

state of utah



## DIVISION OF WILDLIFE RESOURCES

DOUGLAS F. DAY 1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333  
Director

June 18, 1979

Reply To SOUTHEASTERN REGIONAL OFFICE  
455 West Railroad Avenue, Box 840, Price, Utah 84501  
(801) 637-3310Mr. Tom Bailey  
Plateau Mining Company  
P.O. Drawer PMC  
Price, Utah 84501

Dear Tom:

I want to take this opportunity to extend thanks to Mark Adkins and Steve Rigby for the assistance they have provided Larry Dalton in becoming familiar with surface facilities on the property encompassed by Plateau's mine plan area. We are also appreciative of the opportunity you provided for Mr. Dalton to present the program concerning Energy Development and its impacts on wildlife to Plateau's staff.

In response to your request for wildlife resources information (30 CFR, part 783.20) and the Division's recommendations concerning a wildlife plan (30 CFR, part 784.21) to accompany your permit application, the attached map delineating high value habitats for wildlife and supporting narrative for those use areas and other high interest wildlife species are provided. Since the primary or secondary premining and assumed postmining use of the mine plan area was and will be wildlands inhabited by wildlife, suggested vegetative species (seed list along with potential material supply sources for seed and seedlings) for use in enhancement and/or reclamation work that would benefit wildlife are included (30 CFR, parts 817.97 d 4, 817.97 d 5, 817.97 d 9, part 817.116 b 3 IV and part 817.117 c 2). Also, note that Utah's Division of Oil, Gas and Mining is the regulatory authority for final approval of the mining and reclamation plan.

Thank you for an opportunity to assist Plateau Mining Company in complying with OSM's permanent regulatory program for surface coal mining and reclamation and the resultant protection of Utah's wildlife resources. If the scientific name or other information relative to status of any wildlife species referenced is needed, please consult the Division publication 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" that was provided to your office earlier.

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Mr. Tom Bailey  
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If we can be of any further service, please contact Larry Dalton as appropriate.

Sincerely,

*Larry J. Wilson by Larry J. Dalton*

Larry J. Wilson, Supervisor  
Southeastern Region

LJW:LBD:trw

cc: Director's Office  
Darrell Nish  
Jack Topham  
Gary Moreau  
Clark Johnson  
Cleon Feight ✓

30 CFR, PART 783.20 FISH AND WILDLIFE RESOURCE INFORMATION

The mine plan area for Plateau Mining Company encompasses a portion of the Wasatch Plateau in Carbon County, Utah. The Division publication No. 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" adequately identifies occurrence, status, population trend and habitat use areas for wildlife species that inhabit the Wasatch Plateau. Generally speaking, the mine plan area is inhabited on occasion and during different seasons of the year by about 350 species of vertebrate wildlife, (no known fish species, 6 amphibian species, 18 reptile species, 242 bird species and 84 mammal species), some of which are considered to be high interest species for the habitats and local area represented. High interest wildlife are defined as all game species; any economically important species; and any species of special aesthetic, scientific or educational significance. This definition would include all federally listed, threatened and endangered species of wildlife.

The attached map (Figure 1) displays mapable, high value habitats for high interest wildlife (mule deer, elk, golden and bald eagles) on and adjacent to the mine plan area. Mule deer and elk normally utilize the crucial-critical and high-priority winter ranges between November 1 and May 15 each year.

In the instance of the eagles it is important to note that golden eagles are common, year around residents of the mine plan area and extremely sensitive to disturbance within one-fourth mile of an active nest site

between April 15 and June 15. Bald eagles are winter residents between November 15 and March 15 each year. To date no roost trees have been identified on or adjacent to the mine plan area. No bald eagles are currently known to nest in Utah.

The riparian zones associated with drainage bottoms, streams (eph<sup>m</sup>eral, intermittent or perennial -- 30 CFR, part 701.5), seeps and springs are ranked as being crucial-critical to all aquatic and terrestrial wildlife species. All of the streams associated with the mine plan area are ranked as having limited value for any fishery. They all represent class 6 waters in Utah -- class 1 waters are the best blue ribbon waters and class 6 waters are dewatered during portions of the year.

It should be noted that in addition to the mapable areas of high value habitat that have been ranked as being either crucial-critical or of high-priority to some wildlife, that the entire lease area provides high-priority yearlong habitat for cougar and black bear. Mountain cottontail (above 7,000 feet elevation), desert cottontail (below 7,000 feet elevation), snowshoe hare, mourning doves, ruffed and blue grouse also inhabit the mine plan area. The entire lease area provides high-priority, yearlong habitat for cottontail rabbits. The snowshoe hare is entirely dependent upon the fir-spruce vegetation type as a yearlong habitat use area. Morning doves normally inhabit the mine plan area between May 1 and September 15 each year; they nest throughout most of this period. Ruffed grouse for the

most part are dependant upon wildlands vegetated by aspen and coniferous vegetation and that are located within one-quarter mile of stream courses. These areas are crucial-critical, yearlong use areas for ruffed grouse. Blue grouse utilize the mountain brush and coniferous areas of wildlands and are not dependant upon stream courses. The mountain brush zones provide crucial-critical breeding territories for blue grouse between March 15 and June 15 each year. The high elevation, mature stands of Douglas fir are crucial-critical winter range for blue grouse during December, January and February each year.

It should be noted that the high elevation, montane habitats provide summer range for a substantial number of mule deer and some elk between May 16 and October 31 each year. Fawning/calving and rearing processes take place on the summer range.

