

**Murphy, D.R. 1989a.** Drainage. pp. 6–8. *In*: K.L. Johnson (ed.). 1989. Rangeland Resources of Utah. Utah Rangeland Comm. (unenum. pub.). Utah State Univ. Coop. Ext. Ser. *coop. with* Utah Dept. Agr. and Utah Div. Wildl. Res., Logan, Utah. 103. p.

**Murphy, D.R. 1989b.** Physical features of Utah. pp. 4–6. *In*: K.L. Johnson (ed.). 1989. Rangeland Resources of Utah. Utah Rangeland Comm. (unenum. pub.). Utah State Univ. Coop. Ext. Ser. *coop. with* Utah Dept. Agr. and Utah Div. Wildl. Res., Logan, Utah. 103 p.

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## Vegetation Types of Utah

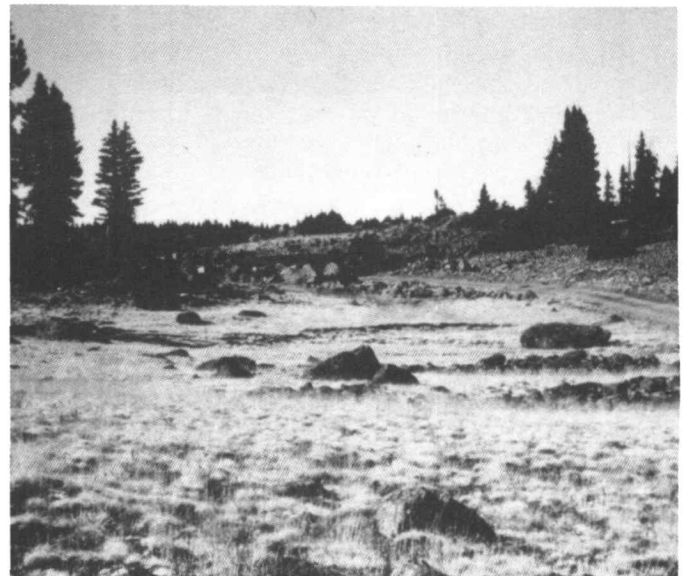
Roger E. Banner

Utah is a land of contrast. Elevations range from 2,350 ft in extreme southwestern Utah to 13,528 ft at King's Peak in the Uinta Mountains in northeastern Utah (MacMahon 1988). The wide variety of physical features that occur, linked to the diversity of plant and animal communities, produces many kinds of rangeland ecosystems. Although many vegetation maps have been produced over the years, Kuchler (1964, 1970) compiled maps showing the potential natural vegetation of the conterminous United States with 20 subdivisions shown for Utah. One of these, desert, occurs primarily on old lake bottoms that are now salt flat and is essentially devoid of vegetation. Kuchler's map subdivisions for Utah give adequate detail and are recognizable, making them appropriate vegetation units for discussion in an overview (MacMahon 1988, West 1989). This paper summarizes information presented by West (1989).

### Alpine Zone

Alpine ecosystems in Utah occur in mountainous areas above timberline, usually above 11,000 ft. The 498,000 ac classified as alpine meadows and barrens (Yorks and McMullen 1980b) in Utah is located in the Uinta Mountains. Small alpine areas occur on other Utah mountain ranges.

Vegetation of this zone is called tundra and is dominated by mosses and lichens, low-growing, perennial herbaceous and prostrate shrubby vascular plants. Tree species present grow along the ground and appear as shrubs. Usually, fewer than 200 alpine plant species are present on any given mountain range. Grasses and sedges are widespread and species of the mustard, rose, saxifrage, buckwheat, and pink families are common. Tufted hair grass, alpine avens, and sedge are prevalent on many dry and wet meadow sites. Water sedge is common in bog communities, and shrub thickets are often dominated by willows: Drummond willow, grayleaf willow, or plain-leaf willow.



*Subalpine Zone vegetation on the Aquarius Plateau of southcentral Utah.*

Domestic sheep grazing has been the primary human use of the alpine zone in Utah since the mid-nineteenth century. However, it has steadily declined over the past 40 years. Much of the alpine zone is inherently low in productivity yet relatively high in ecological condition.

