Also, windbreaks and crop residue management reduce the hazard of wind erosion and increase the available water capacity of the soils. Development of watering facilities and prescribed grazing are important practices on rangeland.

MLRA 30 - Mohave Basin and Range

MLRA 30 - Mohave Basin and Range (Utah portion)

Ecological Zone	Desert	Semidesert	Upland	Mountain
Precipitation	4 -7 inches	6 – 10 inches		
Elevation	2500 - 3800	3,000-4,300	NONE	NONE
Soil Moisture Regime	Typic Ardic	Typic Ardic		
Soil Temp Regime	Thermic	Thermic		
Freeze free Days	190-210	190-210		
Notes	Typically no trees. Mostly Cresotebush	Blackbrush and Joshua tree.		

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



30—Mojave Desert

This area is in California (59 percent), Nevada (28 percent), Arizona (12 percent), and Utah (1 percent). It makes up about 43,750 square miles (113,370 square kilometers). Lancaster, Palmdale, Victorville, Apple Valley, and Barstow, California, Bullhead City and Kingman, Arizona, Saint George, Utah and Las Vegas, Nevada, occur in this MLRA. Interstate 15 connects Las Vegas and Barstow in this area. Interstate 40 connects Kingman and Barstow. Interstate 40 terminates in Barstow, where it intersects with Interstate 15. The Lake Mead National Recreation Area is along the Colorado River, which forms the border between Nevada and Arizona in this MLRA.

The Mojave National Preserve, Joshua Tree and Death Valley National Parks, and numerous wilderness study areas and recreational areas occur in this sparsely populated MLRA. Numerous military reservations occur in the area, including Edwards Air Force Base, Fort Irwin, China Lake Naval Weapons Center, Goldstone Communications Complex, and Twenty-Nine Palms Marine Corps Base in California and Nellis Air Force Range and Nellis and Indian Springs Air Force Bases in Nevada.

Physiography

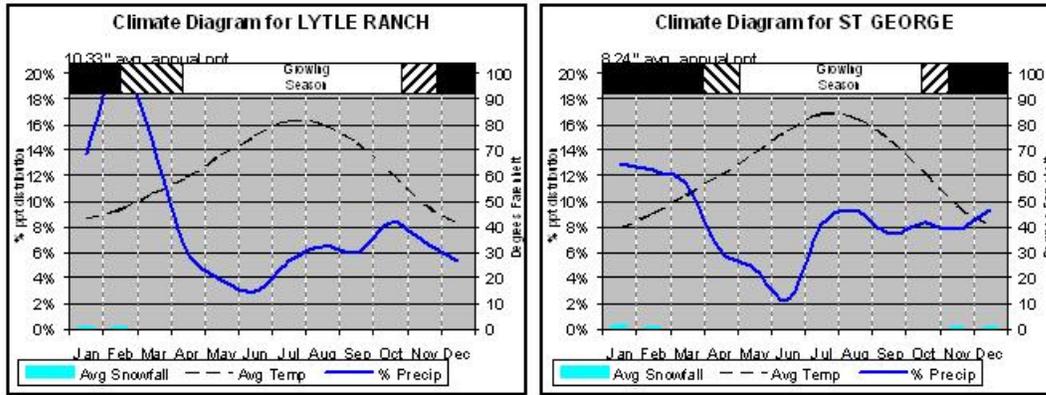
This area is in the Basin and Range Province of the Intermontane Plateaus. Most of the MLRA is in the Sonoran Desert Section of this province. The northern third is in the Great Basin Section, and the southeastern part is in the Mexican Highland Section. A small part of the southwest corner is in the Salton Trough Section. Broad basins, valleys, and old lakebeds make up most of the area, but widely spaced mountains trending north to south occur throughout the area. Isolated, short mountain ranges are separated by an aggraded desert plain. The mountains are fault blocks that have been tilted up. Long alluvial fans coalesce with dry lakebeds between some of the ranges. Elevation ranges from 282 feet (85 meters) below sea level in Death Valley to 3,950 feet (1,205 meters) above sea level in valleys and basins. The lowest elevation occurring on dry land in the world, 282 feet (85 meters) below sea level, occurs in the Badwater Basin in Death Valley. Some mountain ranges have peaks that exceed 11,100 feet (3,385 meters). The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northern Mojave-Mono Lake (1809), 40 percent; Lower Colorado-Lake Mead (1501), 23 percent; Southern Mojave- Salton Sea (1810), 17 percent; Central Nevada Desert Basins (1606), 11 percent; and Lower Colorado (1503), 9 percent. The Colorado River crosses the eastern end of this area. Other rivers include the Armagosa and Mojave Rivers.

Geology

Most of this area is underlain by Quaternary (Pleistocene to Recent) alluvial deposits on alluvial fans and valley floors. Recent alluvial fans and remnant alluvial fan terraces typically grade from boulder-strewn deposits and coarse desert pavement near the fan apex to finer grained sands, silts, and clays at the distal ends. Playas are at the lowest elevations in the closed basins. They commonly have eolian accumulations along their downwind fringes. Water from shallow subsurface flow and from surface flows that periodically fill the playa basins evaporates, leaving accumulations of evaporite minerals, including salts and borates. Most of the domestic production of borate minerals and boron in the United States comes from surface and underground mines in this MLRA. Upland areas in the MLRA consist of isolated mountain ranges variably underlain by pre-Cenozoic metamorphic and igneous rocks, Paleozoic carbonates, Mesozoic granitics, and Cenozoic nonmarine sedimentary and volcanic deposits. Valuable deposits of silver, gold, talc, and other commodities occur throughout the area, particularly where granitic magma intruded into older sedimentary rocks. The geology of this area is dynamic and complex. Cenozoic to Recent tectonic extension and crustal thinning have resulted in granitic and other igneous intrusions, geologically recent volcanism, and normal and detachment faulting and associated seismicity. The tectonic setting of this area includes translational movement occurring along the Garlock Fault and along right-lateral strike-slip faults that comprise the Eastern California Shear Zone.

Climate

The average annual precipitation is 2 to 8 inches (50 to 205 millimeters) in most of this extremely dry MLRA. It exceeds 37 inches (940 millimeters) in some scattered areas at the higher elevations in Nevada and southwestern Utah. Most of the rainfall occurs in the winter months as low-intensity precipitation from Pacific storms that are frontal in nature. High-intensity, convective thunderstorms can occur during the summer, but they contribute little to soil moisture. These storms occur more frequently in the eastern part of the area, where they contribute more to soil moisture. Snow is not very common and usually is on the ground for very short periods at the lower elevations, but the highest elevations may have snow for several weeks at a time in the winter. The average annual snowfall ranges from nearly 0 inches in the lowest deserts to more than 30 inches (760 millimeters) at the highest elevations of the Spring Mountains directly west of Las Vegas. The average annual temperature ranges from 43 degrees F (6 degrees C) in the highest mountains to 76 degrees F (25 degrees C) in areas along the Colorado River in California, Nevada, and Arizona. Most of the lowest deserts have a growing season of nearly 365 days per year, especially along the Colorado River, whereas other desert areas have a frost-free period of 200 to 330 days per year. In the higher mountains and the higher valleys in Nevada and extreme southwestern Utah, the frost-free period typically is about 150 to 180 days per year. In the highest mountains, it is as short as 160 days per year. Death Valley National Park is considered one of the hottest and driest areas in the Western Hemisphere. The average annual precipitation in the park is 1.96 inches (49.8 millimeters), and the summer air temperatures can be as high as 134 degrees F (56.7 degrees C).



Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 20.1%; ground water, 12.2%

Livestock—surface water, 2.0%; ground water, 0.1%

Irrigation—surface water, 62.1%; ground water, 1.1%

Other—surface water, 1.9%; ground water, 0.4%

The total withdrawals average 2,565 million gallons per day (9,710 million liters per day). About 14 percent is from ground water sources, and 86 percent is from surface water sources. The low amount of rainfall in this area maintains the desert vegetation, but water is scarce. The public water supply and irrigation water for agriculture are obtained almost entirely from the Colorado and Mojave Rivers. This water is of good quality and is suitable for most uses. Some irrigation water is obtained from large springs in Nevada that typically contain about 1,000 parts per million (milligrams per liter) total dissolved solids. Ground water is the only water available in Death Valley. In this water, concentrations of total dissolved solids are about 500 parts per million (milligrams per liter) and chloride levels are fairly high. Some public supply, domestic use, and irrigation water is obtained from wells in Nevada and in California. Mountain ranges tend to separate ground water basins (valleyfill deposits) in the Mojave Desert. The median value of total dissolved solids is 375 parts per million (milligrams per liter). Total dissolved solids are lowest at the outer edges of the basins, where recharge occurs from surface runoff in the mountains. A level of total dissolved solids of more than 4,000 parts per million (milligrams per liter) is not uncommon under playa lakes in the low parts of the basins. Ground water in the Las Vegas Valley basin fill aquifer typically exceeds 500 parts per million (milligrams per liter) total dissolved solids. Ground water in the southeast corner of the valley has a total dissolved solids content of more than 2,000 parts per million (milligrams per liter) because of deposits of gypsum and evaporites. This water also contains very high levels of arsenic, boron, and fluoride from natural sources. These contaminants exceed State and Federal standards for drinking water. All of the ground water in this MLRA is very hard.

Soils

The dominant soil orders in this MLRA are Aridisols and Entisols. The soils in the area dominantly have a thermic soil temperature regime, an aridic soil moisture regime, and mixed or carbonatic mineralogy. They generally are well drained to excessively drained, loamy-skeletal or sandy-skeletal, and shallow to very deep. Torriorthents formed in alluvium on fan pediments, alluvial fans, fan aprons, and flood plains (Arizo, Carrizo, Hesperia, and Yermo series) and in residuum and colluvium on limestone and dolomite hills and mountains (St. Thomas series), on volcanic hills and mountains (Sunrock series), and on granite hills and mountains (Dalvord and Goldroad series). Torripsammments (Cajon series), Haplocalcids (Gunsight, Huevi, Tonopah, and Weiser series), and Petrocalcids (Bard, Cave, and Mormon Mesa series) formed in alluvium on alluvial fans, fan aprons, mesas, and terraces.

Biological Resources

This area supports thin stands of desert vegetation. Creosotebush, white bursage, Joshua-tree, juniper, yucca, cactus, and Mormon-tea are the major species. Numerous annual forbs and grasses grow during years of favorable moisture. Saltbush, saltgrass, alkali sacaton, and iodinebush grow on alkali flats. Indian ricegrass, Joshua-tree, desert needlegrass, and galleta grow on sandy soils. Some of the major wildlife species in this area are antelope,

coyote, kit fox, jackrabbit, cottontail, squirrel, road runner, Gambel's quail, mourning dove, gopher snake, sidewinder, and rattlesnake. Some water bodies contain various species of pupfish. The Desert Tortoise, a threatened species, is in parts of this MLRA.

Land Use

Following are the various kinds of land use in this MLRA:

Grassland—private, 13%; Federal, 65%

Forest—Federal, 2%

Urban development—private, 2%; Federal, 2%

Water—private, 1%; Federal, 2%

Other—private, 5%; Federal 8%

About four-fifths of this area is Federally owned. Much of the remainder is owned by local governments. Most of the land has a cover of desert vegetation. The area is used only locally for grazing because of low forage production and the lack of water for livestock. On sites intensively used for recreation, especially where motorcycles and off-road vehicles are driven, the hazards of wind erosion and water erosion are severe. In Utah, where an adequate water supply is available, much of the land that was irrigated cropland or hayland, as well as some of the adjacent rangeland, is undergoing urbanization. The major soil resource concerns on rangeland are the productivity and sustainability of the soils and the hazards of wind erosion and water erosion. Compaction, soil tilth, management of soil moisture, and wind erosion are the major soil resource concerns on irrigated cropland. In urbanized areas and irrigated fields, differential settling resulting from the content of gypsum in the soils is a management concern, particularly in the area around St. George, Utah. Conservation practices on irrigated cropland generally include irrigation system improvement, irrigation water management, nutrient management, and pest management. Conservation practices on rangeland include prescribed grazing, development of watering facilities, and erosion control.

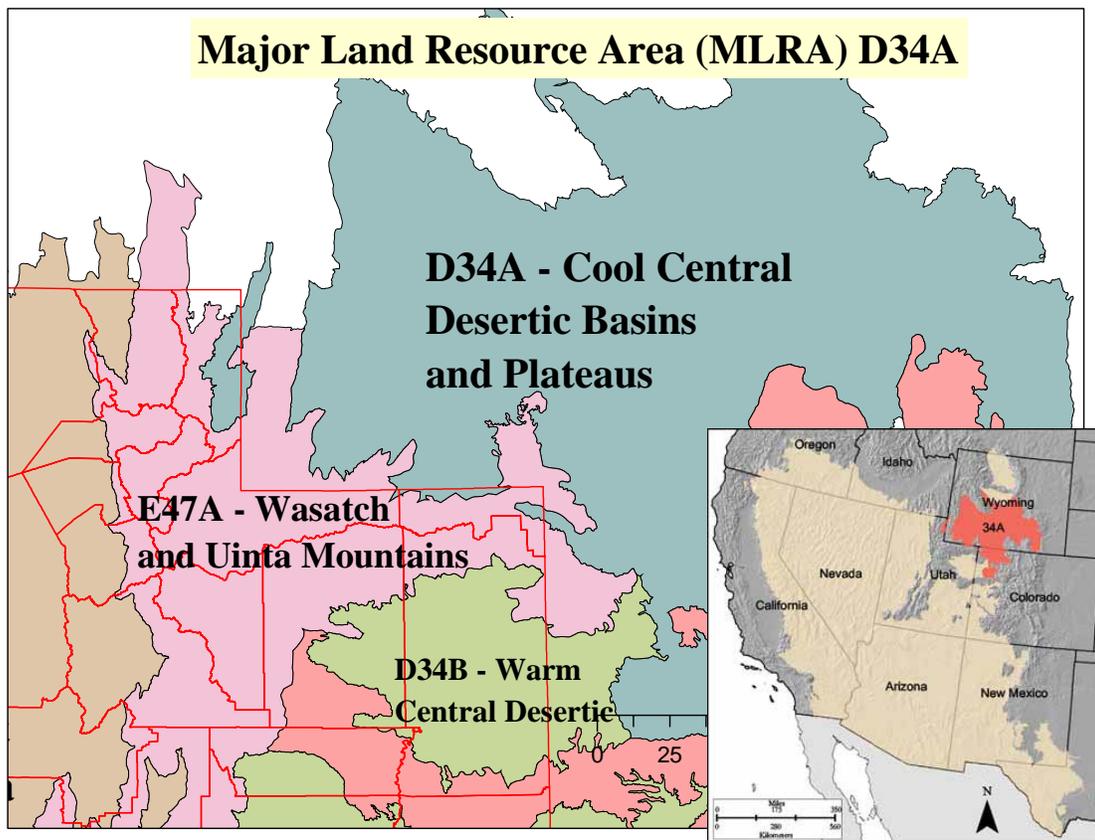
MLRA 34A – Cool Central Desertic Basins; Mountains; and Plateaus

MLRA 34A – Cool Central Desertic Basins; Mountains; and Plateaus (Utah portion)

Ecological Zone	Desert	Semidesert*	Upland*	Mountain
Precipitation		7 -9 inches	10-14 inches	
Elevation	NONE	5,200 – 7,000	6,000 – 8,000	NONE
Soil Moisture Regime		Aridic Ustic	Ustic Aridic	
Soil Temp Regime		Frigid	Frigid	
Freeze free Days		50-90	50-100	
Notes		Wyoming big sage is typical. 300 - 700 lbs/ac	Wyoming big sagebrush with snowberry and serviceberry are typical. 600 - 1500 lbs/ac	

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



34A—Cool Central Desertic Basins and Plateaus

This area is in Wyoming (85 percent), Colorado (13 percent), and Utah (2 percent). It makes up about 33,005 square miles (85,525 square kilometers). The cities of Laramie, Pinedale, Rawlins, and Rock Springs, Wyoming, and Craig and Meeker, Colorado, occur in this MLRA. Interstate 80 bisects the northern part of the MLRA.