Since Utah's Division of Oil, Gas and Mining and the U.S. Fish and Wildlife Service have been provided with a copy of the publication "Vertebrate Wildlife that Inhabit Southeastern Utah" there is no apparent reason why all of the species that occur on the mine plan area should be listed in the application for a mining permit. Additionally, it is not believed that detailed population studies of wildlife specific to the mine plan area should be required.

It is recommended that your primary effort be placed on identifying species of vegetation in each vegetative association for the purposes of reclamation.

It is believed that if satisfactory reclamation is achieved and man's disturbance does not continue or become a factor that most species of wildlife will return. Without doubt the key to success for enhancing or restoring wildlands will be development of habitats so that the postmining condition as compared to the premining condition will have similar species, frequency and distribution of permanent plants in each vegetative type that will allow for natural plant succession.

## 30 CFR, PART 784.21 FISH AND WILDLIFE PLAN

Utah Division of Wildlife Resources provides the following recommendations to minimize disturbances and impacts on wildlife and their habitats that could be impacted during Plateau's mining and reclamation operations. The recommendations will also address how enhancement of the wildlife resource and their habitats as discussed in 30 CFR, 783.20 can be achieved. The recommendations for minimizing disturbances and impacts and potential enhancements where practicable are consistent with the performance standards of 30 CFR, 817.97. In instances where it will be necessary to restore or beneficial to enhance high value habitats for fish and wildlife (30 CFR, part 817.97 d 4 and 817.97 d 5); or that the primary or secondary postmining land use will be for wildlife habitat (30 CFR, part 817.97 d 9) and rangeland seedings are to be used, recommended seed lists and rates of application are provided (30 CFR, parts 817.111 through 817.117; note 817.116 a, 817.116 b 3 iv and 817.117 c 2).

### Threatened and endangered wildlife and their habitats

A portion of the mine plan area is inhabited by the endangered northern bald eagle between November 15 and March 15 each year (Figure 1). Currently no roost trees are known and no bald eagles nest in Utah. In order to minimize disturbance to this species all mine personnel and other persons normally associated with the mine operation should be made aware of the birds' annual presence and value to society. These same people should

be instructed not to disturb, harass or kill bald eagles. If a roost tree(s) for bald eagles is identified by Plateau it should immediately be reported to Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service. Roost trees and a suitable buffer zone should be protected from any human disturbance during the winter period.

#### Eagles and other migratory birds

The golden eagle is a common, year-round resident that nests on the Wasatch Plateau. There are no known golden eagles nests on Plateau's mine plan area. If an active nest is located by persons associated with the mine it should be reported to Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service. Every effort should be made to eliminate man's disturbance within one-fourth mile of an active nest when in use between the period of April 15 and June 15, since golden eagles are sensitive to disturbance and could abandon the nest. Disturbance that would come from above and within view of the nest should be precluded for a distance of at least one-half mile. Adult birds are not to be molested or killed.

Several other species of raptors inhabit the mine plan area. To date, location of their nests and other parameters of the population are not known. If located, nests should not be disturbed when active and abandoned stick nests are not to be damaged during inactive periods. As a general comment,

whenever active raptor nests are observed, they should be reported to the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service. All persons regularly associated with the mining operation should be made aware of the value of raptors to society and the fact that they are protected by both state and federal laws.

Design and construction of all electrical power lines and other transmission facilities shall be designed in accordance with guidelines set forth in "Environmental Criteria for Electric Transmission System" published by the USDI and USDA in 1970 and/or the REA Bulletin 61-10 "Powerline Contacts by Eagles and Other Large Birds".

Mourning doves inhabit the mine plan area between about May 1 and September 15 each year; they also nest during this period. Persons associated with the mining operation should not disturb dove nests since they may produce two or more clutches each year.

All birds other than resident upland game birds, house sparrows and starlings are protected under the Federal Migratory Bird Treaty Act. All of the migratory birds and their eggs and nests (when active) are not to be harassed, disturbed, destroyed or killed by any persons without valid federal and state collecting permits. Plantings of native and/or ornamental berry-producing shrubs around surface facilities will provide food and cover for many of the smaller species of these birds. This would enhance their natural habitat and would mitigate ~~for~~ disturbances and destruction of their habitats at other sites in the mine plan area.

High interest wildlife and their high value habitats

Mule deer and elk inhabit the high-priority and crucial-critical winter ranges identified in Figure 1 between November 1 and May 15 each year. These areas should be protected from exploration or other industrial activities during the periods when inhabited. Proposed industrial activities that would permanently or for a long period of time occupy crucial-critical habitats should be placed on alternate, lesser-valued sites. Disturbances on high-priority deer winter range should be kept to a minimum.

It is important to note that big game on winter ranges are sensitive to disturbance. These animals are always depleted by winter conditions. Unnecessary disturbance by man causes them to use up critical and limited energy reserves which, often times, results in mortality. In less severe cases, the fetus being carried by females can be aborted or absorbed by the animal, thus reducing reproductive success.

If the mining operation should ever require any structures that would present a barrier to daily movements of wildlife, suitable passage structures are to be constructed along with wing fences to guide the animals to passageways. Detailed studies will be required to determine placement of passageways.

Mule deer and elk fawn or calf in the higher montane habitats between May 15 and July 15 each year. This is also true for limited numbers of black bear and cougar. During this period the young animals need the peace and tranquility normally afforded by remote wildlands. This allows the young

animal to develop in relatively unstressed situations and to utilize habitats that are secure from predators. Disturbance by man can compromise this situation and result in abandonment of the young by the female or increased natural predation. It is recommended that employees be cautioned against disturbing these animals if accidentally located. Additionally, exploration activities should be limited as much as possible during the fawning/calving period.