### Subalpine Zone

The subalpine zone runs down slope from the alpine zone to approximately 9,000 ft. The subalpine zone in Utah is estimated to be 1,250,000 ac. The largest areas of this zone occur in the Uinta Mountains and cap the Wasatch, Paunsagunt, Markagunt, Aquarius, and Tavaputs Plateaus. Small areas occur on other Utah mountain ranges.

Undisturbed forested sites within the subalpine zone are dominated by conifers such as Engelmann and blue spruce, and subalpine and white (true) firs. Intermingled

meadows are important in this zone as are stringers of long-lived pines, e.g., limber pine and bristlecone pine, that occur on rocky ridges. Open woodlands of aspen or lodgepole pine occupy areas that have been disturbed by fire in relatively recent times.

The herbaceous component of subalpine zone flora in Utah is diverse (Reese 1981). Forbs are more numerous than grasses and perennials are more numerous than annuals. Shrubs such as mountain silver sagebrush are few and dominate only in patches in meadows and along treelines. Undisturbed subalpine zone sites are characterized by sparse understory of sweetroot, heartleaf arnica, white violet, and numerous sedges. Disturbed sites (open woodlands) generally have a dense understory of grasses and herbs. Important forb species include wild geranium, dandelion, yarrow, larkspur, and penstemon. Common grasses are slender wheatgrass, streambank wheatgrass, King's fescue, and Thurber fescue.

Subalpine zones received little attention by humans until settlement by Europeans. Loggers were not interested in subalpine forest trees as long as more productive and valuable forests were still available. Excessive livestock grazing damaged subalpine zone watersheds and consequently destroyed or threatened irrigation and culinary water supplies. Soil instability and erosion in the subalpine zone was instrumental in providing political support for creation of forest reserves at the onset of the twentieth century.



*Mountain Brush Zone vegetation in the Wasatch Mountains of northern Utah.*

### **Montane Zone**

The montane zone in Utah occurs at elevations between 9,000 and 5,500 ft depending on local environmental conditions. About 1,744,000 ac of montane forest occurs in Utah (Yorks and McMullen 1980a).

The Douglas-fir forest type dominates forest sites in the Wasatch and Uinta Mountains, the Tavaputs, Manti, and

Book Cliffs-Roan Cliffs Plateaus that have not been disturbed by logging or fire for long periods. If fire or logging has occurred during the last 100 years, aspen or lodgepole pine are most common. Douglas-fir is either lacking or mixed with other trees in some areas. The ponderosa pine type occurs in the lowest, driest areas of the montane zone in southern Utah. Park areas of dry and wet meadows are an important part of the montane zone. As in the subalpine zone, site conditions and past disturbance dictate plant composition.

Shrubs are more prevalent in the montane zone than in the subalpine zone. Snowberry, serviceberry, and mountain big sagebrush are common. Mountain silver sagebrush is found on some higher elevation meadow sites. Common grasses are slender wheatgrass, Thurber fescue, mountain and nodding brome, Sandberg and Kentucky bluegrass, Letterman needlegrass, and blue wildrye. Forbs include geranium, Rocky Mountain gentian, penstemon, paintbrush, and lupine.

The montane zone has been extensively used since Europe settlement. Douglas-fir and ponderosa pine were highly valued and selectively harvested for timber. This zone was subjected to unrestricted livestock grazing which degraded many watersheds. It continues to provide important seasonal habitat for elk and deer as well as livestock.

### **Mountain Brush Zone**

The mountain brush zone with tall shrub-dominated vegetation occurs at mid-elevations from 5,000 to 8,000 ft in Utah. Mountain brush often forms a transition zone between coniferous forests above and pinyon-juniper woodlands below. It occurs on the flanks of the Wasatch Mountains and Wasatch Plateau in northern Utah as well as at higher elevations in the Colorado River Drainage. Small patches occur on mountains of the Great Basin. There are about 955,000 ac in the mountain brush zone in Utah (Yorks and McMullen 1980b).