Physiography

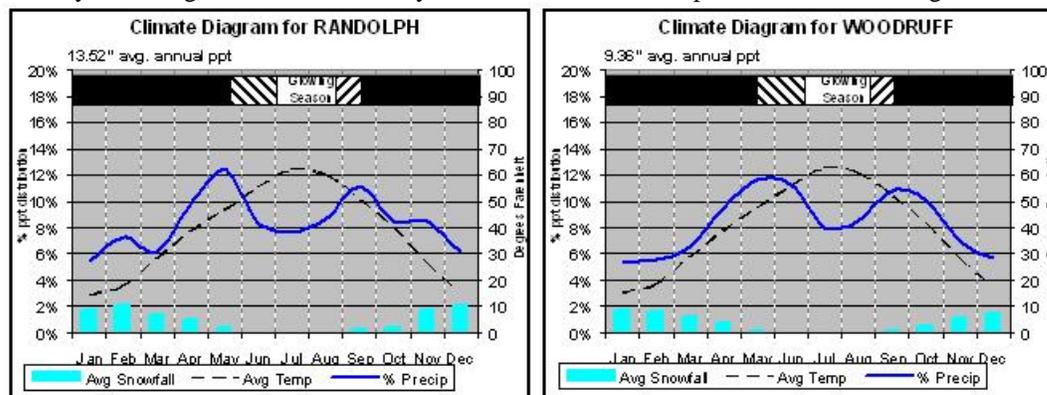
About 85 percent of this area is in the Wyoming Basin Province of the Rocky Mountain System, 5 percent is in the Middle Rocky Mountains Province of the Rocky Mountain System, and 10 percent is in the Uinta Basin Section of the Colorado Plateaus Province of the Intermontane Plateaus. The part of the area in the Uinta Basin Section is in Colorado. The Wyoming Basin is bounded on most sides by mountains. The Owl Creek Mountains, the Big Horn Mountains, and the Wind River Range are to the north; the Salt Range and Wasatch Mountains are to the west; and the Laramie and Sierra Madre Mountains are to the east. The part of the MLRA in Colorado is bounded on the south by the Roan Plateau, on the east by the Elkhead Mountains, and on the west by Dinosaur National Monument. In most of the MLRA, elevation ranges from 5,200 feet (1,585 meters) to 7,500 feet (2,285 meters). Small mountainous areas have an elevation as high as 9,200 feet (2,805 meters). The extent of the Hydrologic Unit Areas (identified by four digit numbers) that make up this MLRA is as follows: Great Divide-Upper Green (1404), 47 percent; North Platte (1018), 28 percent; White-Yampa (1405), 16 percent; Bighorn (1008), 6 percent; Bear (1601), 2 percent; and Powder-Tongue (1009), 1 percent. The Popo Agie, Sweetwater, Laramie, Green, and North Platte Rivers run through the northern part of this MLRA, and the Little Snake, Yampa, and White Rivers run through the southern part.

Geology

This area is dominated by residual basin-floor geologic materials. Shale and sandstone are the dominant rock types. The Tertiary-age Bridger, Laney, Green River, Wasatch, Wind River, and Browns Park Formations dominate the MLRA. Cretaceous-age formations occur as small areas throughout the MLRA. The dominant Cretaceous formations are the Lewis and Lance Formations and the members of the Mesa Verde Group. Quaternary alluvial and eolian deposits occur throughout the MLRA. Glacial deposits occur primarily on outwash terraces in the vicinity of Pinedale, Wyoming. The small mountain ranges in this MLRA are made up of Precambrian igneous and metamorphic rocks.

Climate

The average annual precipitation generally is 7 to 12 inches (180 to 305 millimeters), but it ranges from 7 to 32 inches (180 to 815 millimeters). Much of the precipitation occurs as snow from October through April and as rain from May and September. These precipitation events occur as a result of cold fronts moving through the area. Occasional convective thunderstorms produce small amounts of rain during the period June through September. The driest period is usually June through August. The average annual temperature generally is 40 to 44 degrees F (5 to 7 degrees C), but it ranges from 33 to 47 degrees F (0 to 8 degrees C). The frost-free period averages 105 days and ranges from 45 to 160 days. The shortest frost free periods occur at the highest elevations.



Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 0.3%; ground water, 0.3%

Livestock—surface water, 0.2%; ground water, 0.2%

Irrigation—surface water, 89.7%; ground water, 5.1%

Other—surface water, 2.8%; ground water, 1.4%

The total withdrawals average 2,590 million gallons per day (9,805 million liters per day). About 7 percent is from groundwater sources, and 93 percent is from surface water sources. Water is scarce in much of the MLRA. Irrigation water is available, however, along the few rivers that bring water into the area from the adjoining mountains. Numerous reservoirs store snowmelt runoff for later use in the growing season. The surface water is of good quality. It is suitable for almost all uses with minimal treatment. Ground water supplies are meager and little developed in much of this area. A large area of irrigated cropland is along the Bear River, in the northwest corner of the part of this MLRA in Utah. Ground water from the unconsolidated valley fill is pumped for irrigation. This water typically contains less than 1,000 parts per million (milligrams per liter) total dissolved solids and is suitable for almost all uses. Two aquifers are in the part of this area in Wyoming. One is a sand-and-gravel aquifer that is equivalent to the High Plains (Ogallala) Aquifer farther east. Water from the sand-and-gravel aquifer contains less than 500 parts per million total dissolved solids (milligrams per liter) and is moderately hard. It is used for public and domestic supply, livestock, and irrigation. Water also occurs at greater depths in the structural basin aquifer, which is the most extensive and widely used aquifer in this area. It has lenticular beds of sandstone, coal, and shale that can exceed 5,000 feet in thickness. Because of a median level of 1,100 parts per million total dissolved solids (milligrams per liter), the water from this aquifer generally is unsuitable for public supplies. The water is used for domestic supply, livestock, and some irrigation.

Soils

The dominant soil orders in this MLRA are Aridisols and Entisols. Some representative suborders are Argids, Cambids, Orthents, Fluvents, and Psamments. The most extensive and representative great groups are Haplargids (Forelle, Ryan Park, Ryark, and Maysprings series), Haplocambids (Poposhia series), Torriorthents (Blazon series), Natrargids (Tisworth series), Calciargids (Rock River series), Torrifluvents (Cowestglen and Battlement series), and Torripsamments (Coyet series). The dominant soil temperature regime is frigid, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 14 inches (205 to 355 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 14 to 16 inches (355 to 405 millimeters) have an ustic soil moisture regime that borders on aridic. On the lower slopes of the minor mountain ranges, the soils that receive 16 to 20 inches (405 to 510 millimeters) of precipitation generally have a frigid soil temperature regime and an ustic soil moisture regime. The soils at the highest elevations in the small mountain ranges have a cryic soil temperature regime and a udic soil moisture regime that borders on ustic. Some soils with a mesic soil temperature regime occur at the lowest elevations in the southern part of the MLRA. Soils with mixed or smectitic mineralogy are dominant. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. Many formed in slope alluvium or residuum derived from shale or sandstone. Soils that formed in stream- or river-deposited alluvium are near the major waterways. Most of the soils are well drained. Most are calcareous.

Biological Resources

The kind of vegetation varies from one precipitation zone to another in this MLRA. In a salt desert zone in small areas receiving less than 8 inches (205 millimeters) of annual precipitation, the representative plant species are Gardner's saltbush, mat saltbush, greasewood, shadscale, bud sagebrush, winterfat, Indian ricegrass, and western wheatgrass. Wyoming big sagebrush may occur but only as a few widely spaced plants. A semi-desert grass-shrub zone, the largest in the MLRA, is characterized by a vast sagebrush steppe. This zone occurs in the areas receiving 8 to 16 inches (205 to 405 millimeters) of annual precipitation. The representative vegetation includes Wyoming big sagebrush, early sagebrush, antelope bitterbrush, bluebunch wheatgrass, western wheatgrass, prairie junegrass, needleandthread, and Indian ricegrass. Utah juniper may occur in small areas. Cottonwood and willows grow in riparian zones along the major perennial streams and rivers. A foothill-mountain zone in Wyoming is in the narrow mountain ranges that receive more than 16 inches (405 millimeters) of annual precipitation. The vegetation on these ranges includes ponderosa pine, limber pine, lodgepole pine, and Engelmann's spruce and an understory of big sagebrush, Oregon-grape, Saskatoon serviceberry, antelope bitterbrush, bluebunch wheatgrass, and Idaho fescue. Another small zone in this MLRA occurs on the high plains grasslands near Laramie, Wyoming. This zone is dominated by cool-season grasses, such as bluebunch wheatgrass, green needlegrass, muttongrass, and western wheatgrass. Big sagebrush is conspicuously absent in this area. A lower foothill-mountain zone along the southern boundary of Wyoming and in Colorado occurs on the higher hills and mesas receiving more than 12 inches (305 millimeters) of annual precipitation. This zone is characterized by forested areas of Utah juniper with lesser amounts of pinyon pine and with an understory of Gambel oak, Wyoming big sagebrush, mountain mahogany, muttongrass, needleandthread, prairie junegrass, and Indian ricegrass. Some of the major wildlife species in this MLRA are whitetailed prairie dog, white-tailed jackrabbit, desert cottontail rabbit, coyote, red fox, badger, pronghorn, mule deer, elk, sage grouse, golden eagle, bald eagle, screech owl, common raven, sage sparrow, Brewer's sparrow, western rattlesnake, and bull snake.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 2%

Grassland—private, 27%; Federal, 67%

Forest—Federal, 1%

Urban development—private, 1%

Other—private, 1%; Federal, 1%

A little more than two-thirds of this area is Federally owned. The rest is in private ranches. Most of the land is used for grazing by sheep and cattle. Hunting also is an important land use. The rangeland consists of shrubs and cool-season grasses. About 2 percent of the area is cropland. Areas of irrigated hay and pasture occur mostly along the few large rivers or streams. Nonirrigated small grain crops are grown in small areas near Craig and Meeker, Colorado, where the annual precipitation is more than 13 inches (330 millimeters), the frost-free period is more than 75 days, the soils commonly are deep, and grainmarketing facilities are nearby. The major soil resource concerns are erosion, salinity, and water quality in streams and rivers. The availability of water for crops and livestock limits agricultural production. The main management concerns on rangeland are wind erosion, gully erosion, invasive species, and declining rangeland health. The main concerns on cropland are salinization and declining water tables. Conservation practices on rangeland generally include erosion control, fencing, development of watering facilities, brush management, rangeland seeding, and proper grazing management. The conservation practices that are important on cropland are those that reduce the hazard of erosion and improve the efficiency of irrigation water use. Conservation practices on hayland and pasture are improvement of the efficiency of irrigation systems, irrigation water management, and forage harvest management.

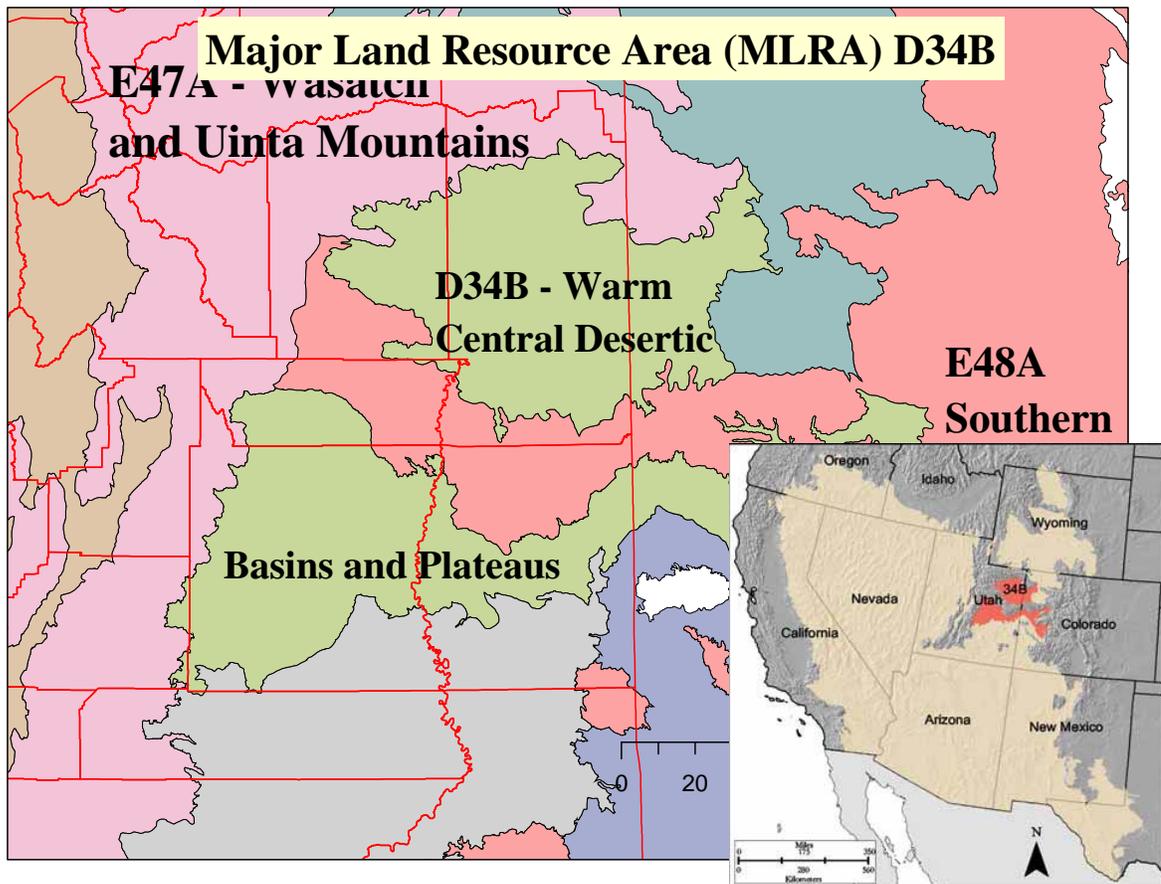
MLRA 34B – Warm Central Desertic Basins; Mountains; and Plateaus

MLRA 34B – Warm Central Desertic Basins; Mountains; and Plateaus

Ecological Zone	Desert	Semidesert*	Upland*	Mountain
Precipitation	4-8 inches	8 -12 inches	12-16 inches	
Elevation	4,600 -5,700	5,200 – 7,000	6,000 – 8,000	NONE
Soil Moisture Regime	Typic Ardic	Ustic Aridic	Aridic Ustic	
Soil Temp Regime	Mesic	Mesic	Mesic	
Freeze free Days	120-190	100-160	100-145	
Notes	Salt desert shrub 250 - 400 lbs/ac.	Wyoming big sage and juniper are typical. Pinyon is present, but rare 300 - 500 lbs/ac	Pinyon and Utah Juniper are present. Pinyon is typically more dominant 600 - 900 lbs/ac	

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



34B—Warm Central Desertic Basins and Plateaus

This area is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). The cities of Vernal, Roosevelt, Price, and Duchesne, Utah, and Grand Junction, Delta, and

Montrose, Colorado, occur in this MLRA. Interstate 40 bisects the northern part of the area, and Interstate 70 bisects the southern part. The Uintah and Ouray Indian Reservation and the western end of Dinosaur National Monument occur in this MLRA.

Physiography

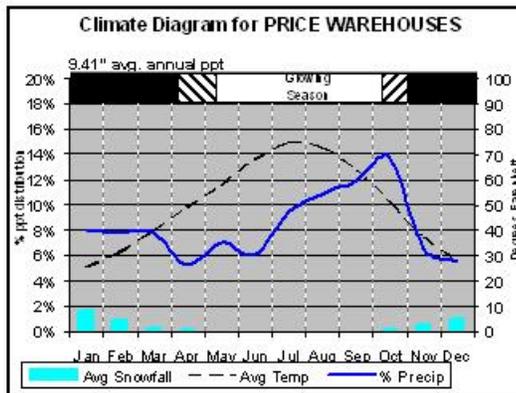
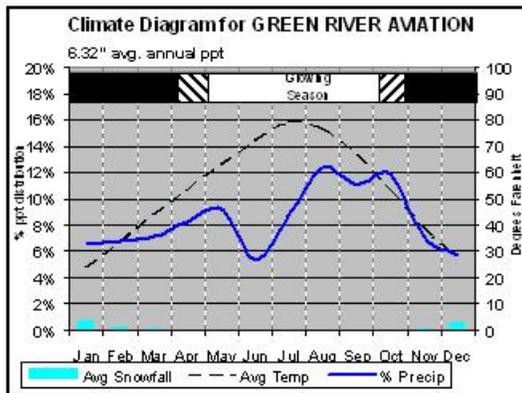
This area is in the Canyon Lands (60 percent) and Uinta Basin (35 percent) Sections of the Colorado Plateaus Province of the Intermontane Plateaus. A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Another small part is in the Middle Rocky Mountains Province of the Rocky Mountain System. This MLRA consists of broad intermountain basins bounded by plateaus and steep escarpments. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau. The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Lower Green (1406), 51 percent; White-Yampa (1405), 18 percent; Colorado Headwaters (1401), 11 percent; Gunnison (1402), 9 percent; Upper Colorado-Dirty Devil (1407), 6 percent; and Upper Colorado-Dolores (1403), 5 percent. The Colorado, Green, Gunnison, Price, and Uncompahgre Rivers run through the southern part of this MLRA. The Duchesne, Green, Strawberry, and White Rivers run through the northern part.