It is important that blue grouse, ruffed grouse, cottontail rabbits and the limited numbers of snowshoe hares not be unnecessarily disturbed during any period of the year. During winter periods such disturbances deplete the animals' energy reserves resulting in similar losses as discussed for big game. During the spring and summer periods the birds and rabbits are producing and rearing young. Breeding territories for blue grouse (March 15 to June 15) and drumming logs for ruffed grouse (March 1 to May 30) must be protected from disturbance while being utilized each year. In the instance of ruffed grouse their display areas must be protected from alteration or destruction since they represent traditional sites that are reused each year. The nests of rabbits and grouse must also be protected from disturbance or destruction when being used. Scattering of broods and litters causes a greater frequency of accidents and increases opportunity for predation. Employees associated with the mining operation should be instructed to not molest any wildlife, their young or to disturb breeding, nesting and/or rearing sites.

It is important to note that roads and other surface facilities to be constructed should as far as practicable be placed at sites where they will not compromise wildlife or habitats previously discussed. Also, surface facilities, including roads, should be screened if possible from wildlife use areas by vegetation or terrain. Employees associated with mining operations should be instructed that when wildlife are encountered during routine work that they not stop vehicles for viewing purposes. Moving traffic is less disturbing to wildlife than traffic that stops or results in out of the vehicle activities. If viewing is desirable, the vehicle should only be slowed, but not stopped.

Hunting and other state and federal wildlife regulations should be adhered to by sportsmen utilizing the mine plan area.

All hazards associated with the mine operation should be fenced or covered to preclude use by wildlife.

In situations where wildland habitats are disturbed, reclamation will be required. Also, there are sites where enhancement of wildland habitats through vegetation treatments and/or seedings and transplants of seedlings could benefit wildlife. The attached tables (1 through 10) depict recommended seed lists for several vegetative associations and application rates for rangeland seedings that would benefit wildlife. If seed for a plant species is not available, suitable alternates are also listed. For some vegetation associations, plant species are recommended that will assist in erosion control

of special sites such as roadbanks. Seedling transplants from nursery stock or nearby rangelands would also be acceptable for enhancement or reclamation of wildlands. In either instance, Tables 1 through 10 provide lists of vegetation species by habitat association that would benefit wildlife.

Temporary control of rodents may be required to ensure a successful rangeland treatment. It is recommended that the county agent be consulted in this area of concern. Poisoned oats are the most common and acceptable method for rodent control, however, only licensed persons may apply the treatment.

Currently, there are some new concepts in methodology for revegetation that are being successfully implemented in other parts of the nation and world. One promising method is a procedure where a large scoop removes, from a natural and stabilized site, a small area of earth intact with vegetation and subsurface soils for placement on a site to be reclaimed. This same procedure can be utilized when disturbing pristine sites, except that the native vegetation is stored for use in latent reclamation. Another meritorious method for stimulating natural revegetation, in combination with other reclamation techniques, is to plan facility developments so that islands of natural, native vegetation remain. This will allow for natural vegetation to spread from the islands. These techniques can also be useful for enhancement of poor quality sites that currently exist on the mine plan area.

Encapsulation of seed and fertilizer for several releases over a period of years after a single application is a new and possibly advantageous

procedure. This technique along with soil stabilizing structures has been successfully used in South Africa. Dr. J. Van Wyk in the Department of Botany at Potchefstroom University in South Africa could provide additional information on this new technique.

There are also new specialized techniques coming to the forefront for stabilization of problem sites such as roadbanks and steep slopes. It is important that these sites be promptly and permanently revegetated in order to reduce siltation into local riverine systems. This will mitigate ~~for~~ damage to aquatic wildlife populations and habitats from siltation. Enhancement of existing problems sites or reclamation of disturbed sites can mitigate for salt loading local river systems. It is believed that natural, nonpoint sources represent 50 percent of the salinity in the upper basin of the Colorado River system into which this mine plan area drains.

It is recommended the company make numerous contacts with appropriate agencies, institutions and persons to ensure that enhancement or reclamation projects achieve the required degree of permanency, plant diversity, extent of cover and capability of regeneration to ensure plant succession. Generally speaking, seeding should be accomplished as late in the fall as possible. Seedling transplants need to be coordinated with local soil moisture conditions. It is paramount that suitable vegetation be maintained and/or reestablished if the life requirements of wildlife are to be satisfied in the postmining period. Success in this area of concern along with cessation of man's disturbances will likely result in natural invasion and the resultant inhabitation by most wildlife species of an impacted site.

There is also some concern for the effects that subsidence may have on sources of water that support existing wildlife populations and their habitats. If hydrologic monitoring shows a significant reduction or total loss of ground and/or surface waters, the company should immediately consult the Division of Wildlife Resources and the U.S. Fish and Wildlife Service on emergency procedures if needed. A significant local loss of water may demand temporary or permanent alternative sources of water to be established by the company for use by wildlife.

It is recommended that all natural wetlands and riparian vegetation along streams, drainage bottoms, or around seeps and springs be maintained. Roads and other facility developments should not destroy these limited, highly productive and specialized habitats. Roads crossing through those areas should do so in a manner that is least damaging to the habitat. Wetlands and riparian habitats are ranked as crucial-critical habitats and are the most productive sites in terms of herbage and biota produced as compared to other local habitat types. It is probable that a majority of the vertebrate wildlife that inhabit the mine plan area make some use of riparian or wetland areas.

It is recommended that persistent pesticides not be utilized on the mine plan area. Other alternate pesticides or forms of control should be utilized.