The dominant vegetation of the mountain brush zone is tall shrubs (Gambel oak and scrub live oak, curleaf and true mountain mahogany, big tooth maple, squawbush, and cliff rose). Shorter shrubs include snowberry, deerbushes, serviceberry, bitterbrush, and manzanitas. Grasses common to this zone are needlegrasses, bluegrasses, junegrass, wheatgrasses, and perennial bromes. Forbs include yarrow, fleabanes, peavines, vetches, goldeneye, and hairy golden aster.

The mountain brush zone in Utah has been grazed extensively by domestic livestock since about 1850. Control of fire and unrestricted grazing and hunting led to greater shrub dominance. This zone is highly valued as big game winter range. Livestock grazing has been highly restricted or excluded on some areas of this zone for watershed protection.

### **Pinyon-Juniper Woodlands**

Pinyon-juniper woodlands are the most widely distributed vegetation type in Utah. They cover 8,948,000 ac (Yorks and McMullen 1980a). These woodlands occur at



*Pinyon-Juniper Woodlands vegetation in the Blanding Basin of southeastern Utah.*

elevations from near 5,000 to 8,000 ft like the mountain brush zone. Singleleaf pinyon and Utah juniper occur alone or together in the Great Basin, and Rocky Mountain pinyon occurs with Utah juniper on the Colorado Plateau.

The pinyon-juniper woodlands are floristically poor considering the extent of the area they occupy (West et al. 1978, Tueller et al. 1979). Big sagebrush is the most common shrub and only about a dozen grasses and forbs complement the trees in these communities. Common grasses include bluegrasses, Indian ricegrass, and squirreltail. Buckwheats, pussytoes, and phloxes are present in the pinyon-juniper woodlands. Soil microphytic crusts often cover open areas in the tree interspaces.

Fire control, wood harvest, and domestic livestock grazing have all influenced the pinyon-juniper woodlands. Fire control and overgrazing hastened the spread of these woodlands into surrounding vegetation types. Charcoal production and tree cutting for fuel, timbers, or ties along with simultaneous unrestricted livestock grazing denuded areas near mining districts and railroads. Watershed characteristics of these woodlands are poor, with relatively high soil erosion rates common. A relatively small portion of these woodlands has been converted to shrubby and herbaceous vegetation by chaining, chemical control, and burning for big game winter range and spring-fall livestock range. The Bureau of Land Management (BLM) administers 61% of the pinyon-juniper woodlands in Utah. About 5% or 265,000 ac of the 5,458,000 ac of this type under BLM control has been treated to convert it to shrubby and herbaceous vegetation. Environmental concern over type conversion in pinyon-juniper woodlands is high. Little conclusive scientific information exists to support any particular point of view.

#### **Wheatgrass-Bluegrass Rangelands**

Only limited areas of Utah were or are native grasslands since Pre-Columbian times. These grasslands occur from

roughly 5,000 to 6,000 ft in the upper parts of valleys, on benches, foothills, and lower mountain slopes along the Wasatch Front of Utah and high valleys in southwestern Utah. Yorks and McMullen (1980b) report 387,000 ac of this type of rangeland in Utah.

Important grasses of wheatgrass-bluegrass rangelands include bluebunch wheatgrass and Sandberg, Nevada and Cusick bluegrass. Others in this vegetation type are Indian ricegrass, needle-and-thread, and sand dropseed. Globemallow, balsamroot, yarrow, phlox, paintbrush, milkvetch, and Utah sweetvetch are important forbs on these rangelands.

Most of this type was converted to intensive dryland, then irrigated, agriculture shortly after European settlement. It is located where much of the urbanization has taken place in Utah and only remnants remain. Introduced species like cheatgrass, goatgrass, dyers woad, and bur buttercup have invaded disturbed areas over much of this type.



*Great Basin Sagebrush vegetation northwest of Cedar City in southern Utah.*

#### **Sagebrush Steppe**

The sagebrush steppe occurs at elevations from 4,500 to 5,500 ft in Utah. It is the intermediate zone between grassland and desert shrubland. This zone occurs on the Snake River Plateau and in the Uinta Basin. Sagebrush steppe occupies 3,858,000 ac in Utah (Yorks and McMullen 1980b).