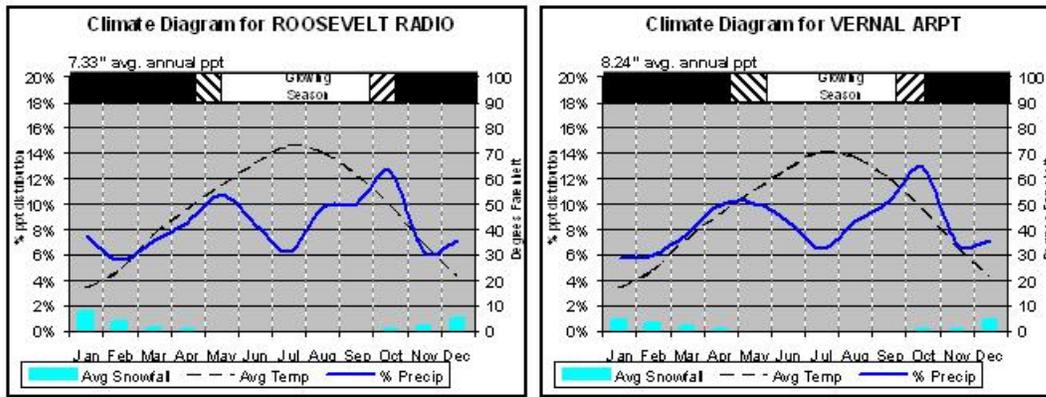
Geology

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA. Glacial deposits on outwash terraces occur primarily along the Uncompahgre and Gunnison Rivers in Colorado and on outwash terraces from the Uintah Mountains north of Duchesne, Utah. Permian Kaibab Limestone occurs on the crest of the San Rafael Swell, an Eocene anticline west of Green River, Utah, that is about 100 miles long north to south and about 40 miles wide. Tertiary-age granodiorite intrusives occur off the southwest tip of the San Rafael Swell.

Climate

The average annual precipitation ranges from 6 to 24 inches (150 to 610 millimeters) in the 6- to 10-inch (150- to 255- millimeter) precipitation zone covering most of this MLRA. Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The frost-free period averages 170 days and ranges from 110 to 235 days.





Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 4.0%; ground water, 0.3%

Livestock—surface water, 0.7%; ground water, 0.0%

Irrigation—surface water, 85.1%; ground water, 8.7%

Other—surface water, 1.0%; ground water, 0.3%

The total withdrawals average 1,440 million gallons per day (5,450 million liters per day). About 9 percent is from ground water sources, and 91 percent is from surface water sources. Precipitation is sparse in this area. There is a significant area of irrigated hayland and cropland in the Duchesne, Price, and San Rafael basins in the part of this area in Utah. The surface water is of good quality and is pumped or diverted from the rivers for irrigation. Water-supply concerns in these basins include Native American water rights and coal and oil-shale development. The Upper Colorado, White, and Gunnison Rivers in Colorado are used to irrigate hay meadows, orchards, and cropland. The river water is generally of good quality, except for short reaches that are contaminated with trace elements and metals from mining and naturally occurring sources. Water rights, salinity control, and water transfers to the eastern side of the Continental Divide are water-supply concerns in Colorado. There are two sources of ground water in this MLRA. One is unconsolidated valley fill in the northern part of the area, and the second is a sandstone aquifer in the southern part. Dakota Sandstone, the Morrison Formation, and Entrada Sandstone are the Colorado equivalent of the sandstone aquifer in Utah. Water from the unconsolidated valley fill aquifer is of good quality and is used for both public supply and irrigation. Water from the sandstone aquifer also is used for public supply and irrigation, but its quality varies considerably. The ground water near recharge zones has the best quality. Deeper water may be saline.

Soils

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. Some of the most extensive and representative great groups are Torriorthents (Chipeta, Persayo, Cadrina, Killpack, and Gerst series), Haplocalcids (Walknolls, Abracon, Avalon, and Shalako series), Haplocambids (Sagers and Begay series), Natrargids (Motto series), Argiustolls (Cortyzack series), Torrifuvents (Ravola series), and Haplustolls (Moonset series). The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 10 inches (255 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 10 to 12 inches (255 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have a mesic moisture regime but in some areas have an ustic regime that borders on aridic. Some soils with a frigid soil temperature regime and an ustic soil moisture regime occur at the highest elevations in the northern part of the MLRA. The dominant soil mineralogy is mixed. The soils that formed in material weathered from Mancos shale tend to have active or semiactive clay activity classes. Most of the soils formed in slope alluvium or residuum derived from shale or sandstone. Soils that formed in alluvium occur near the major waterways, and soils that formed in colluvium occur generally on slopes of more than 35 percent. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. Most are well drained. Most are calcareous. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Biological Resources

This area has three major land resource units. These are the desert-salt desert zone, the semi-desert zone, and the upland foothill zone. The largest and most dominant unit is the desert-salt desert zone. This zone occurs at the lower elevations receiving less than 10 inches of annual precipitation (255 millimeters). The representative vegetation includes Castlevalley saltbush, Gardner's saltbush, mat saltbush, greasewood, shadscale, bud sagebrush, winterfat, Indian ricegrass, salina wildrye, and galleta. Cottonwood and willows grow along riparian zones. The semi-desert zone occurs as a narrow 10- to 12-inch (255- to 305-millimeter) precipitation band. This zone has two vegetative subzones. The more extensive subzone includes Wyoming big sagebrush, black sagebrush, shadscale, fourwing saltbush, Mormon tea, Indian ricegrass, and galleta. The other subzone occurs mostly in the area of the San Rafael Swell in Utah. This subzone is similar to the other subzone but lacks Wyoming big sagebrush and has more Utah juniper trees. Wyoming big sagebrush and pinyon pine may occur but only as a few widely scattered plants. The upland-foothill zone occurs as a 12- to 16-inch (305- to 405-millimeter) precipitation band. Utah juniper and pinyon pine forests dominant this zone. The representative vegetation includes Utah juniper, pinyon pine, Wyoming big sagebrush, black sagebrush, prairie junegrass, muttongrass, and needleandthread. Gambel oak, Utah serviceberry, antelope bitterbrush, mountain mahogany, and bluebunch wheatgrass grow at the higher elevations. Some of the major wildlife species in this MLRA are coyote, kit fox, white-tailed prairie dog, white-tailed jackrabbit, pronghorn, mule deer, elk, American kestrel, sage grouse, turkey vulture, screech owl, mourning dove, pinon jay, common raven, sage sparrow, bald eagle, golden eagle, western rattlesnake, bullsnake, fence lizard, sagebrush lizard, Colorado pike minnow, razorback sucker, bonytail, and humpback chub.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 1%
Grassland—private, 21%; Federal, 74%
Forest—Federal, 1%
Urban development—private, 1%
Other—private, 1%; Federal, 1%

About three-fourths of this area is Federally owned. Most of the area is used for recreation or livestock grazing. Different types of surface or sprinkler irrigation are used in many of the valleys. The major crops grown throughout the area are silage corn, grain corn, alfalfa, and small grains. Cantaloupe and melons are grown near Green River, Utah, and lettuce, onions, dry beans, peppers and other small vegetable crops are grown in the Grand Valley and Uncompahgre areas. Many tracts of rangeland and cropland have been, and are continuing to be, subdivided for community development. The major soil resource concerns are salinity, leaching of selenium and salts into surface and ground water supplies, irrigation-induced erosion, and subsidence resulting from gypsum dissolution. Wind erosion is a hazard on light textured soils during periods when annual crops are grown and during periods of plant germination. It also is a hazard in areas of salt-desert shrub communities. The main management concerns on rangeland are wind erosion, gully erosion, invasive species, and declining rangeland health. The main management concerns in cultivated areas include salinization, declining water tables, and inadequate supplies of irrigation water. Conservation practices on rangeland generally include erosion control, fencing, development of watering facilities, brush management, rangeland seeding, and proper grazing management. Conservation practices on cropland include improvement of the efficiency of irrigation systems, irrigation water management, and crop residue management. Conservation practices on hayland and pasture include improvement of the efficiency of irrigation systems, irrigation water management, and forage harvest management.

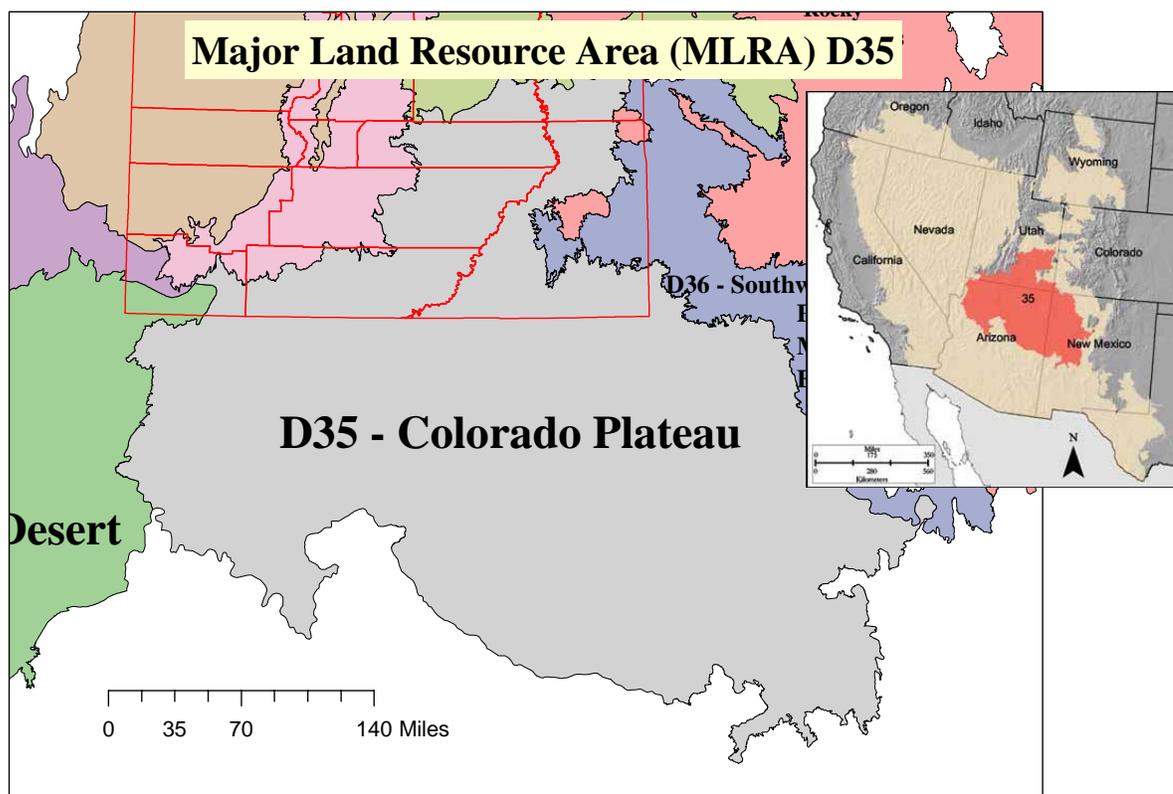
MLRA 35 - Colorado and Green River Plateaus

MLRA 35 - Colorado and Green River Plateaus (Utah portion)

Ecological Zone	Desert	Semidesert*	Upland*	Mountain
Precipitation	5 -9 inches	9 -13 inches	13-16 inches	
Elevation	3,000 -5,000	4,500 -6,500	5,800 - 7,000	NONE
Soil Moisture Regime	Typic Ardic	Ustic Aridic	Aridic Ustic	
Soil Temp Regime	Mesic/Thermic	Mesic	Mesic	
Freeze free Days	120-220	120-160	100-130	
Notes	Shadscale and blackbrush 300 – 500 lbs/ac	Percent of Juniper production is usually greater than the Pinyon production 400 – 700 lbs/ac	Percent of Pinyon production is usually greater than the Juniper production 100 – 500 lbs/ac 800 – 1,000 lbs/ac	

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



35—Colorado Plateau

This area is in Arizona (56 percent), Utah (22 percent), New Mexico (21 percent), and Colorado (1 percent). It makes up about 71,735 square miles (185,885 square kilometers). The cities of Kingman and Winslow, Arizona, Gallup and Grants, New Mexico, and Kanab and Moab, Utah, are in this area. Interstate 40 connects some of

these cities, and Interstate 17 terminates in Flagstaff, Arizona, just outside this MLRA. The Grand Canyon and Petrified Forest National Parks and the Canyon de Chelly and Wupatki National Monuments are in the part of this MLRA in Arizona. The Zion, Capitol Reef, Canyonlands, and Arches National Parks and the Grand Staircase-Escalante, and Hovenweep National Monuments are in the part in Utah. The Aztec Ruins, El Morro, El Malpais, and Chaco Canyon National Monuments and the Chaco Culture National Historic Park are in the part in New Mexico. The Dixie, Manti-La Sal, Kaibab, Prescott, Coconino, Sitgreaves, Apache, and Cibola National Forests are in this MLRA. "Four Corners," the only place in America where four State boundaries meet at one point, is in this area. The Navajo and Hopi Nations make up a significant portion of this MLRA in eastern Arizona, western New Mexico, and southern Utah. Other Native American Nations in Arizona include the Zuni, Havasupai, Hualapai, and Kaibab. The Ramah Nation and a small part of the Acoma Nation are in the part of this MLRA in New Mexico. Almost all of the part of this MLRA in Colorado is in the Ute Mountain Nation.

Physiography

This area is in the Colorado Plateaus Province of the Intermontane Plateaus. Different parts of this MLRA are in five of the six sections within the Colorado Plateaus Province. Most of the eastern and central parts of the MLRA are in the Navajo Section. The second largest part, to the west of the Navajo Section, is in the Grand Canyon Section. The northernmost part is in the Canyon Lands Section, and the northwest corner is in the High Plateaus of Utah Section. The southeast corner is in the Datil Section. In general, the surface consists of gently sloping to strongly sloping plains. Volcanic plugs that rise abruptly above the plains, steep scarps, or deeply incised canyons interrupt the surface of the plains. In most areas elevation is 4,250 to 4,950 feet (1,295 to 1,510 meters). Mt. Trumbull, on the north rim of the Grand Canyon, however, reaches a height of 8,028 feet (2,448 meters), and the Navajo Mountain, on the Utah-Arizona State line, reaches a height of 10,388 feet (3,167 meters). The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Little Colorado (1502), 34 percent; San Juan (1408), 21 percent; Lower Colorado-Lake Mead (1501), 19 percent; Upper Colorado-Dirty Devil (1407), 14 percent; Rio Grande-Elephant Butte (1302), 4 percent; Salt (1506), 3 percent; Upper Colorado-Dolores (1403), 3 percent; and Lower Green (1406), 2 percent. The Colorado River and its tributary in Arizona, the Little Colorado River, are in this MLRA. The Glen Canyon Dam, on the Colorado River (Lake Powell), also is in this area. The Mancos and McElmo Rivers in Colorado are tributaries to the San Juan River in New Mexico. Parts of the Virgin, Sevier, Escalante, Otter, Dirty Devil, Green, and Pariah Rivers are in the part of this MLRA in Utah. Rio Puerco is in the part in New Mexico.

Geology

This area is part of the Colorado Plateau, an area that has been structurally uplifted. Rivers flowing across the area cut down into the bedrock as it was being uplifted, resulting in spectacular geologic scenery. Areas of shale, sandstone, limestone, dolomite, and volcanic rock outcrop are extensive. Rocks representing almost the entire geologic timespan are exposed from the bottom of the Grand Canyon up to the present-day surface. Quaternary and Tertiary lava flows occur on the surface in the southwest part of this area. Older flows cap plateaus and mesas, and isolated volcanic cones and eroded volcanic necks occur throughout the area.

Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 0.4%; ground water, 2.7%

Livestock—surface water, 5.7%; ground water, 2.0%

Irrigation—surface water, 34.9%; ground water, 12.9%

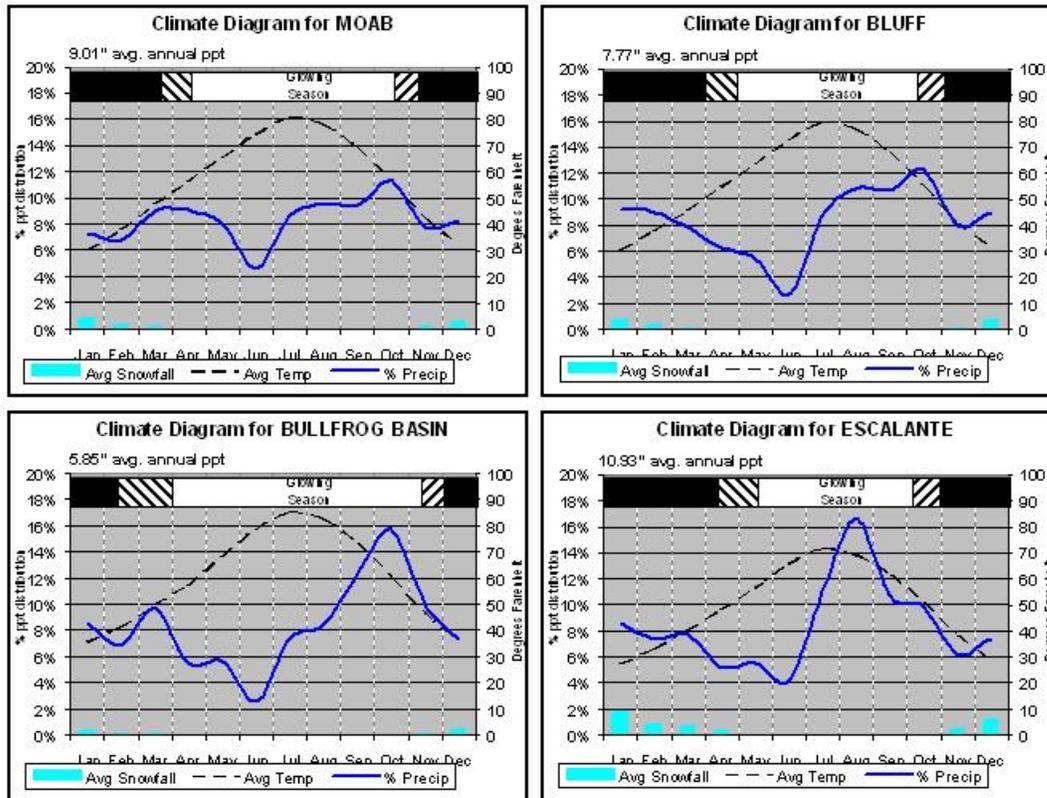
Other—surface water, 24.3%; ground water, 17.2%

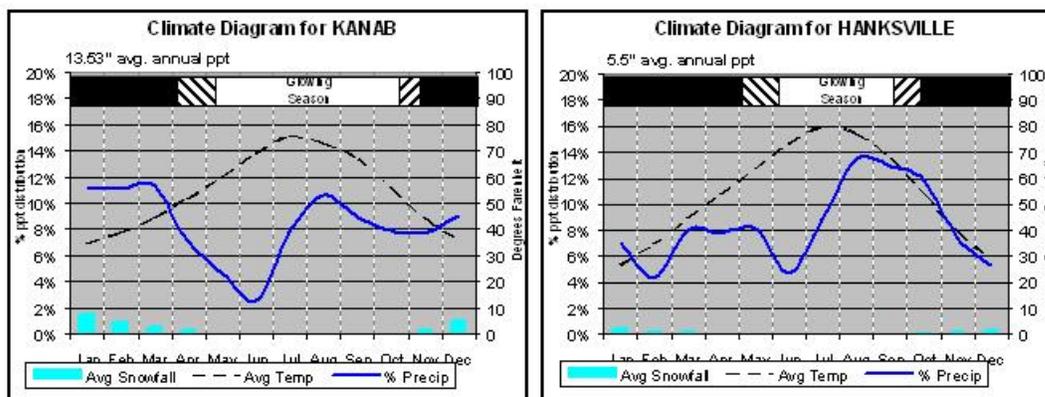
The total withdrawals average 560 million gallons per day (2,120 million liters per day). About 35 percent is from groundwater sources, and 65 percent is from surface water sources. Water is scarce throughout the area. Many streams and rivers are ephemeral. The Little Colorado River drains the largest segment of the area, but its flow is intermittent. Water is stored in small reservoirs for irrigation purposes, but supplies are often inadequate. Some irrigation water is obtained from erratic streamflow. The surface water is suitable for almost all uses. A high sediment load is the primary water-quality problem. The San Juan River basin in the part of this area in northwest New Mexico has the highest streamflow volume in the State. It is one area that relies almost entirely on surface water. The Navajo Reservoir and a few smaller reservoirs store water for use by residents in this area. The river water is of exceptional quality. It is suitable for a cold-water fishery. High salt and sediment loads from ephemeral tributaries on the south side of the basin degrade the river water. Ground water is the primary source of drinking water in many areas. In places some irrigation water is obtained from deep wells. Ground water occurs in the

Coconino, Navajo, and Dakota Sandstone aquifers. It is soft to hard water and generally contains less than 300 parts per million (milligrams per liter) total dissolved solids in Arizona. Median levels of total dissolved solids are closer to 1,000 parts per million (milligrams per liter) in Utah and New Mexico. Lower levels of total dissolved solids and fresher water occur near the recharge zones for these consolidated sediments. Very salty water occurs at depth and away from the recharge zones. Highly mineralized water leaks into these aquifers from older and younger marine sediments above and below the sandstone aquifers. Some irrigation water is pumped from the valley fill in the San Juan River basin. It has a higher salt content than the river water but otherwise is very similar in quality. Use of the valley fill water is limited because seepage of salty water from the adjacent rocks containing soluble salts increases the sodium sulfate content.

Climate

The average annual precipitation is 6 to 18 inches (150 to 455 millimeters) in almost all of this area, but it is less than 5 inches (125 millimeters) in a few basins on the west edge of the area. The highest average annual precipitation, 30 inches (760 millimeters), occurs in a few isolated mountains in southern Utah and near the Arizona-New Mexico State line. About half of the precipitation falls from July through September. April, May, and June are the driest months. Most of the rainfall occurs as high-intensity, convective thunderstorms late in summer. Light snow falls in winter, but it does not remain on the ground very long. The average annual temperature is 36 to 66 degrees F (2 to 19 degrees C), decreasing to the north and at the higher elevations. The frost-free period averages 215 days and ranges from 105 to 320 days, decreasing in length to the north and at the higher elevations.





Soils

The dominant soil orders in this MLRA are Alfisols, Aridisols, Entisols, and Mollisols. The soils in the area dominantly have a mesic soil temperature regime; an aridic soil moisture regime or an ustic moisture regime that borders on aridic; and carbonatic, mixed, or smectitic mineralogy. They generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy or clayey. Haplustalfs (Lykorly series) and Haplargids (Penistaja series) formed in mixed eolian deposits and alluvium on mesas, cuestas, hills, bajadas, and fan terraces. Calciargids (Millett series) formed in alluvium on fan terraces, piedmonts, and plains. Haplocalcids formed in mixed residuum and colluvium on benches, hills, and ridges (Mellenthin series) and in eolian deposits over alluvium (Winona series). Haplocambids formed in mixed eolian deposits and alluvium on mesas, cuestas, hills, and fan terraces (Begay series) and in alluvium on plateaus and mesas (Epikom series). Ustorthents formed in mixed residuum and colluvium on mesas and mountains (Menefee series) and in mixed eolian deposits and alluvium on ridges, hills, and mesas (Vessilla series). Torriorthents formed in mixed alluvium and residuum (Moenkopie series) and in mixed residuum and colluvium (Rizno series) on mesas, hills, benches, cuestas, and plateaus. Torripsamments (Sheppard series) formed in eolian deposits on benches, dunes, and terraces. Argiustolls (Luzena series) formed in residuum and colluvium on mesas, hills, and mountains.

Biological Resources

This area supports desert shrub and woodland vegetation. At high elevations, pinyon-juniper woodland and sagebrush have an understory of galleta, blue grama, black grama, and western wheatgrass. Galleta grass, alkali sacaton, Indian ricegrass, bottlebrush squirreltail, and needlegrasses intermixed with fourwing saltbush and winterfat are at the lower elevations. Greasewood and shadscale are part of the plant community on salty soils. Blackbrush may be dominant at the lower elevations. Some of the major wildlife species in this area are elk, mule deer, antelope, mountain lion, coyote, fox, bobcat, badger, skunk, rabbit, prairie dog, bats, eagles, hawks, owls, crow, woodpecker, bluebird, and swallow.

Land Use

Following are the various kinds of land use in this MLRA:

- Cropland—private, 1%
- Grassland—private, 48%; Federal, 27%
- Forest—private, 8%; Federal, 6%
- Urban development—private, 1%
- Water—private, 1%
- Other—private, 7%; Federal, 1%

About one-third of this area is Federally owned. About three-fourths is rangeland. The rangeland is grazed by sheep and cattle. About 1 percent of the area, along the valleys of the major streams, is irrigated cropland. Alfalfa, small grains for hay, and corn for silage are the chief crops. Less than one-tenth of the area in scattered small tracts on Indian reservations is dry-farmed. Corn is the chief crop in the dry-farmed areas. More than one-tenth of the area is juniper and pinyon-juniper woodland. Firewood and pinyon nuts are products of this woodland, which also is grazed by cattle and sheep. If the areas are overgrazed, juniper invades the grassland. Severe gullying, overgrazing, and the lack of a dependable water supply are land use problems. Because of the mild climate and nearby recreational opportunities, the irrigated cropland near towns, such as Moab and Kanab, is being converted

to housing developments. The major soil resource concerns are maintenance of the content of organic matter in the soils, soil productivity, wind erosion, water erosion, salinity, and sodicity. These factors and the low rainfall result in soils that have little or no resilience after disturbance and a very low tolerance for soil loss by erosion. Conservation practices on rangeland generally include brush management, rangeland seeding, prescribed grazing, prescribed burning, fencing, development of watering facilities, and erosion control. Conservation practices on cropland and hayland are crop rotation, crop residue management, minimum tillage, nutrient and pest management, land leveling, ditch lining, irrigation water management, soil salinity management, and pasture and hayland management.

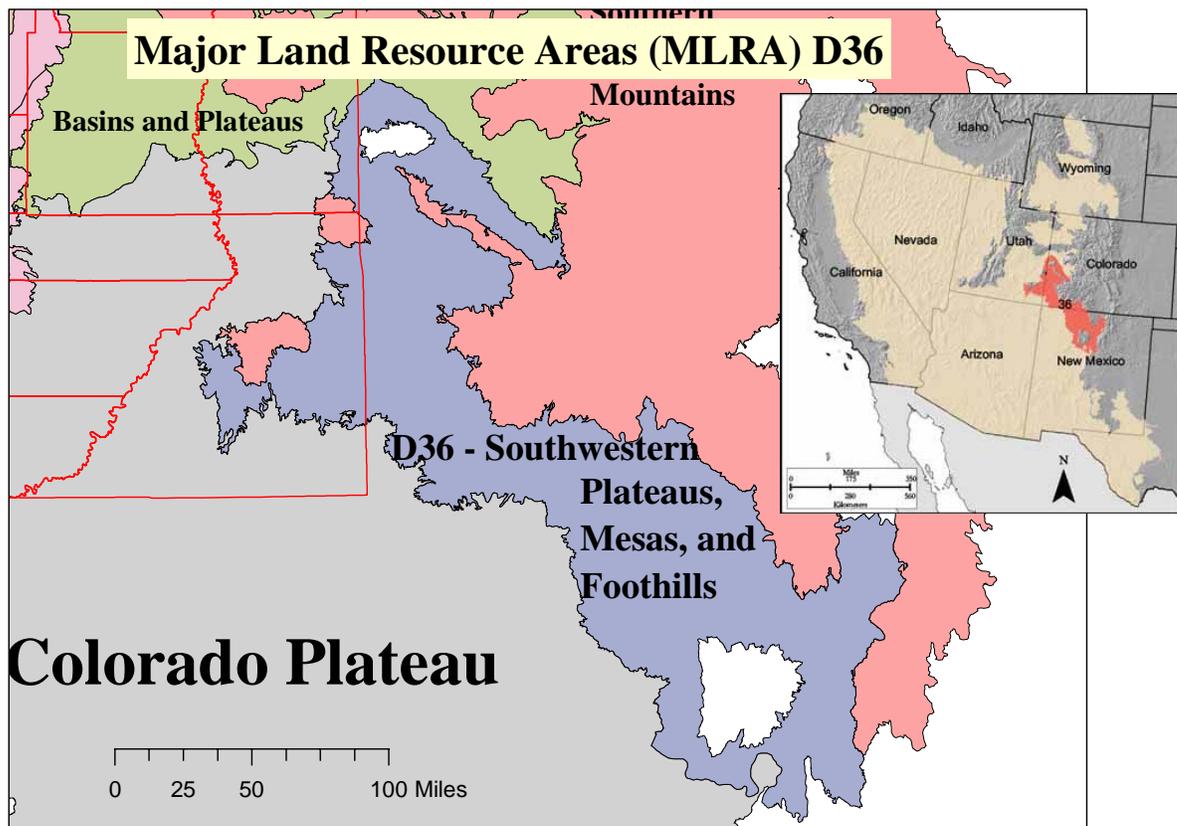
MLRA 36 – Southwestern Plateaus, Mesas and Foothills

MLRA 36 – Southwestern Plateaus, Mesas and Foothills (Utah portion)

Ecological Zone	Desert	Semidesert*	Upland*	Mountain
Precipitation		9 -13 inches	13-16 inches	
Elevation	NONE (D35)	4,500 -6,500	5,800 - 7,000	NONE (E48)
Soil Moisture Regime		Ustic	Ustic	
Soil Temp Regime		Mesic	Mesic	
Freeze free Days		120-160	100-130	
Notes		Percent of Juniper production is usually greater than the Pinyon production 400 – 700 lbs/ac	Percent of Pinyon production is usually greater than the Juniper production 100 – 500 lbs/ac 800 – 1,000 lbs/ac	

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



36—Southwestern Plateaus, Mesas, and Foothills

This area is in New Mexico (58 percent), Colorado (32 percent), and Utah (10 percent). It makes up about 23,885 square miles (61,895 square kilometers). The major towns in the area are Cortez and Durango, Colorado; Santa Fe

and Los Alamos, New Mexico; and Monticello, Utah. Grand Junction, Colorado, and Interstate 70 are just outside the northern tip of this area. Interstates 40 and 25 cross the middle of the area. Mesa Verde National Park and the Bandelier, Hovenweep, Natural Bridges, Yucca House, and Colorado National Monuments are in the area. Many Indian reservations are in this MLRA. The largest are the Southern Ute, Ute Mountain, and Jicarilla Apache Indian Reservations. Also in the area are the Cochiti, Jemez, Nambe, Navajo, Picuris, Pojoaque, San Felipe, San Ildefonso, San Juan, Sandia, Santa Ana, Santa Clara, Santa Domingo, Taos, Tesuque, and Zia Indian Reservations.