It is recommended that aquatic resources be protected by avoiding impacts to stream channels. Utah Division of Wildlife Resources reaffirms

all of the recommendations in 30 CFR, parts 817.44, 817.57 and 817.126 for protection of stream channels. It is also recommended that adequate precautions be taken to keep all forms of coal from being deposited in stream channels. This would include blow coal from haulage trucks, railroads or other transportation systems and storage piles along with larger particles from similar and other sources. If needed to control blow coal, haulage systems should be covered or the surface of the coal sprayed in order to solidify it against wind movement.

COMMON AND BOTANICAL NAMES FOR VEGETATION SPECIES IN THE ATTACHED TABLES THAT HAVE BEEN SUGGESTED FOR USE WITH ENHANCEMENT OR RECLAMATION PROJECTS THAT WOULD BENEFIT WILDLIFE

Common Name	Botanical Name	Common Name	Botanical Name
Alfalfa, (Ladak, Nomad, Rambler, Teton, Travois)	<i>Medicago sativa</i>	Bluegrass, Canada	<i>P. compressa</i>
Alfalfa, sickle	<i>M. falcatus</i>	Bluegrass, Kentucky	<i>P. pratensis</i>
Alfileria	<i>Erodium cicutarium</i>	Bluegrass, Nevada	<i>P. nevadensis</i>
Alkaligrass, nuttall	<i>Puccinellia airoides</i>	Bluegrass, Sandberg	<i>P. secunda</i>
Angelica, small-leaf	<i>Angelica pinnata</i>	Bouncing-bet	<i>Saponaria officinalis</i>
Apache-plume	<i>Fallugia paradoxa</i>	Boxelder	<i>Acer negundo negundo</i>
Ash, singleleaf	<i>Fraxinus anomala</i>	Brome, cheatgrass	<i>Bromus tectorum</i>
Aspen, quaking	<i>Populus tremuloides</i>		<i>tectorum</i>
Aster, alpine leafybract	<i>Aster foliaceus</i>	Brome, meadow	<i>B. erectus</i>
Aster, Engelmann	<i>A. engelmannii</i>	Brome, mountain	<i>B. carinatus</i>
Aster, Pacific	<i>A. chilensis adscendens</i>	Brome, nodding	<i>B. anomalus</i>
Aster, smooth (or blue)	<i>A. glaucodes</i>	Brome, red (foxtail)	<i>B. rubens</i>
		Brome, smooth (northern)	<i>B. inermis</i>
Balsamroot, arrowleaf	<i>Balsamorhiza sagittata</i>	Brome, smooth (southern)	<i>B. inermis</i>
Balsamroot, cutleaf	<i>B. macrophylla</i>	Brome, subalpine	<i>B. tomentellus</i>
Barberry, creeping	<i>Berberis repens</i>	Buffaloberry, roundleaf	<i>Shepherdia rotundifolia</i>
Barberry, Fremont	<i>B. fremontii</i>	Buffaloberry, russet	<i>S. canadensis</i>
Barley, bulbous	<i>Hordeum bulbosum</i>	Buffaloberry, silver	<i>S. argentea</i>
Barley, meadow	<i>H. brachyantherum</i>	Burnet, small	<i>Sanguisorba minor</i>
Bassia, fivehook (alkaliweed, ragweed, smotherweed)	<i>Bassia hyssopifolia</i>	Buttercup, bur	<i>Ranunculus testiculatus</i>
Bitterbrush, antelope	<i>Purshia tridentata</i>	Cacti	Cactaceae
Bitterbrush, desert	<i>P. glandulosa</i>	Canarygrass, reed	<i>Phalaris arundinacea</i>
Blackbrush	<i>Coleogyne ramosissima</i>	Ceanothus, Martin	<i>Ceanothus martinii</i>
Bladdersenna, common	<i>Colutea arborescens</i>	Ceanothus, redstem	<i>C. sanguineus</i>
Bluegrass, big	<i>Poa ampla</i>	Ceanothus, snowbrush	<i>C. velutinus</i>
Bluegrass, bulbous	<i>P. bulbosa</i>	Checkermallow, Oregon	<i>Sidalcea oregana</i>
		Cherry, Bessey (sand)	<i>Prunus besseyi</i>
		Chokecherry, black (common)	<i>P. virginiana</i> <i>melanocarpa</i>