Various species of sagebrush or subspecies of big sagebrush dominate and form subdivisions of the sagebrush steppe because they occupy different ecological sites (West 1983a). Bitterbrush is found on some sites. Bluebunch wheatgrass is the most widespread bunchgrass. Thurber's needlegrass and grasses and forbs of the wheatgrass-bluegrass type commonly occur also.

Domestic livestock have had a major impact on the sagebrush steppe. Herbaceous plants were severely sup-

pressed with unrestricted grazing prior to passage of the Taylor Grazing Act in 1934. Subsequently, shrub dominated sites of this type were the object of extensive brush control efforts in the 1950's and 1960's. Plowing and seeding of crested wheatgrass and Russian wildrye, as well as herbicidal treatments to kill woody plants, were applied over large areas to increase forage production for livestock. These efforts have been criticized by wildlife biologists and others for insensitivity toward habitat requirements of wildlife species such as sagegrouse and wintering mule deer. This controversy has pointed out the need for better science-based information on wildlife species' habitat requirements.

### Great Basin Sagebrush

The Great Basin sagebrush type is overwhelmingly dominated by sagebrush, regardless of the degree of disturbance by humans (West 1983b). In Utah it occurs at elevations from 4,500 to around 6,000 ft on 6,553,000 ac (Yorks and McMullen 1980b). The Great Basin sagebrush type is distributed widely over the western half of Utah and at a few locations in the Uinta Basin and the Colorado Plateau.

This type lies above and often intermingled with the salt desert shrub types. It is much like the sagebrush steppe except for the complete domination of plant communities by sagebrush species which sort themselves out mainly by soil differences (West 1983b). Major herbaceous species include a shortened list of those also found in adjacent types. Wheatgrasses, needlegrasses, bluegrasses, and Great Basin wildrye are found on some sites in the northwest portions while warm season grasses like galleta, grammas, and dropseeds occupy some sites in the southern and eastern portions.

The Great Basin sagebrush type was grazed extensively by livestock during the annual migratory treks between winter and summer ranges. Low forage productivity has limited livestock use. A relatively small amount of this area was converted to irrigated cropland as water sources and transport systems were developed in the mid-nineteenth century.

### Saltbush-Greasewood

The saltbush-greasewood type may be more commonly called the salt desert shrub type. This type generally occurs at elevations below 6,000 ft and includes 10,507,000 ac in Utah (Yorks and McMullen 1980b). There are two subdivisions of the type which relate mainly to soil moisture. Well-drained areas with limited soil moisture are occupied by euhalophytes, like the saltbushes, in low lying and generally salty regions of the Great Basin, Uinta Basin, and the Colorado Plateau. Hydrohalophytes rooted in brackish moisture zones with at least a seasonally high water table occupy intermingled lowlands within these same areas.

Important shrubs and half shrubs of the euhalophyte subdivision include shadscale, little rabbitbrush, winterfat, budsage, gray molly, horsebrush, hopsage, Nuttall saltbush, cuneate saltbush, and saltsage. Mat saltbush is



*Saltbush-Greasewood vegetation in the Black Rock Desert of the Great Basin west of Kanosh, Utah.*

common on marine shales in the Colorado Plateau and the Uinta Basin. Indian ricegrass, needle-and-thread, sand dropseed, and galleta are common. Native and introduced annuals, e.g., cheatgrass, Russian thistle, halogeton, peppergrass, bur buttercup, wild buckwheat, and mustards, are numerous in wet years. Greasewood, saltgrass, alkali sacaton, seepweed, and pickleweed are important hydrohalophytes of this type.

Winter sheep grazing has been an important activity on the saltbush-greasewood type. Sheep grazing is gradually being converted to cattle grazing as the range sheep industry continues to decline throughout Utah. Wildfire has become a threat to fire intolerant shrubs, e.g., shadscale and winterfat, as introduced annuals like cheat-



*Galleta-Threeawn Shrub Steppe vegetation in the Green River Desert north of Hanksville, Utah.*

grass provide fuel in wetter years.