Physiography

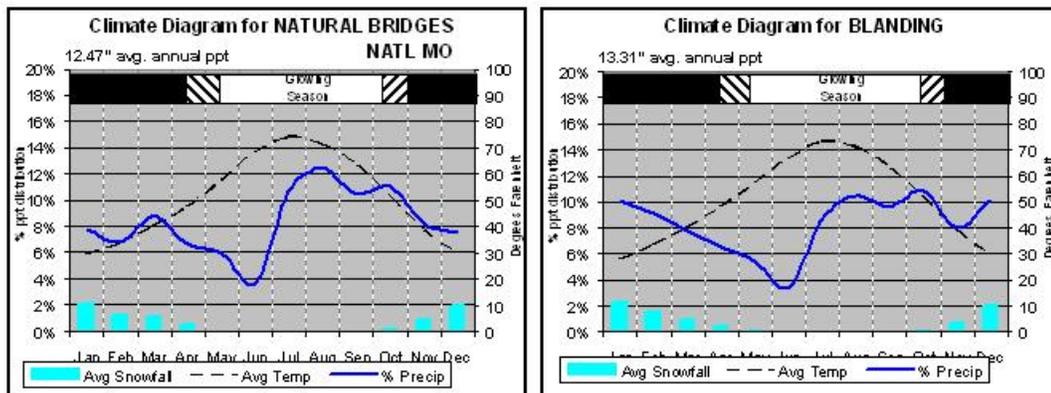
This area is on the Intermontane Plateaus. It is mainly in the Canyon Lands and Navajo Sections of the Colorado Plateaus Province, is partly in the Mexican Highland Section of the Basin and Range Province, and extends marginally into the Southern Rocky Mountains Province. Landforms in most areas are controlled by the underlying sedimentary rock formations, but fluvial landforms are in the Rio Grande rift basin at the southeastern extent of the MLRA. Elevation commonly is 4,600 to 8,500 feet (1,400 to 2,590 meters). It generally is highest (as much as 9,300 feet, or 2,835 meters) in areas of the foothills and high mesas that border the Southern Rocky Mountains. Relief generally is less than 1,500 feet (455 meters). The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Rio Grande-Elephant Butte (1302), 47 percent; San Juan (1408), 32 percent; Upper Colorado-Dolores (1403), 15 percent; Gunnison (1402), 4 percent; Colorado Headwaters (1401), 1 percent; and Upper Colorado-Dirty Devil (1407), 1 percent. The upper reaches of the Rio Grande and San Juan Rivers and their tributaries are in the part of this MLRA near the Colorado and New Mexico State lines. Rio Puerco and Rio Chama are in the part of the MLRA in New Mexico. The Dolores and San Miguel Rivers are in the part in Colorado, and a short reach of the Colorado River crosses this MLRA near the Utah and Colorado State lines.

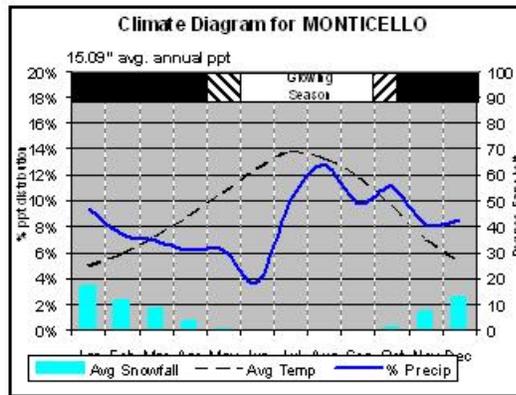
Geology

Most of the area is characterized by generally horizontal beds of Jurassic, Cretaceous, and Tertiary sedimentary rocks. Representative formations are the Morrison Formation; Dakota Sandstone, Mancos Shale, Cliff House Sandstone, and other members of the Mesa Verde Group; the Animas Formation; and the San Jose Formation. The sedimentary rocks have been eroded into plateaus, mesas, hills, and canyons. Thick deposits of eolian material of Pleistocene age mantle the top of the mesas in some areas. Small areas of Tertiary and Quaternary volcanic rocks, including cinder cones and lava flows, are in the Rio Grande rift basin in New Mexico. Wide valleys in the rift basin have accumulated deep alluvial sediments, and fan remnants are common.

Climate

The average annual precipitation in this area ranges from 8 to 31 inches (205 to 785 millimeters). It is dominantly 12 to 20 inches (305 to 510 millimeters). Much of the rainfall occurs as convective storms in late summer; about 20 to 35 percent of the total precipitation falls in July and August. This proportion increases from north to south within the area. About 15 to 25 percent of the precipitation is snow. Snowpacks are generally light and not persistent throughout the winter, except at the higher elevations. The average annual temperature ranges from 37 to 56 degrees F (3 to 14 degrees C). The frost-free period averages 160 days and ranges from 105 to 210 days. The shortest frost-free periods occur in the northern part of the area and at high elevations.





Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 2.1%; ground water, 3.6%

Livestock—surface water, 0.6%; ground water, 0.1%

Irrigation—surface water, 78.7%; ground water, 11.1%

Other—surface water, 0.1%; ground water, 3.7%

The total withdrawals average 1,130 million gallons per day (4,275 million liters per day). About 18 percent is from ground water sources, and 82 percent is from surface water sources. Water commonly is scarce in areas away from the major streams. The Dolores, Animas, and San Juan Rivers, which are perennial streams in the northern end of the area, are major sources of irrigation water. The headwater streams of the Rio Grande also have water of excellent quality. The Navajo, Heron, and El Vado Reservoirs store water for irrigation and recreation in this area. The San Juan River is a high-quality, cold-water fishery stream in northwestern New Mexico. It is used for municipal and industrial supplies as well as irrigation. High salt loads from southern tributary streams affect water quality in this area. The quality of some surface water has been degraded by the effects of upstream mining activities in the late 1800s. This mining occurred mainly in the upper reaches of the streams outside this MLRA. Ground water is the primary source of drinking water in many areas. In places some irrigation water is obtained from deep wells. Cretaceous and Jurassic sediments (Dakota and Morrison Formations and Entrada Sandstone) provide some ground water of variable quality in southwestern Colorado. The ground water in New Mexico is in Tertiary sandstone and in the older sediments. It is soft to hard water and generally exceeds the national drinking water standard for total dissolved solids. Median levels of total dissolved solids are close to 1,000 parts per million (milligrams per liter) in New Mexico. Because of high sodium and sulfate levels, the water is of limited use for drinking in many areas. Fresher water with lower levels of total dissolved solids is near the recharge zones for these consolidated sediments. Very salty water is at depth and away from the recharge zones. Highly mineralized water leaks into these aquifers from older and younger marine sediments above and below the sandstone aquifers. Some irrigation water is pumped from the valley fill in the larger river valleys. It has a higher salt content than the river water but otherwise is very similar in quality. Seepage of salty water from the adjacent rocks containing soluble salts can increase the sodium sulfate content, which limits the use of the valley fill water.

Soils

The dominant soil orders in this MLRA are Alfisols, Inceptisols, Mollisols, Entisols, and Aridisols. The soil moisture regime is mainly ustic, but an aridic regime that is marginal to ustic occurs in some areas. The soil temperature regime is mesic or frigid. Mineralogy is dominantly mixed or smectitic. In the warmer areas, shallow Ustorthents (Menefee series) formed in residuum on shale hills and mesas. Shallow Torriorthents (Rizno series) formed in material weathered from sandstone on mesas and cuestas. Very deep, loamy Haplargids (Penistaja series) and Haplustalfs (Alire) formed in alluvium derived from sandstone, shale, or granite on mesas or fan remnants. Very deep, clayey Haplustepts (Roques series) formed in alluvium derived from shale on valley sides. Very deep, silty Haplustalfs (Cahona and Wetherill series) formed in eolian material on hills and mesas. In the cooler areas, very deep, clayey Haplustalfs (Goldbug series) formed in slope alluvium derived from sandstone and

shale on hills and mesas. Shallow Argiustolls (Fivepine series) formed in slope alluvium and residuum derived from sandstone. Moderately deep Argiustolls (Nortez series) formed in eolian material derived from sandstone on hills and mesas.

Biological Resources

The vegetation is Sagebrush semidesert at the lower elevations. Pinyon-juniper woodland and ponderosa pine forests are at mid elevations. Some common plants are Wyoming big sagebrush, western wheatgrass, galleta, needleandthread, and blue grama at the lower elevations; twoneedle pinyon, Utah juniper, Indian ricegrass, mountain mahogany, ponderosa pine, Gambel oak, Arizona fescue, and muttongrass at mid elevations; and Rocky Mountain Douglasfir, white fir, mountain muhly, common snowberry, Parry's oatgrass, and mountain brome at the higher elevations. Some of the major wildlife species in this area are mule deer, elk, coyote, black bear, mountain lion, black-tailed jackrabbit, Gunnison's prairie dog, badger, piñon jay, black-billed magpie, mountain chickadee, red-breasted nuthatch, white-breasted nuthatch, collared lizard, fence lizard, and western rattlesnake. Reservoirs and rivers provide most of the fish habitat in this area. The ones at the higher elevations have cold-water species, such as rainbow trout and brown trout, and the ones at the lower elevations may have warm-water species, such as bass, bluegill, crappie, and catfish.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 3%
Grassland—private, 41%; Federal, 39%
Forest—private, 7%; Federal, 5%
Urban development—private, 2%
Other—private, 3%

Nearly all of this area supports natural vegetation and is used as grazing land or forestland. Cropland also is a significant land use. Where irrigation water is available, irrigated crops, such as wheat, barley, beans, oats, alfalfa, and hay, are grown. An area in Colorado and Utah is used as nonirrigated cropland. The major crops grown on this nonirrigated cropland are beans and winter wheat. The pinyon-juniper woodlands are a source of fuel wood. At the higher elevations, commercial timber is harvested, principally ponderosa pine and Rocky Mountain Douglas-fir. Some urban development is occurring in the vicinity of Santa Fe. The major soil resource concerns are wind erosion, water erosion, maintenance of the productivity of the soils, and management of soil moisture. Conservation practices on cropland generally include crop residue management, minimum tillage, and irrigation water management. Proper grazing use is a concern on grazing lands. The primary concerns in timbered areas are controlling erosion along roads and skid trails and minimizing surface compaction during timber harvesting.

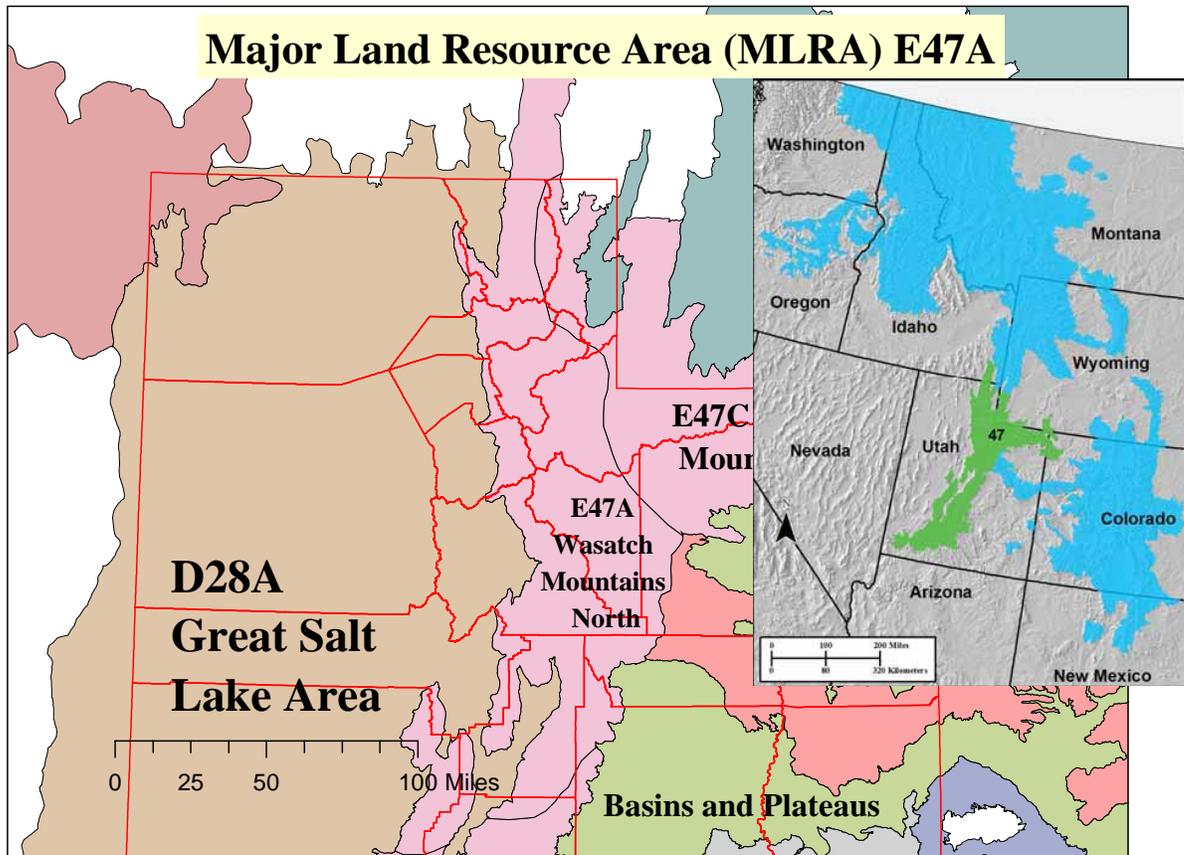
MLRA 47XA - Wasatch Mountains - North

MLRA 47XA - Wasatch Mountains - North

Ecological Zone	Upland*	Mountain*	High Mountain	Subalpine	Alpine
Precipitation (inches)	12-16	16-22	22-40	>35	>35
Elevation	4,300-7,000	5,200-8,600	6,000-9,400	8,000-10,000	>10,000
Soil Moisture Regime	Typic Xeric	Typic Xeric	Udic	Udic	Udic
Soil Temp Regime	Mesic	Frigid	Cryic	Cryic	Cryic
Freeze free Days	100-130	85-110	50-100	20-35	5
Notes	P. and J. present. Pinyon is typically more dominant	Oak and Maple	Aspen and White Fir	Subalpine Fir, Engelmann Spruce	Above Timberline

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



47XA—Wasatch Mountains North

Coalville, Heber City, Park City, Utah, and Evanston, Wyoming, are in this MLRA. Interstate 80 crosses this area. This MLRA includes numerous wilderness study areas. It has numerous national forests, including the Ashley, Caribou, Fishlake, Manti-LaSal, Uinta, and Wasatch-Cache National Forests.

Physiography

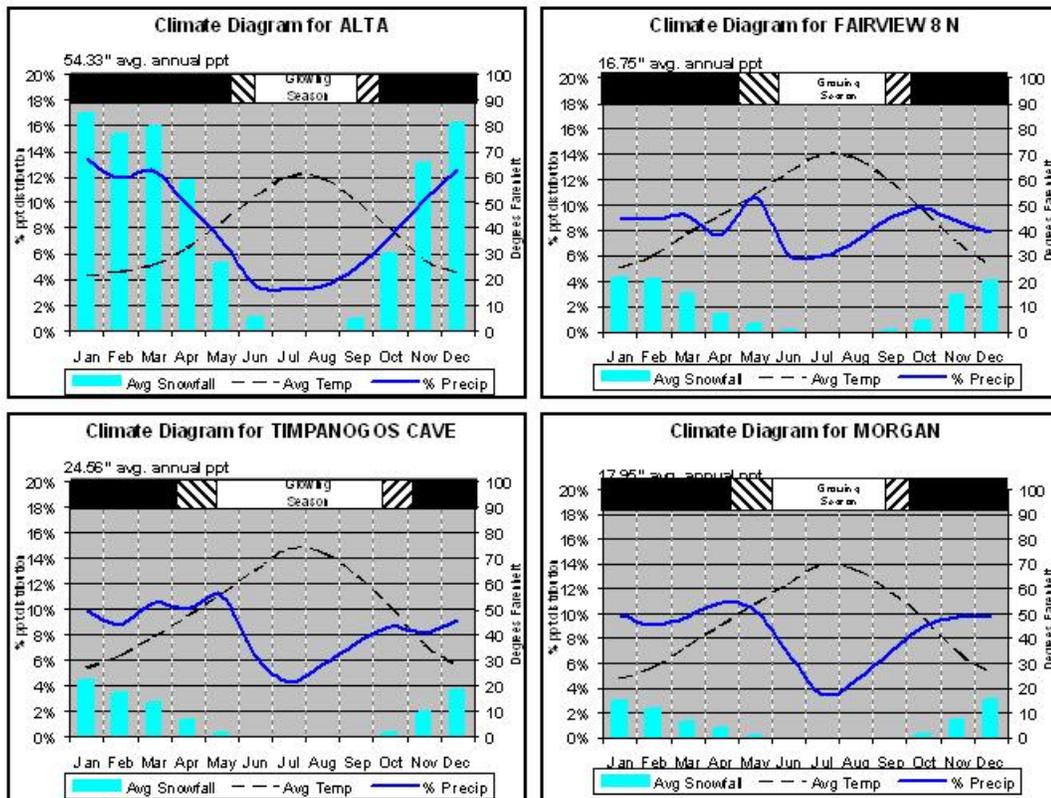
This area is in the Middle Rocky Mountains Province of the Rocky Mountain System. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. Some of mountain areas that are above 7,500 feet (2,285 meters) and all of the areas above 10,000 feet (3,050 meters) have been subject to alpine or mountain glaciation. There are arêtes, horns, cirques, all types of moraines, and outwash features. The Wasatch Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters). The extent of the major Hydrologic Unit Areas that make up E47 as a whole (including E47XA, E47XB, and E47XC) are as follows: Escalante Desert-Sevier Lake (1603), 25 percent; Great Salt Lake (1602), 18 percent; Lower Green (1406), 18 percent; Bear (1601), 13 percent; Great Divide-Upper Green (1404), 11 percent; Upper Colorado-Dirty Devil (1407), 9 percent; Lower Colorado-Lake Mead (1501), 4 percent; and White-Yampa (1405), 2 percent. The Weber and Provo Rivers run through this area.