<u>Common Name</u>	<u>Botanical Name</u>	<u>Common Name</u>	<u>Botanical Name</u>
Cinquefoil, bush	Potentilla fruticosa	Fescue, hard sheep	Festuca ovina duriscu
Cliffrose, Stansbury	Cowania mexicana stansburiana	Fescue, reed (alta or tall)	F. arundinacea
Clover, alsike	Trifolium hybridum	Fescue, sulcata sheep	F. sulcata
Clover, strawberry	T. fragiferum	Fescue, Thurber	F. thurberi
Collomia, slenderleaf	Collomia linearis	Fir, subalpine	Abies lasiocarpa
Columbine, Colorado	Aquilegia coerulea	Fir, white	A. concolor
Cotoneaster, Peking	Cotoneaster acutifolia	Flax, Lewis (or blue)	Linum lewissii
Cowparsnip, common	Heracleum lanatum	Fleabane, Oregon	Erigeron speciosus
Creosotebush, spreading	Larrea divaricata		macranthus
Crownvetch, coronilla	Coronilla varia	Forestiera, New Mexican	Forestiera neomexicana
Currant, golden	Ribes aureum	Forestiera, New Mexican	F. phillyneoides
Currant, gooseberry	R. montigenum	olive	
Currant, squaw	R. cereum inebrians	Foxtail, barley	Hordeum jubatum
Currant, sticky	R. viscosissimum viscosissimum		jubatum
Cypress, Arizona	Cupressus arizonica	Foxtail, meadow	Alopecurus pratensis
Cypress, Belvedere summer	Kochia scoparia	Foxtail, reed	A. arundinaceus
Daisy, common oxeye	Chrysanthemum leucanthemum	Galleta	Hilaria jamesii
Dandelion, common	Taraxacum officinale	Geranium, sticky	Geranium viscosissim
Deathcamas	Zigadenus spp.	Glanthyssop, nettleleaf	Agastache urticifolia
Dogwood, redosier	Cornus stolonifera stolonifera		glaucifolia
Douglas-fir	Pseudotsuga menziesii menziesii	Globemallow,	Sphaeralcea
Dropseed, sand	Sporobolus cryptandrus	gooseberryleaf	grossulariaefolia
Dropseed, spike	S. contractus	Globemallow, stream	S. rivularis
		Goldeneye, Nevada showy	Viguiera multiflora
			nevadensis
Elder, blueberry	Sambucus cerulea	Goldeneye, Canada	Solidago canadensis
Elder, redberry	S. racemosa pubens microbotrys	Goldenrod, low	S. multiradiata
Ephedra, green	Ephedra viridis	Goldenrod, Parry	S. parryi
Ephedra, Nevada	E. nevadensis	Goosefoot	Chenopodium spp.
Eriogonum, cushion	Eriogonum ovalifolium	Greasewood, black	Sarcobatus vermicula
Eriogonum, Wyeth	E. heracleoides		vermiculatus
		Goldeneye, showy	Viguiera multiflora

Common NameBotanical Name

Serviceberry, Utah  
 Snowberry, longflower  
 Snowberry, mountain  
 Solomon-plume, fat  
  
 Sophora, Arizona  
 Spruce, Colorado blue  
 Spruce, Engelmann  
 Squirreltail, bottlebrush  
 Squaw-apple  
 Starwort, tuber  
 Sumac, Rocky Mountain  
 smooth  
 Sumac, skunk bush  
 Sweetanise  
 Sweetclover, white  
 Sweetclover, yellow  
 Sweetroot, spreading  
  
 Sweetvetch, Utah  
  
 Tansymustard, flixweed  
 Tansymustard, pinnate  
 Tarweed, cluster  
 Tenella weed  
 Timothy  
 Tumblemustard  
  
 Valerian, edible  
 Vetch, American  
 Vetch, bramble

*A. utahensis utahensis*  
*Symphoricarpos longiflorus*  
*S. oreophilus*  
*Smilacina racemosa*  
*amplexicaulis*  
*Sophora arizonica*  
*Picea pungens*  
*P. engelmannii*  
*Sitanion hystrix*  
*Peraphyllum ramosissimum*  
*Stellaria jamesiana*  
*Rhus glabra cismontana*  
  
*R. trilobata trilobata*  
*Osmorhiza occidentalis*  
*Melilotus alba*  
*M. officinalis*  
*Osmorhiza chilensis*  
*(divaricata)*  
*Hedysarum boreale*  
*utahensis*  
  
*Descurainia sophia*  
*D. pinnata*  
*Madia glomerata*  
*Chorispora tenella*  
*Phleum pratense*  
*Sisymbrium altissimum*  
  
*Valeriana edulis*  
*Vicia americana minor*  
*V. tenuifolia*

Common NameBotanical Name

Violet, goosefoot  
 Virginsbower, western  
  
 Wheatgrass, bearded  
 Wheatgrass, bearded  
 bluebunch  
 Wheatgrass, beardless  
 bluebunch  
 Wheatgrass, bluestem  
 Wheatgrass, crested  
 (Fairway)  
 Wheatgrass, crested  
 (Standard)  
 Wheatgrass, intermediate  
 Wheatgrass, pubescent  
 or stiffhair  
 Wheatgrass, Scribner  
 Wheatgrass, Siberian  
 Wheatgrass, slender  
 Wheatgrass, tall  
 Wildrye, blue  
 Wildrye, Colorado  
 Wildrye, creeping  
 Wildrye, Great Basin  
 Wildrye, mammoth  
 Wildrye, Russian  
 Wildrye, sabulosa  
 Wildrye, Salina  
 Wildrye, yellow  
 Willow, Gyer  
  
 Willow, purpleosier

*Viola purpurea*  
*Clematis ligusticifolia*  
  
*Agropyron subsecundum*  
*A. spicatum*  
  
*A. spicatum inerme*  
  
*A. smithii*  
*A. cristatum*  
  
*A. desertorum*  
  
*A. intermedium*  
*A. trichophorum*  
  
*A. scribneri*  
*A. sibiricum*  
*A. trachycaulum*  
*A. elongatum*  
*Elymus glaucus*  
*E. ambiguus ambiguus*  
*E. triticoides*  
*E. cinereus*  
*E. giganteus*  
*E. junceus*  
*E. sabulosus*  
*E. salina*  
*E. flavescens*  
*Salix exigua*  
*stenophylla*  
*S. purpurea purpurea*