### Galleta-Threawn Shrub Steppe

The galleta-threawn shrub steppe is restricted to elevations below 6,000 ft on 1,172,000 ac in southeastern Utah (Yorks and McMullen 1980b). It occurs on sandy, relatively salt-free soils. Indian ricegrass, galleta, threeawn, ring muhly, and pungent muhly are found in this type with several shrubs: winterfat, Mormon tea, blackbrush, snakeweed, and badlands mulesear.

The galleta-threawn shrub steppe has been a hostile environment for humans. There was little water, game, or food plants. Forage productivity was low and livestock management on these rangelands has been extensive.



*Blackbrush Rangelands vegetation transition zone between the Mojave Regional Desert and the Great Basin in southwestern Utah.*



*Creosotebush Rangelands vegetation in the Mojave Regional Desert of southwestern Utah.*

from heavy browsing by livestock.

### Creosotebush Rangelands

The creosotebush rangeland is restricted to an extension of the Mojave Regional Desert in the extreme southwestern corner of Utah. It occurs at elevations below 3,000 ft and occupies 148,000 ac (Yorks and McMullen 1980b).

Aside from the dominant plant, creosotebush, major companion shrubs include joshua tree, white bursage, wolfberry, brittlebush, and dalea. Big galleta and bush muhly are the primary perennial grasses and are usually found under shrubs. Native and introduced annual grasses and forbs, e.g., red grama, red brome, and storksbill, are abundant in wet years.

Major impacts in the creosotebush rangelands have been limited because it occurs in such a harsh environment for human activity. Interstate highways and air conditioning in vehicles and homes have produced some encroachment into this type in the last 20–30 years. Livestock grazing has been limited to winter and spring with ephemerals providing most of the forage.

### Tule Marshes-Wet Meadows

Marshes, wet meadows and riparian areas along streams occur at elevations from above 11,000 ft to the Mojave Regional Desert at below 2,350 ft. Yorks and McMullen (1980b) report about 328,000 ac of tule marsh in Utah. Although the area of wet meadow and riparian habitat does not add a great deal more to this total, these types are very important from the standpoint of wildlife habitat and livestock water and forage. The largest area of marsh in Utah occurs along the eastern edge of the Great Salt Lake from Box Elder County on the north to Tooele County on the south.

Tule marshes are dominated near water by cattails. Bulrushes and common reed dominate in shallower water

### Blackbrush Rangelands

Blackbrush rangelands occur from 3,000 to 5,000 ft in a narrow transition zone between the Great Basin and the Mojave hot desert in southwestern Utah and along the Colorado and San Juan Rivers in southeastern Utah. Yorks and McMullen (1980b) report 1,439,000 ac in Utah.

Blackbrush dominates the type, often occurring in essentially pure stands on shallow soils. Mormon tea, juniper, desert peach, and wolfberry occur on some sites. When these rangelands are disturbed, plants like snake-weed, Indian ricegrass, threeawn, grammas, and needle-grasses increase in abundance. However, efforts to manipulate this type to increase forage production have produced unanticipated and undesirable results.

Mining, pipeline construction, and powerline transmission corridors may have had the greatest impact on blackbrush rangelands. Livestock grazing has not been a major factor on this type because it provides very little forage. Spiny stems coupled with chemical compounds present in current year's production protect blackbrush

and spike rushes are found on peaty bogs. Rush generally borders the marsh and saltgrass occurs on areas intermittently covered by water.

A wide range of plants are found on riparian areas and wet meadows. Numerous willows, aspen, cottonwood, boxelder, water birch, red-osier dogwood, and other woody species occur where stream gradient is high enough to allow soil drainage. Grasses and grass-like plants like bluejoint reedgrass, mannagrasses, Nebraska sedge, and beaked sedge are important riparian and wet meadow plants. Kentucky bluegrass, redtop, and other shallow rooted plants are frequently found on degraded sites. Salt cedar has invaded many riparian areas to the extent of domination.

Tule marshes, wet meadows, and riparian areas have been a focal point for human activity. Hunting, trapping, settlement, travel and transportation routes, cultivation, and livestock grazing have degraded most of these areas.

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