Geology

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifer and are significant sources of sand and gravel for construction. An ancient shoreline of historic Lake Bonneville is evident on the foothslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments. Younger igneous rocks (ash and lava) are throughout the area.

Climate

The average annual precipitation in most of this area is 15 to 30 inches (380 to 760 millimeters). It can be as much as 73 inches (1,855 millimeters) at the higher elevations. Peak precipitation occurs in the winter months. The higher elevations receive significant amounts of snowfall each year. The average annual temperature is 30 to 58 degrees F (-1 to 15 degrees C). The frost-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.



Water

Following are the estimated withdrawals of freshwater by use in E47 as a whole (including E47XA, E47XB, and E47XC):

Public supply—surface water, 0.1%; ground water, 0.1%

Livestock—surface water, 4.1%; ground water, 1.0%

Irrigation—surface water, 69.7%; ground water, 17.4%

Other—surface water, 3.7%; ground water, 4.0%

The total withdrawals average 380 million gallons per day (1,440 million liters per day). About 22 percent is from ground water sources, and 78 percent is from surface water sources. Streams, lakes, and ground water supply enough water for the grazing and forestry enterprises in most of the area. Reservoirs in the mountains of this area store water for downstream use. The mountain water is of excellent quality. Perennial streams from the Wasatch Mountains in this area provide irrigation and municipal and industrial water for most of the population in Utah. Ground water in this area is primarily in the unconsolidated deposits of sand and gravel filling the major river valleys in the interior of the area and similar deposits filling the basins on the western edge of the area. Water from these aquifers is very hard but typically contains less than 1,000 parts per million (milligrams per liter) total dissolved solids. Low levels of salts occur in the ground water closest to the recharge areas along the base of the mountains, while briny water occurs in the deeper parts of these deposits.

Soils

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime on plateaus and the lower mountain slopes and a cryic soil temperature regime at the higher elevations. They have a mesic soil temperature regime at the lowest elevations, on south-facing slopes. The soil moisture regime is typically xeric. Mineralogy is typically mixed. The soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal. Haplocalcids formed in mixed residuum and alluvium on mesas, fan aprons, terraces, and plateaus (Langspring and Teagulf series) and in mixed alluvium and colluvium on fans, terraces, and toeslopes (Bruman series). Calcigypsis (Rogrube series) formed in mixed loess and residuum on plateaus. Torriorthents formed in residuum, in some areas mixed with colluvium, on hills, mesas, cuestas, plateaus, and pediments (Atchee, Blazon, Delphill, Haterton, Huguston, and Moyerson series) and in alluvium on alluvial fans and valley floors (Sagers, Alldown, and Tebbs series). Dystrocrypts (Mirror Lake series) formed in till on moraines. Calcicustepts (Rentsac series) formed in colluvium over residuum on mountains, hills, and plains. Haploxerolls (Agassiz series) and Argicryolls (Dranyon series) formed in residuum on mountains. Palexerolls (Borvant series) and Argixerolls (Ant Flat, Henefer, and Yeates Hollow series) formed in alluvium or colluvium on fan terraces, piedmonts, and hills. Palecryolls (Lucky Star series) formed in till, residuum, or colluvium on mountains and moraines.

Biological Resources

This area supports conifer, aspen, grass, mountain shrub, and Sagebrush steppe vegetation. The composition of the vegetation varies with elevation. The zone above an elevation of about 13,000 feet (3,965 meters) supports alpine meadow. Coniferous forests of Engelmann spruce, white fir, subalpine fir, and Rocky Mountain Douglas-fir dominate the mid to high elevations. The most common understory plants in these forests are Oregongrape, myrtle pachystima, and heartleaf arnica. Forests of quaking aspen commonly have an understory that includes blue wildrye, mountain brome, Fendler meadowrue, and aspen peavine. Bluebunch wheatgrass, bearded wheatgrass, blue wildrye, mountain brome, and numerous forbs grow in the understory in areas of Gambel oak, curl-leaf and birchleaf mountain mahogany, snowberry, and serviceberry. Big sagebrush and bluebunch wheatgrass are the dominant species in the sagebrush steppe plant communities that are common at the lowest elevations. Some of the major wildlife species in this area are moose, elk, mule deer, coyote, red fox, bobcat, beaver, porcupine, snowshoe hare, jackrabbit, turkey, sage grouse, chukar, sharp-tailed grouse, gray partridge, ruffed grouse, and blue grouse. The species of fish in the area include rainbow trout, brown trout, brook trout, cutthroat trout, catfish, and sucker.

Land Use

Following are the various kinds of land use in E47 as a whole (including E47XA, E47XB, and E47XC):

Cropland—private, 2%
Grassland—private, 25%; Federal, 35%
Forest—private, 7%; Federal, 25%
Urban development—private, 1%
Water—private, 1%; Federal, 1%
Other—private, 1%; Federal, 2%

Less than one-third of this area is in farms and ranches. The rest of the area generally is Federally owned. Grassland and woodland are grazed in summer. Some dense forests are on moist sites. Recreation and mining are important land uses. A few valleys are irrigated. Forage for livestock is the main crop. The major soil resource concerns are wind erosion, water erosion, maintenance of the productivity of the soils, and maintenance of the quality of surface water. Maintaining a vegetative cover, maintaining the content of organic matter, and preventing excessive compaction are important. Mass movement of the soils also is a concern. Proper grazing use is a concern on grazing lands. In timbered areas, the primary concerns during timber harvesting are controlling erosion along roads and skid trails and minimizing the compaction caused by harvesting equipment. Conservation practices on rangeland generally include brush management, rangeland seeding, prescribed grazing, prescribed burning, fencing, and development of watering facilities. Conservation practices on dry-farmed cropland include terraces, sediment-control basins, summer fallow tillage, crop residue management, and pest management. Conservation practices on irrigated cropland and hayland include irrigation system improvement, irrigation water management, conservation tillage, crop rotation, crop residue management, forage harvest management, and nutrient management. Conservation practices on irrigated pasture include irrigation system improvement, irrigation water management, pasture planting, development of watering facilities, fencing, prescribed grazing, and nutrient management.

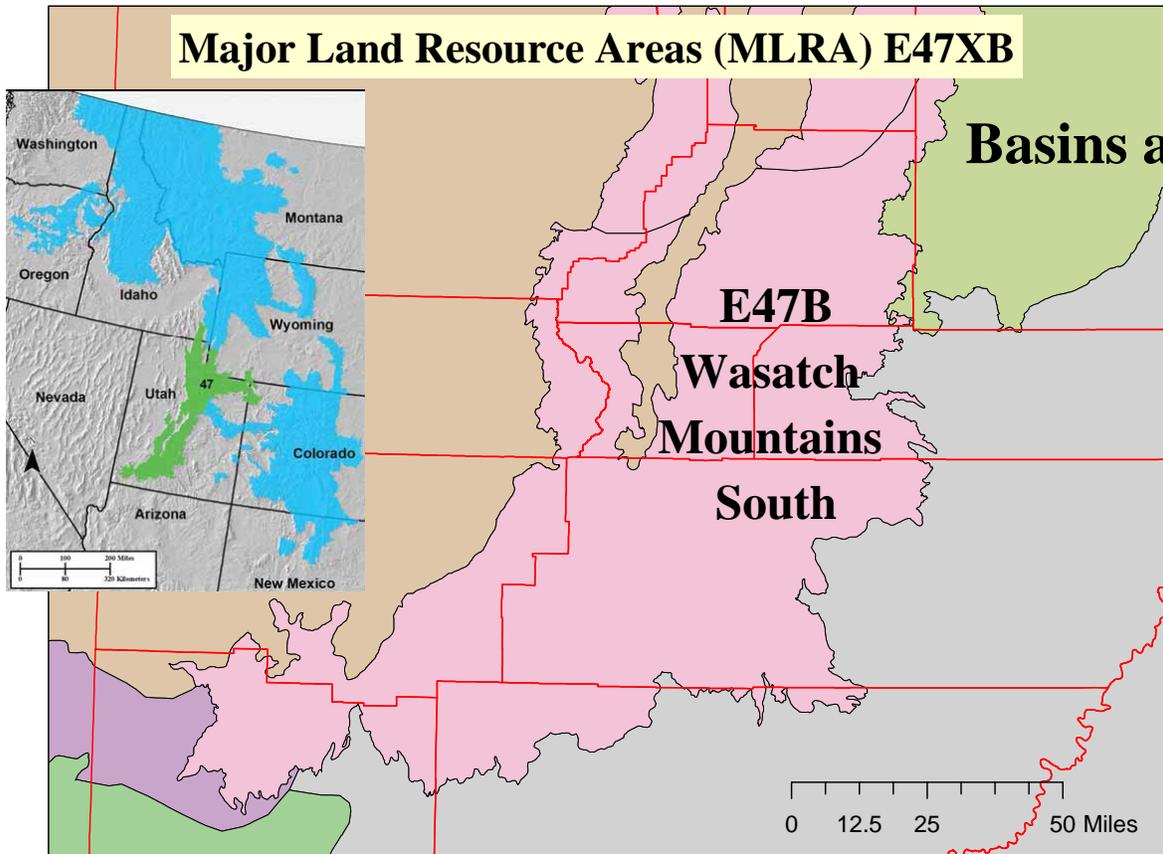
MLRA 47XB - Wasatch Mountains South

MLRA 47XB - Wasatch Mountains South

Ecological Zone	Semidesert*	Upland*	Mountain	High Mountain	Subalpine	Alpine
Precipitation (inches)	9-14	12-16	16-22	22-40	>25 in	>25 in
Elevation	5,000- 7,000	6,800 -8,500	Not Written	Not Written	Not Written	Not Written
Soil Moisture Regime	Ustic Aridic	Ustic	Ustic	Ustic	Ustic	Ustic
Soil Temp Regime	Frigid	Frigid	Frigid	Cryic	Cryic	Cryic
Freeze free Days	70-100	70-100				
Notes	Dominated by the many sagebrushes Black sagebrush	Start to get Pinyon and Juniper stands	Oak and Maple	Aspen, Ponderosa Pine	Subalpine Fir, Engelmann Spruce	Above Timberline

*the aspect (north or south) can greatly influence site characteristics.

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



47XB—Wasatch Mountains South

Loa, Panguitch, and New Harmony, Utah are in this MLRA. Interstate 70 crosses this area. Most of Zion and Bryce Canyon National Parks and Cedar Breaks National Monument are in this area. This MLRA includes

numerous wilderness study areas. It has numerous national forests, including the Ashley, Dixie, Fishlake, and Manti-LaSal National Forests. Most of the Paiute Indian Reservation is in the area.

Physiography

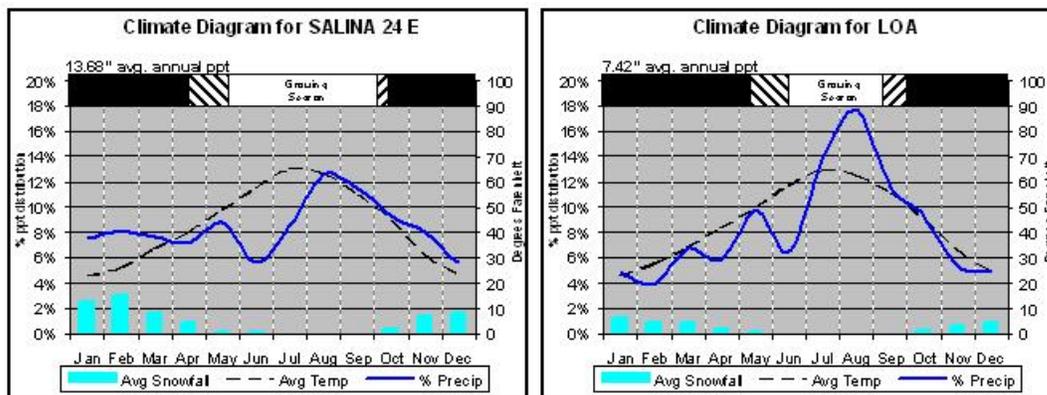
This area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. Some of mountain areas that are above 7,500 feet (2,285 meters) and all of the areas above 10,000 feet (3,050 meters) have been subject to alpine or mountain glaciation. There are arêtes, horns, cirques, all types of moraines, and outwash features. There are rolling mountains and thrust-faulted plateaus that are broad, gently sloping surfaces with steep side slopes that have deep canyons cut into them. The Wasatch Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters). The extent of the major Hydrologic Unit Areas that make up E47 as a whole (including E47XA, E47XB, and E47XC) are as follows: Escalante Desert-Sevier Lake (1603), 25 percent; Great Salt Lake (1602), 18 percent; Lower Green (1406), 18 percent; Bear (1601), 13 percent; Great Divide- Upper Green (1404), 11 percent; Upper Colorado-Dirty Devil (1407), 9 percent; Lower Colorado-Lake Mead (1501), 4 percent; and White-Yampa (1405), 2 percent. The headwaters of the Virgin River are in this area.

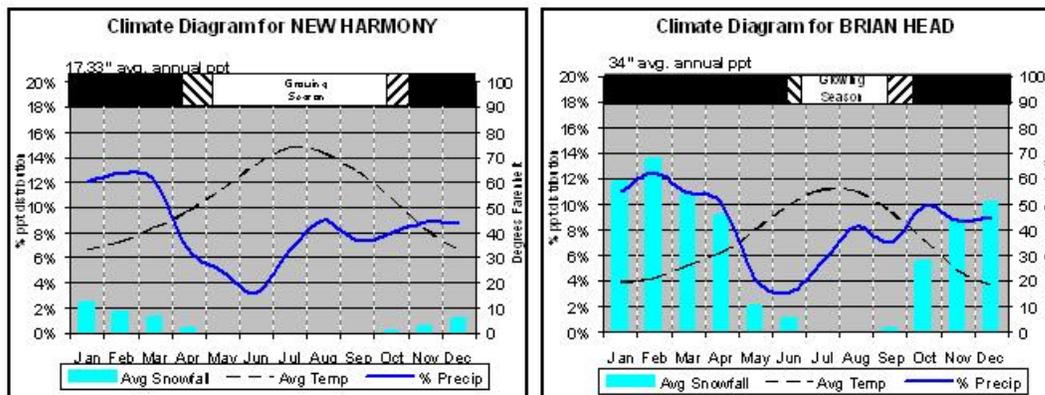
Geology

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifer and are significant sources of sand and gravel for construction. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments. Younger igneous rocks (ash and lava) are throughout the area. Lava-capped mesas are common. These southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks. Eroded volcanic cones are in the southwestern part of the MLRA.

Climate

The average annual precipitation in most of this area is 15 to 30 inches (380 to 760 millimeters). In some valleys between mountain ranges it is 6 to 10 inches (150 to 255 millimeters). It is 10 to 15 inches (255 to 380 millimeters) in some of the MLRA. It can be as much as 73 inches (1,855 millimeters) at the highest elevations. There is a frequent incidence of high-intensity summer thunderstorms; hence, a significant amount of the precipitation occurs during summer. The higher elevations receive significant amounts of snowfall each year. The average annual temperature is 30 to 58 degrees F (-1 to 15 degrees C). The frost-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.





Water

Following are the estimated withdrawals of freshwater by use in E47 as a whole (including E47XA, E47XB, and E47XC):

Public supply—surface water, 0.1%; ground water, 0.1%

Livestock—surface water, 4.1%; ground water, 1.0%

Irrigation—surface water, 69.7%; ground water, 17.4%

Other—surface water, 3.7%; ground water, 4.0%

The total withdrawals average 380 million gallons per day (1,440 million liters per day). About 22 percent is from ground water sources, and 78 percent is from surface water sources. Streams, lakes, and ground water supply enough water for the grazing and forestry enterprises in most of the area. Reservoirs in the mountains of this area store water for downstream use. The mountain water is of excellent quality. Perennial streams from the Wasatch Mountains in this area provide irrigation and municipal and industrial water for most of the population in Utah. The Sevier River provides irrigation water away from the population centers. Almost 99 percent of the flow within the Sevier River basin is used for irrigation and some public supply. Salinity in irrigation return flows is a problem in the rivers in the area. Ground water in this area is primarily in the unconsolidated deposits of sand and gravel filling the major river valleys in the interior of the area and similar deposits filling the basins on the western edge of the area. Water from these aquifers is very hard but typically contains less than 1,000 parts per million (milligrams per liter) total dissolved solids. Low levels of salts occur in the ground water closest to the recharge areas along the base of the mountains, while briny water occurs in the deeper parts of these deposits.