<u>Common Name</u>	<u>Botanical Name</u>	<u>Common Name</u>	<u>Botanical Name</u>
Painted-cup, Northwestern	<i>Castilleja hispida</i>	Rhubarb, garden	<i>Rheum rhapenticum</i>
Peachbrush, desert	<i>Prunus fasciculata</i>	Ricegrass, Indian	<i>Oryzopsis hymenoides</i>
Peashrub, Siberian	<i>Caragana arborescens</i>		<i>hymenoides</i>
Peavine, flat	<i>Lathyrus sylvestris</i>	Rose, Woods	<i>Rosa woodsii</i>
Peavine, perennial	<i>L. latifolius</i>		<i>ultramontana</i>
Peavine, thicketleaf	<i>L. lanszwertii</i>	Rush, Baltic	<i>Juncus balticus</i>
Peavine, Utah	<i>L. utahensis</i>	Russian-olive	<i>Elaeagnus angustifolia</i>
Penstemon, Eaton	<i>Penstemon eatonii</i>	Russianthistle	<i>Salsola kali tenuifolia</i>
Penstemon, littlecup	<i>P. sepalulus</i>	Rye, mountain	<i>Secale montanum</i>
Penstemon, low	<i>P. humilis</i>	Rye, winter	<i>S. cereale</i>
Penstemon, Palmer	<i>P. palmeri</i>		
Penstemon, Rydberg	<i>P. rydbergii</i>	Sacaton, alkali	<i>Sporobolus airoides</i>
Penstemon, sidehill	<i>P. platyphyllus</i>		<i>airoides</i>
Penstemon, thicketleaf	<i>P. pachyphyllus</i>	Sagebrush, Louisiana	<i>Artemisia ludoviciana</i>
Penstemon, toadflax	<i>P. linarioides</i>		<i>ludoviciana</i>
Penstemon, Wasatch	<i>P. cyananthus</i>	Sagebrush, tarragon	<i>A. dracunculus</i>
Pine, pinyon	<i>Pinus edulis</i>	Sagebrush, big	<i>A. tridentata tridentata</i>
Pine, ponderosa	<i>P. ponderosa</i>	Sagebrush, black	<i>A. arbuscula nova</i>
Pine, singleleaf pinyon	<i>P. monophylla</i>	Sagebrush, bud	<i>A. spinescens</i>
Plum, American	<i>Prunus americana</i>	Sagebrush, fringed	<i>A. frigida</i>
		Sagebrush, silver	<i>A. cana cana</i>
Quackgrass	<i>Agropyron repens</i>	Salsify, vegetable-	<i>Tragopogon porrifolius</i>
		oyster	
Rabbitbrush, Douglas	<i>Chrysothamnus viscidiflorus</i>	Saltbush, fourwing	<i>Atriplex canescens</i>
	<i>viscidiflorus</i>	Saltbush, Gardner	<i>A. gardneri</i>
Rabbitbrush, dwarf	<i>C. depressus</i>	Saltbush, shadscale	<i>A. confertifolia</i>
Rabbitbrush, Parry	<i>C. parryi parryi</i>	Saltgrass, inland	<i>Distichlis spicata</i>
Rabbitbrush, rubber	<i>C. nauseosus nauseosus</i>		<i>stricta</i>
Rabbitbrush, small	<i>C. stenophyllus</i>	Salt-tree, Siberian	<i>Halimodendron</i>
Raspberry, American red	<i>Rubus idaeus sachalinensis</i>		<i>halodendron</i>
Redtop	<i>Agrostis alba</i>	Sedge, ovalhead	<i>Carex festivella</i>
Reedgrass, chee	<i>Calamagrostis epigeios</i>	Seepweed (pickleweed)	<i>Suaeda spp.</i>
		Serviceberry, Saskatoon	<i>Amelanchier alnifolia</i>

<u>Common Name</u>	<u>Botanical Name</u>	<u>Common Name</u>	<u>Botanical Name</u>
Groundsel, butterwood	<i>Senecio serra</i>	Lupine, silky	<i>L. sericeus</i>
Hair-grass, tufted	<i>Deschampsia caespitosa</i>	Lupine, silvery	<i>L. argenteus</i>
Halogeton	<i>Halogeton glomeratus</i>	Maple, bigtooth	<i>Acer grandidentatum</i>
Hawthorn, river	<i>Crataegus douglasii rivularis</i>	Maple, Manchurian	<i>A. mandshuricum</i>
Helianthella, oneflower	<i>Helianthella uniflora</i>	Maple, Rocky Mountain	<i>A. glabrum</i>
Honeylocust, common	<i>Gleditsia triacanthos</i>	Matrimony-vine	<i>Lycium halimifolium</i>
Honeysuckle, bearberry	<i>Lonicera involucrata</i>	Medick black	<i>Medicago lupulina</i>
Honeysuckle, Tatarian	<i>L. tatarica</i>	Mesquite	<i>Prosopis spp.</i>
Hopsage, spineless	<i>Grayia brandegei</i>	Milkvetch, chickpea	<i>Astragalus cicer</i>
Hopsage, spiny	<i>G. spinosa</i>	Milkvetch, sicklepod	<i>A. falcatus</i>
		Milkvetch, Snakeriver plains	<i>A. filipes</i>
Iodine bush	<i>Allenrolfea occidentalis</i>	Milkvetch, tall	<i>A. galegiformis</i>
Iris, German (common iris)	<i>Iris germanica</i>	Mountain-mahogany, curleaf	<i>Cercocarpus ledifolius ledifolius</i>
Ivesia, Gordon	<i>Ivesia gordonii</i>	Mountain-mahogany, littleleaf	<i>C. ledifolius intricatus</i>
Juniper, Rocky Mountain	<i>Juniperus scopulorum</i>	Mountain-mahogany, true or birchleaf	<i>C. montanus montanus</i>
Juniper, Utah	<i>J. osteosperma</i>	Muhly, mat	<i>Muhlenbergia richardsonis</i>
Knotweed, Douglas	<i>Polygonum douglasii douglasii</i>	Mustard, African	<i>Malcolmia africana</i>
Larkspur	<i>Delphinium spp.</i>	Needlegrass, green	<i>Stipa viridula</i>
Leptotaenia, carrotleaf	<i>Lomatium dissectum</i>	Needlegrass, Letterman	<i>S. lettermani</i>
Lettuce, prickly	<i>Lactuca serriola</i>	Oak, Gambel (shrubby)	<i>Quercus gambelii</i>
Ligusticum, Porter	<i>Ligusticum porteri</i>	Oatgrass, tall	<i>Arrhenatherum elatius</i>
Lilac, common	<i>Syringa vulgaris</i>	Orchardgrass	<i>Dactylis glomerata</i>
Lilac, late	<i>S. villosa</i>		
Locust, black	<i>Robinia pseudoacacia</i>		
Lomatium, nineleaf	<i>Lomatium triternatum</i>		
Lomatium, Nuttall	<i>L. nuttallii</i>		
Lupine, mountain	<i>Lupinus alpestris</i>		
Lupine, Nevada	<i>L. nevadensis</i>		

Common Name

Willow, Scouler  
Winterfat, common  
Woad, Dyers  
Wormwood, oldman  
Wyethia, mulesears

Yarrow, western  
Yellowbrush

Yucca  
Yucca, Joshua-tree

Botanical Name

*S. scouleriana*  
*Eurotia lanata lanata*  
*Isatis tinctoria*  
*Artemisia abrotanum*  
*Wyethia amplexicaulis*

*Achillea millefolium lanulosa*  
*Chrysothamnus viscidiflorus*  
*lanceolatus*

*Yucca* spp.  
*Yucca brevifolia brevifolia*

Common Name

Botanical Name

Table 1. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed mountain brush associations characterized by Gambel oak, bigtooth maple, black chokecherry and serviceberry. Also included are acceptable alternatives if seed for a plant species is not available. Alternatives marked with an asterisk (\*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	North exposures and shady areas		Sunny exposures (south, west, east)		Mixture for tall mountain brush type, shaded sites.	
	Broadcast	Drilled	Broadcast	Drilled	Species	Seeding per acre
-Pounds per acre -					<u>Pounds</u>	
<b>Grasses:</b>					<b>Grasses:</b>	
Fairway crested wheatgrass	2	1	2	1	Smooth brome (southern strain)	5
Smooth brome (southern strains)	4	2	2	1	Fairway crested wheatgrass	1
Intermediate wheatgrass	4	2	2	1	Intermediate wheatgrass	3
Pubescent wheatgrass	0	0	2	1	Orchardgrass (Utah grown)	2
Bluestem wheatgrass	0	0	1	1/2	Tall oatgrass	1
Orchardgrass	1	1/2	1	1/2	Mountain brome	1
Russian wildrye	0	0	1	1/2		
Tall oatgrass	1	1/2	0	0		
<b>Forbs:</b>					<b>Forbs:</b>	
Alfalfa (Nomad, Rambler, Travois, Ladak-equal parts)	2	1	2	1	Alfalfa (creeping strains or Ladak)	1
Chickpea milkvetch	0	0	1	1/2	Pacific aster	1/4
Utah sweetvetch	0	0	1	1/2	Oneflower helianthella	1/2
Yellow sweetclove	0	0	1	1/2	Showy goldeneye	1/4
Arrowleaf balsamroot	1	1/2	1	1/2		
Pacific aster	1	1/2	1	1/2	Totals	15

Table 1. Continued

Species	North exposures and shady areas		Sunny exposures (south, west, east)	
	Broadcast	Drilled	Broadcast	Drilled
-Pounds per acre-				
Shrubs:				
Rubber rabbitbrush	1/2	1/4	1/2	1/4
Douglas rabbitbrush	1/2	1/4	1/2	1/4
Big sagebrush	0	0	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Totals	17	8 1/2	20 1/2	10 1/4

Shrubs for pits, major disturbance areas, cleat marks, and drilled areas:

Antelope bitterbrush	1	1/2	2	1
Golden currant	1/2	1/4	1/2	1/4
Birchleaf mountain mahogany	1	1/2	1/2	1/4
Curlleaf mountain mahogany	0	0	1/2	1/4
Cliffrose	0	0	1/2	1/4
Green ephedra	1/2	1/4	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Woods rose	1	1/2	1/2	1/4
Saskatoon serviceberry	0	0	1	1/2
Totals	4	2	7	3 1/2

Table 1. Continued

Alternate Species for Mountain Brush Associations

Grasses:

Bearded bluebunch wheatgrass  
 Beardless bluebunch wheatgrass  
 Big bluegrass\*  
 Bluestem wheatgrass  
 Bottlebrush squirreltail\*  
 Bulbous barley\*  
 Bulbous bluegrass\*

Great Basin wildrye  
 Green needlegrass\*  
 Hard sheep fescue  
 Indian ricegrass\*  
 Kentucky bluegrass\*  
 Meadow brome\*  
 Mountain rye\*

Sand dropseed\*  
 Siberian wheatgrass  
 Slender wheatgrass  
 Standard crested wheatgrass  
 Sulcata sheep fescue  
 Tall wheatgrass\*  
 Winter rye\*

Forbs:

American vetch\*  
 Bouncing-bet  
 Bramble vetch\*  
 Common cowparsnip\*  
 Cutleaf balsamroot  
 Eaton penstemon\*  
 German iris\*  
 Gooseberryleaf globemallow\*  
 Lewis (or blue) flax

Louisiana sagebrush\*  
 Low penstemon\*  
 Nevada showy goldeneye  
 Nuttall lomatium  
 Palmer penstemon\*  
 Parry goldenrod\*  
 Sicklepod milkvetch  
 Sidehill penstemon\*  
 Silky lupine\*