Soils

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime on plateaus and the lower mountain slopes and a cryic soil temperature regime at the higher elevations. They have a mesic soil temperature regime at the lowest elevations, on south-facing slopes, and in some of the valleys. The soil moisture regime is xeric to ustic in the eastern and southern parts. Mineralogy is typically mixed. The soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal. Haplocalcids formed in mixed residuum and alluvium on mesas, fan aprons, terraces, and plateaus (Langspring and Teagulf series) and in mixed alluvium and colluvium on fans, terraces, and toeslopes (Bruman series). Calcigypsid (Rogrube series) formed in mixed loess and residuum on plateaus. Torriorthents formed in residuum, in some areas mixed with colluvium, on hills, mesas, cuetas, plateaus, and pediments (Atchee, Blazon, Delphill, Haterton, Huguston, and Moyerson series) and in alluvium on alluvial fans and valley floors (Sagers, Alldown, and Tebbs series). Dystrocrypts (Mirror Lake series) formed in till on moraines. Calcustepts (Rentsac series) formed in colluvium over residuum on mountains, hills, and plains. Haploxerolls (Agassiz series) and Argicryolls (Dranyon series) formed in residuum on mountains. Palexerolls (Borvant series) and Argixerolls (Ant Flat, Henefer, and Yeates Hollow series) formed in alluvium or colluvium on fan terraces, piedmonts, and hills. Palecryolls (Lucky Star series) formed in till, residuum, or colluvium on mountains and moraines.

Biological Resources

This area supports conifer, aspen, grass, mountain shrub, and sagebrush-grass vegetation. The composition of the vegetation varies with elevation. The zone above an elevation of about 13,000 feet (3,965 meters) supports alpine meadow. Coniferous forests of Engelmann spruce, white fir, subalpine fir, and Rocky Mountain Douglas-fir dominate the mid to high elevations. The most common understory plants in these forests are Oregon grape, myrtle pachystima, and heartleaf arnica. This part of the Wasatch Mountains includes significant amounts of ponderosa pine. Forests of quaking aspen commonly have an understory that includes blue wildrye, mountain brome, Fendler meadowrue, and aspen peavine. Bluebunch wheatgrass, bearded wheatgrass, blue wildrye, mountain brome, and numerous forbs grow in the understory in areas of Gambel oak, curl-leaf and birchleaf mountain mahogany, snowberry, and serviceberry. Big sagebrush and bluebunch wheatgrass are the dominant species in the sagebrush steppe plant communities that are common at the lowest elevations. The abundance of warm-season herbaceous species increases significantly in the southern part of the MLRA. Some of the major wildlife species in this area are moose, elk, mule deer, coyote, red fox, bobcat, beaver, porcupine, snowshoe hare, jackrabbit, sage grouse, chukar, sharp-tailed grouse, gray partridge, turkey, ruffed grouse, and blue grouse. The species of fish in the area include rainbow trout, brown trout, brook trout, cutthroat trout, catfish, and sucker.

Land Use

Following are the various kinds of land use in E47 as a whole (including E47XA, E47XB, and E47XC):

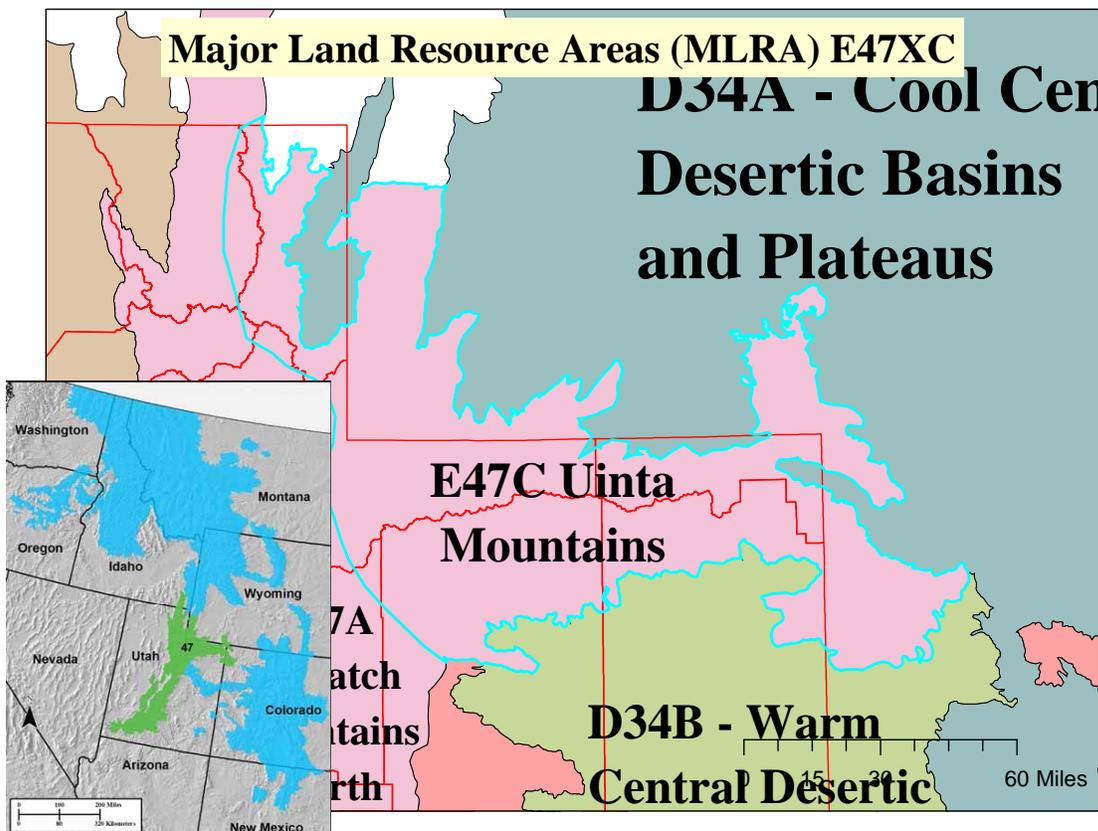
Cropland—private, 2%
Grassland—private, 25%; Federal, 35%
Forest—private, 7%; Federal, 25%
Urban development—private, 1%
Water—private, 1%; Federal, 1%
Other—private, 1%; Federal, 2%

Less than one-third of this area is in farms and ranches. The rest of the area generally is Federally owned. Grassland and woodland are grazed in summer. Some dense forests are on moist sites. Recreation and mining are important land uses. A few valleys are irrigated. Forage for livestock is the main crop. The major soil resource concerns are wind erosion, water erosion, maintenance of the productivity of the soils, and maintenance of the quality of surface water. Maintaining a vegetative cover, maintaining the content of organic matter, and preventing excessive compaction are important. Mass movement of the soils also is a concern. Proper grazing use is a concern on grazing lands. In timbered areas, the primary concerns during timber harvesting are controlling erosion along roads and skid trails and minimizing the compaction caused by harvesting equipment. Conservation practices on rangeland generally include brush management, rangeland seeding, prescribed grazing, prescribed burning, fencing, and development of watering facilities. Conservation practices on dry-farmed cropland include terraces, sediment-control basins, summer fallow tillage, crop residue management, and pest management. Conservation practices on irrigated cropland and hayland include irrigation system improvement, irrigation water management, conservation tillage, crop rotation, crop residue management, forage harvest management, and nutrient management. Conservation practices on irrigated pasture include irrigation system improvement, irrigation water management, pasture planting, development of watering facilities, fencing, prescribed grazing, and nutrient management.

MLRA 47XC - Uinta Mountains

MLRA 47XC - Uinta Mountains

Ecological Zone	Upland	Mountain	High Mountain	Subalpine	Alpine
Precipitation (inches)	10-16	14-25	22-40	>35	>35
Elevation	6,000-8,500	6,000 9,500	Not Written		
Soil Moisture Regime	Ustic Aridic	Typic Xeric			
Soil Temp Regime	Frigid	Cryic	Cryic	Cryic	Cryic
Freeze free Days	90-110	60-90			
Notes	Pinyon, Juniper 500-900 lbs/ac	Browse, mountain sagebrush. 1,300 -1,900 lbs/ac	Aspen	Subalpine Fir, Engelmann Spruce	Above Timberline
*the aspect (north or south) can greatly influence site characteristics.					
All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.					



47XC—Uinta Mountains

Evanston, Wyoming, and Hanna, and Tabiona, Utah are in this MLRA. This MLRA includes the Uinta Wilderness. It has numerous national forests, including the Uinta and Wasatch-Cache National Forests. The northern part of the Uinta-Ourray Indian Reservation and the southern part of the Flaming Gorge National Recreation Area in Utah are in this area.

Physiography

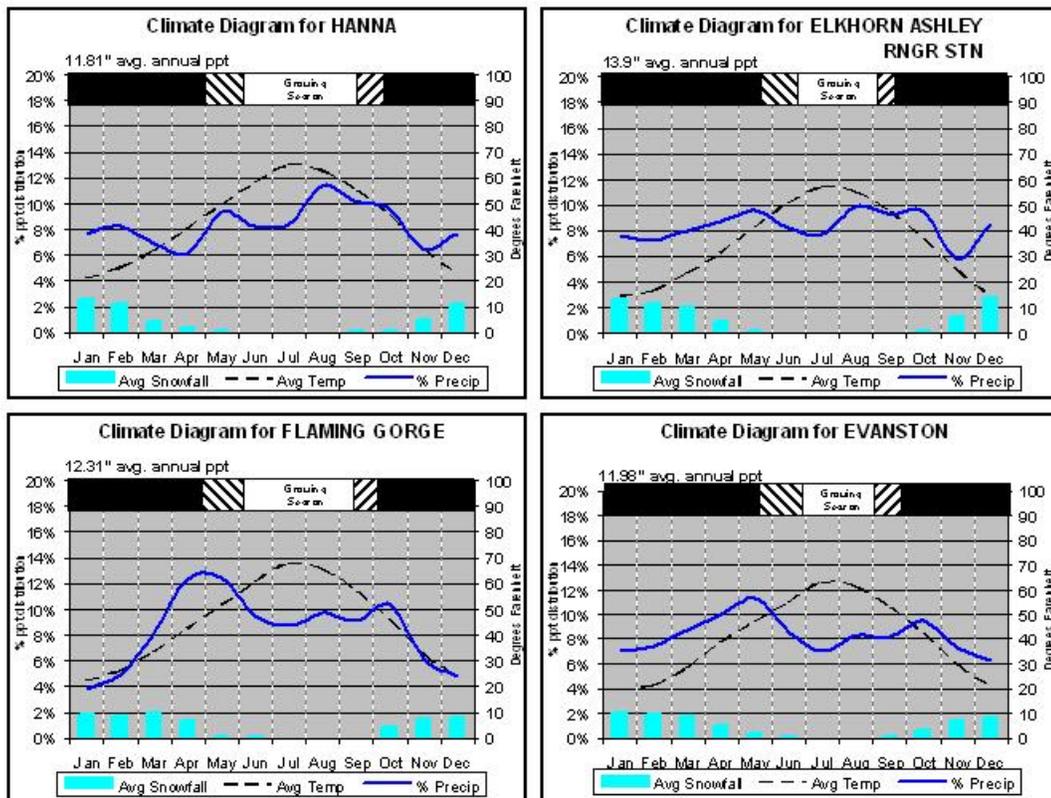
This area is in the Middle Rocky Mountains Province of the Rocky Mountain System. This MLRA includes the Uinta Mountains, which trend east and west. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongate shape. Structurally, they consist of a broadly folded anticline that has an erosion resistant quartzite core. Some of mountain areas that are above 7,500 feet (2,285 meters) and all of the areas above 10,000 feet (3,050 meters) have been subject to alpine or mountain glaciation. There are arêtes, horns, cirques, all types of moraines, and outwash features. The Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters). The extent of the major Hydrologic Unit Areas that make up E47 as a whole (including E47XA, E47XB, and E47XC) are as follows: Escalante Desert-Sevier Lake (1603), 25 percent; Great Salt Lake (1602), 18 percent; Lower Green (1406), 18 percent; Bear (1601), 13 percent; Great Divide- Upper Green (1404), 11 percent; Upper Colorado-Dirty Devil (1407), 9 percent; Lower Colorado-Lake Mead (1501), 4 percent; and White-Yampa (1405), 2 percent. The Duchesne River and many other tributaries to the Green River run through this MLRA. The headwaters of the Bear River are in this MLRA.

Geology

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifer and are significant sources of sand and gravel for construction. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, and Precambrian rocks are exposed in the Uinta Mountains. Younger igneous rocks (ash and lava) are throughout the area. Lava-capped mesas are common in the southern part of the area.

Climate

The average annual precipitation in most of this area is 15 to 30 inches (380 to 760 millimeters). It is 10 to 15 inches (255 to 380 millimeters) in some areas of Colorado and Wyoming. It can be as much as 73 inches (1,855 millimeters) at the highest elevations. The southern and eastern parts have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of the precipitation occurs during summer. The higher elevations receive significant amounts of snowfall each year. The average annual temperature is 30 to 58 degrees F (-1 to 15 degrees C). The frost-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.



Water

Following are the estimated withdrawals of freshwater by use in E47 as a whole (including E47XA, E47XB, and E47XC):

Public supply—surface water, 0.1%; ground water, 0.1%

Livestock—surface water, 4.1%; ground water, 1.0%

Irrigation—surface water, 69.7%; ground water, 17.4%

Other—surface water, 3.7%; ground water, 4.0%

The total withdrawals average 380 million gallons per day (1,440 million liters per day). About 22 percent is from ground water sources, and 78 percent is from surface water sources. Streams, lakes, and ground water supply enough water for the grazing and forestry enterprises in most of the area. Reservoirs in the mountains of this area store water for downstream use. The mountain water is of excellent quality. Perennial streams from the Wasatch Mountains in this area provide irrigation and municipal and industrial water for most of the population in Utah. The Green and Sevier Rivers provide irrigation water away from the population centers. Almost 99 percent of the flow within the Sevier River basin in the southern end and middle of this MLRA is used for irrigation and some public supply. Salinity in irrigation return flows is a problem in the rivers in the southern part of the area. Ground water in this area is primarily in the unconsolidated deposits of sand and gravel filling the major river valleys in the interior of the area and similar deposits filling the basins on the western edge of the area. Water from these aquifers is very hard but typically contains less than 1,000 parts per million (milligrams per liter) total dissolved solids. Low levels of salts occur in the ground water closest to the recharge areas along the base of the mountains, while briny water occurs in the deeper parts of these deposits.

Soils

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime on the lower mountain slopes and a cryic soil temperature regime at the higher elevations. They have a mesic soil temperature regime at the lowest elevations, and on south-facing slopes. The soil moisture regime is typically xeric. Mineralogy is typically mixed. The soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal. Haplocalcids formed in mixed residuum and alluvium on mesas, fan aprons, terraces, and plateaus (Langspring and Teagulf series) and in mixed alluvium and colluvium on fans, terraces, and toeslopes (Bruman series). Calcigypsid (Rogrube series) formed in mixed loess and residuum on plateaus. Torriorthents formed in residuum, in some areas mixed with colluvium, on hills, mesas, cuestas, plateaus, and pediments (Atchee, Blazon, Delphill, Haterton, Huguston, and Moyerson series) and in alluvium on alluvial fans and valley floors (Sagers, Alldown, and Tebbs series). Dystrocrypts (Mirror Lake series) formed in till on moraines. Calciustepts (Rentsac series) formed in colluvium over residuum on mountains, hills, and plains. Haploxerolls (Agassiz series) and Argicryolls (Dranyon series) formed in residuum on mountains. Palexerolls (Borvant series) and Argixerolls (Ant Flat, Henefer, and Yeates Hollow series) formed in alluvium or colluvium on fan terraces, piedmonts, and hills. Palecryolls (Lucky Star series) formed in till, residuum, or colluvium on mountains and moraines.

Biological Resources

This area supports conifer, aspen, grass, mountain shrub, and sagebrush-grass vegetation. The composition of the vegetation varies with elevation. The zone above an elevation of about 13,000 feet (3,965 meters) supports alpine meadow. Coniferous forests of Engelmann spruce, white fir, subalpine fir, and Rocky Mountain Douglas-fir dominate the mid to high elevations. The most common understory plants in these forests are Oregongrape, myrtle pachystima, and heartleaf arnica. The part of the MLRA in the Uintah Mountains includes significant amounts of lodgepole pine, and the southern part of the Wasatch Mountains includes significant amounts of ponderosa pine. Forests of quaking aspen commonly have an understory that includes blue wildrye, mountain brome, Fendler meadowrue, and aspen peavine. Bluebunch wheatgrass, bearded wheatgrass, blue wildrye, mountain brome, and numerous forbs grow in the understory in areas of Gambel oak, curl-leaf and birchleaf mountain mahogany, snowberry, and serviceberry. Big sagebrush and bluebunch wheatgrass are the dominant species in the sagebrush-grass plant communities that are common at the lowest elevations. The abundance of warm-season herbaceous species increases significantly in the southern part of the MLRA. Some of the major wildlife species in this area are moose, elk, mule deer, bighorn sheep, Rocky Mountain goat, coyote, red fox, bobcat, beaver, porcupine, snowshoe hare, jackrabbit, sage grouse, chukar, sharp-tailed grouse, gray partridge, ruffed grouse, and blue grouse. The species of fish in the area include rainbow trout, brown trout, brook trout, cutthroat trout, catfish, and sucker.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 2%

Grassland—private, 25%; Federal, 35%

Forest—private, 7%; Federal, 25%

Urban development—private, 1%

Water—private, 1%; Federal, 1%

Other—private, 1%; Federal, 2%

Less than one-third of this area is in farms and ranches. The rest of the area generally is Federally owned.

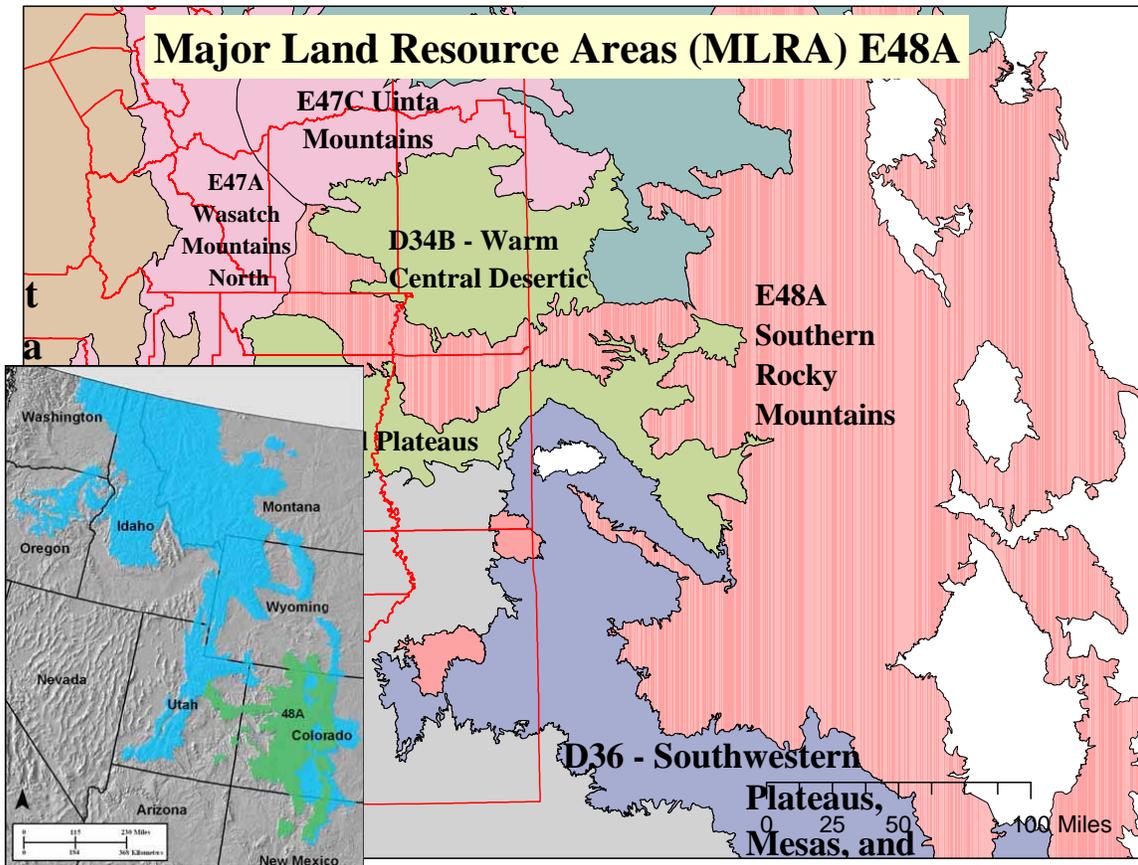
Grassland and woodland are grazed in summer. Some dense forests are on moist sites. Recreation and mining are important land uses. A few valleys are irrigated. Forage for livestock is the main crop. The major soil resource concerns are wind erosion, water erosion, maintenance of the productivity of the soils, and maintenance of the quality of surface water. Maintaining a vegetative cover, maintaining the content of organic matter, and preventing excessive compaction are important. Mass movement of the soils also is a concern. Proper grazing use is a concern on grazing lands. In timbered areas, the primary concerns during timber harvesting are controlling erosion along roads and skid trails and minimizing the compaction caused by harvesting equipment. Conservation practices on rangeland generally include brush management, rangeland seeding, prescribed grazing, prescribed burning, fencing, and development of watering facilities. Conservation practices on dry-farmed cropland include terraces, sediment-control basins, summer fallow tillage, crop residue management, and pest management. Conservation practices on irrigated cropland and hayland include irrigation system improvement, irrigation water management, conservation tillage, crop rotation, crop residue management, forage harvest management, and nutrient management. Conservation practices on irrigated pasture include irrigation system improvement, irrigation water management, pasture planting, development of watering facilities, fencing, prescribed grazing, and nutrient management.

MLRA 48A - Southern Rocky Mountains

MLRA 48A - Southern Rocky Mountains (Utah portion)

Ecological Zone	Upland	Mountain	High Mountain	Subalpine	Alpine
Precipitation inches		16-22	20-30	>25	
Elevation	NONE	7,000 – 9,000	7,000-10,000		
Soil Moisture Regime		Typic Xeric	Udic		
Soil Temp Regime		Frigid	Cryic		
Freeze free Days		60-100	40-60		
Notes		Oak and browse 900 -1,400 lbs/ac	Aspen, Thurber's fescue 2,400 – 2,500 lbs/ac	Subalpine fir, Engelmann spruce	Above Timberline

All values in this table are approximate and should be used as guidelines. Different combinations of temperature, precipitation and soil type can place an ecological site into different zones.



48A—Southern Rocky Mountains

This area (shown in fig. 48A-1) is in Colorado (76 percent), New Mexico (11 percent), Utah (8 percent), and Wyoming (5 percent). It makes up about 45,920 square miles (119,000 square kilometers). The towns of Steamboat Springs, Glenwood Springs, Aspen, Leadville, and Gunnison, Colorado, are in this MLRA. Interstate 70 crosses the northern half of the area. This MLRA has numerous national forests, including the Medicine Bow

National Forest in Wyoming; the Routt, Roosevelt, San Isabel, Gunnison, Uncompahgre, Rio Grande, San Juan, and Santa Fe National Forests in Colorado; and the Carson National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA. The Pole Mountain Military Reservation is in the Medicine Bow National Forest. The Taos Indian Reservation is in the part of this area in New Mexico. The Black Canyon of the Gunnison National Monument and the Curecanti National Recreation Area are directly west of Gunnison, Colorado, in this area.

Physiography

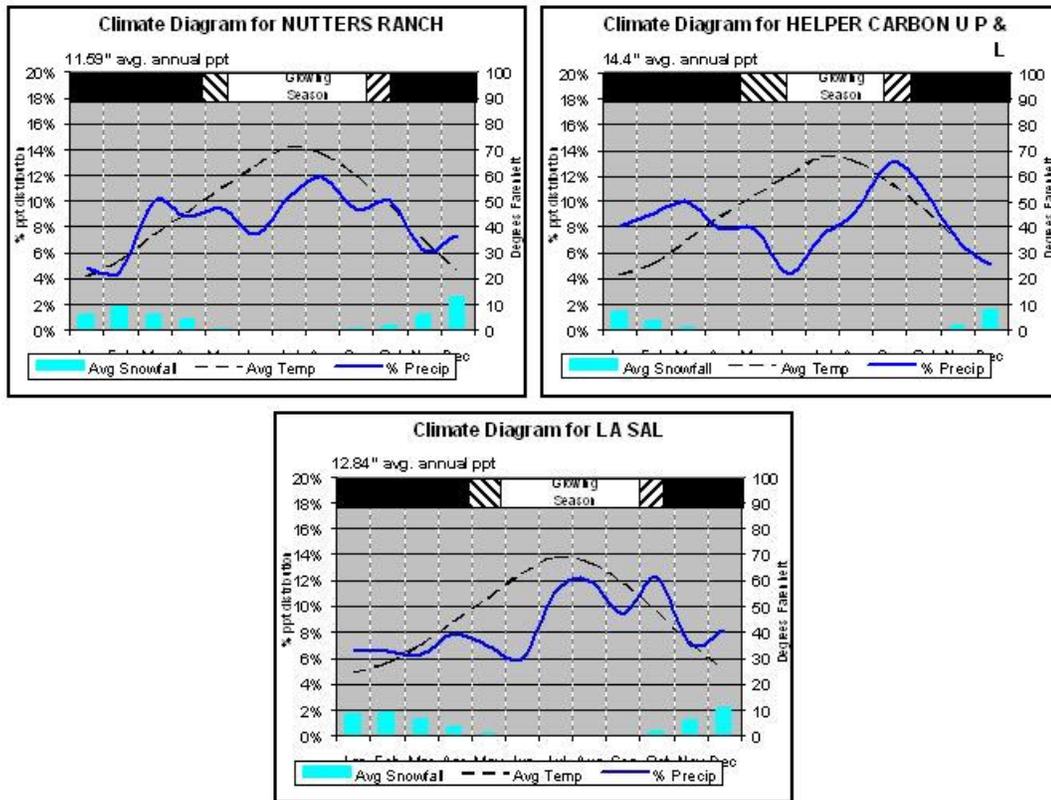
Most of this area is in the Southern Rocky Mountains Province of the Rocky Mountain System. The western extension of the MLRA into Utah is in the Uinta Basin Section of the Colorado Plateaus Province of the Intermontane Plateaus. Small parts of the southwest corner and some isolated areas farther west are in the Canyon Lands Section of the same province and division. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. High plateaus and steep-walled canyons are fairly common, especially in the west. Elevation typically ranges from 7,550 to 14,100 feet (2,300 to 4,300 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). The extent of the major Hydrologic Unit Areas that make up this MLRA is as follows: Colorado Headwaters (1401), 17 percent; Gunnison (1402), 13 percent; White-Yampa (1405), 11 percent; South Platte (1019), 10 percent; Upper Arkansas (1102), 9 percent; Rio Grande Headwaters (1301), 9 percent; Rio Grande-Elephant Butte (1302), 7 percent; North Platte (1018), 6 percent; Lower Green (1406), 5 percent; San Juan (1408), 5 percent; Upper Colorado-Dolores (1403), 5 percent; and Upper Canadian (1108), 3 percent. The headwaters of many of the major rivers on the High Plains and the Colorado Plateau are in this area. The Continental (or Great) Divide also is in this area. The North and South Platte, Arkansas, and Rio Grande rivers drain toward the Atlantic Ocean, and the Green, Yampa, and Colorado Rivers drain toward the Pacific Ocean. The Rio Grande is a National Wild and Scenic River in northern New Mexico, which is in the southern part of this MLRA.

Geology

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. The Rockies on the east side of this area are called the "Front Range," which is a fault block that has been tilted up on edge and uplifted. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping. The rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but some are Precambrian rocks. Younger igneous rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area. The Rockies were reshaped by glaciation during the pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are significant sources of sand and gravel for construction.

Climate

The average annual precipitation is 15 to 30 inches (380 to 760 millimeters) in the foothills and most of the valleys, 7 to 15 inches (180 to 380 millimeters) in some of the lower valleys on the lee side of the mountain ranges, and 30 to 63 inches (760 to 1,600 millimeters) in the mountains. Rainfall occurs as high-intensity, convective thunderstorms during the growing season, but most of the precipitation falls in winter as snow. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The frost-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation and from south to north.



Water

Following are the estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 8.5%; ground water, 0.0%

Livestock—surface water, 2.7%; ground water, 0.4%

Irrigation—surface water, 77.7%; ground water, 5.6%

Other—surface water, 2.9%; ground water, 2.1%

The total withdrawals average 845 million gallons per day (3,200 million liters per day). About 8 percent is from ground water sources, and 92 percent is from surface water sources. Water from the streams and lakes is abundant and generally of excellent quality. Mining activities result in contamination in some areas. The lower valleys depend on streamflow from this area for irrigation water. Most of the streamflow is from snowmelt, which typically occurs from March to June, so reservoirs or a source of ground water is needed to supply water for irrigation late in the growing season. This area has only two extensive aquifers. One is the unconsolidated to consolidated silt, sand, and gravel of the High Plains and equivalent aquifers in the southern part of Carbon County, Wyoming. The other is the Leadville Limestone aquifer in Colorado. The water from the High Plains aquifer is of good quality, and high-yielding wells are common in areas of this aquifer. The water is used for irrigation, livestock, domestic supply, oil and gas exploration, and mining. It is hard or moderately hard and has a median concentration of about 300 parts per million (milligrams per liter) total dissolved solids. The Leadville Limestone has salty water at depth, but the level of total dissolved solids is generally less than 500 parts per million (milligrams per liter). Because of ample supplies of surface water and the lower quality of this ground water, the Leadville Limestone aquifer has not been extensively developed in this area. Limited quantities of ground water occur in the basin and valley fill sediments in most of the streams and rivers at the lower elevations in this area. These aquifers are directly connected with the streams, so water quality is similar to that in the surface runoff. The water is generally of good quality and is suitable for all uses.

Soils

The dominant soil orders in this area are Alfisols, Entisols, Mollisols, and Inceptisols. The soils in the area generally are moderately deep, stony or very stony, and medium textured and have an ustic or udic soil moisture regime, a cryic soil temperature regime, and mixed mineralogy. Cryoboralfs (Peeler and Frisco series) are on

timbered mountain slopes. Shallow Cryorthents (Crespin and Mine series) are on very steep grass and shrub-covered breaks. Deep and moderately deep Cryoborolls (Woodhall and Carbol series) are on the lower fans and valleys. Cryochrepts and Cryaquepts (Bottle and Vasquez series) and areas of rock outcrop are above timberline.

Biological Resources

This area supports forests on the upper slopes, alpine tundra above timberline, and shrub-grass vegetation at the lower elevations. Grasses, sagebrush, and other shrubs grow on the lower slopes and in valleys. Lodgepole pine, aspen, Douglasfir, and ponderosa pine are the major trees of the lower forest. Engelmann spruce, subalpine fir, white fir, and limber pine intermingled with stands of aspen are typical on the mountain slopes. Willow, alder, and birch trees grow along streams. The timberline zone is characterized by stunted and wind-twisted limber pine, bristlecone pine, Engelmann spruce, and subalpine fir. The treeless alpine tundra supports alpine grasses, herbaceous plants, and shrubs. Some of the major wildlife species in this area are black bear, elk, mule deer, snowshoe hare, jackrabbit, cottontail, turkey, blue grouse, ptarmigan, and mourning dove. The species of fish in the area include rainbow trout, brown trout, brook trout, lake trout, and kokanee salmon.

Land Use

Following are the various kinds of land use in this MLRA:

Cropland—private, 1%
Grassland—private, 16%; Federal, 22%
Forest—private, 11%; Federal, 41%
Urban development—private, 1%
Water—Federal, 1%
Other—private, 2%; Federal, 5%

Nearly 70 percent of this area is Federally owned. The rest consists of farms, ranches, or other private holdings. The upper mountain slopes, below timberline, are forested. Grassland occurs above timberline. Most of the grassland and much of the open woodland are grazed. Recreation, mining, and wildlife habitat are important land uses throughout this area. Small valleys are used for irrigated hay and pasture, which provide forage for livestock. The major soil resource concerns are water erosion, a short growing season, steep slopes, and shallow and rocky soils. Conservation practices on hayland and pasture generally include proper management of crop residue, nutrients, pesticides, and irrigation water. Forage harvest management is important on rangeland and pasture.