Small burnet  
 Stream globemallow\*  
 Sweetanise\*  
 Tall milkvetch\*  
 Tarragon sagebrush\*  
 Thicketleaf penstemon\*  
 Toadflax penstemon\*  
 Wasatch penstemon\*  
 Cushion eriogonum\*

Shrubs:

Apache-plume\*  
 Arizona cypress\*  
 Black common chokecherry\*  
 Black sagebrush  
 Blueberry elder\*  
 Boxelder\*  
 Common bladdersenna\*  
 Common lilac\*  
 Creeping barberry\*

Desert bitterbrush\*  
 Desert peachbrush\*  
 Dwarf rabbitbrush\*  
 Fringed sagebrush\*  
 Gambel oak\*  
 Gardner saltbush\*  
 Longflower snowberry\*  
 Martin ceanothus\*  
 Mountain snowberry\*

Nevada ephedra\*  
 New Mexican forestiera\*  
 Oldman wormwood (stem cut-  
 tings)\*  
 Parry rabbitbrush\*  
 Peking cotoneaster\*  
 Purpleosier willow\*  
 Redberry elder\*  
 Rocky Mountain sumac\*

Table 1. Continued

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Alternate Species for Mountain Brush Associations

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Shrubs: (continued)

Rocky Mountain juniper\*

Roundleaf buffaloberry\*

Russian-olive\*

Siberian peashrub\*

Silver buffaloberry\*

Skunk bush sumac\*

Squaw apple\*

Tatarian honeysuckle\*

Utah serviceberry

Western virginsbower\*

Winterfat\*

Wyeth eriogonum

Yellowbrush

Table 2 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed aspen and associated conifers, characterized by mountain snowberry, slender wheatgrass, mountain brome and sticky geranium. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Shade	Openings	Alternate Species	
-Pounds per acre-				
<b>Grasses:</b>			<b>Grasses:</b>	
Smooth brome (equal portions of northern and southern strains)	4	4	Bearded wheatgrass	Nodding brome
Orchardgrass (Intermountain area)	2	1	Blue wildrye	Slender wheatgrass
Tall oatgrass	2	1	Fairway crested wheatgrass	Subalpine brome
Intermediate wheatgrass	0	2	Meadow brome	Thurber fescue
Mountain brome	1	1		
Meadow foxtail	1	1		
Kentucky bluegrass	1/2	1/2		
<b>Forbs:</b>			<b>Forbs:</b>	
Alfalfa	0	1	Alpine leafybract aster	Pacific aster
Chickpea milkvetch	0	1	American vetch	Porter ligusticum
Mountain lupine	2	1	Bramble vetch	Small-leaf angelica
Silky lupine	1	1	Butterweed groundsel	Smooth aster
Common cowparsnip	1	0	Colorado columbine	Spreading sweetroot
Sweetanise	1	1	Engelmann aster	Sticky geranium
Showy goldeneye	1/2	1/2	Low goldenrod	Thickleaf peavine
			Nettleleaf giant hyssop	Utah peavine
			Northwestern painted-cup	Vegetable-oyster salsify
			Oregon checkermallow	

Table 2 . Continued

Species	Shade	Openings	Alternate Species	
	-Pounds per acre-			
Shrubs:			Shrubs:	
Antelope bitter brush	0	1	Big sagebrush	Creeping barberry
Mountain snowberry	1	1/2	Bigtooth maple	Redberry elder
Rubber rabbitbrush	1	1/2	Blueberry elder	Woods rose
Totals	18	18		

Table 3 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed wet and semi-wet meadows. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Semi-wet soil		Wet soil		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Semi-wet	Wet
-Pounds per acre-						
Grasses:					Grasses and Sedges:	
Reed canarygrass	4	2	8	4	Great Basin wildrye	Meadow barley
Meadow foxtail	3	1 1/2	2	1	Kentucky bluegrass	Ovalhead sedge
Redtop	1	1/2	1	1/2	Meadow barley	Tufted hairgrass
Smooth brome (northern strain)	3	1 1/2	0	0	Ovalhead sedge	
Timothy	1	1/2	1	1/2		
Forbs:					Forbs:	
Alsike clover	1	1/2	3	1 1/2	Alpine leafybract aster	Edible valerian
Strawberry clover	2	1	3	1 1/2	Pacific aster	Pacific aster
Black medick	2	1	0	0		
Oregon checkermallow	2	1	0	0		
Totals	19	9 1/2	18	9		

Table 4 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Inland Saltgrass Associations, characterized by inland saltbrush, alkali sacaton, nuttall alkaligrass and creeping wildrye. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Wet Lands		Dry Lands		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
-Pounds per acre-					
<b>Grasses:</b>					<b>Grasses:</b>
Russian wildrye	4	2	4	2	Alkali sacaton
Tall wheatgrass	2	1	1	1/2	Bluestem wheatgrass
Fairway crested wheatgrass	0	0	2	1	Slender wheatgrass
Tall fescue	2	1	0	0	Meadow foxtail
Great Basin wildrye	2	1	2	1	Quackgrass
<b>Forbs:</b>					<b>Forbs:</b>
Yellow sweetclover	4	2	4	2	Alfalfa (creeping strain or Ladak)
Strawberry clover	2	1	1	0	Black medick
Pacific aster	1	1/2	1	1/2	Fivehook bassia
					Belvedere summer cypress
<b>Shrubs:</b>					<b>Shrubs:</b>
Gardner saltbush	3	1 1/2	3	1 1/2	American plum
Fourwing saltbush	0	0	4	2	Russian-olive
					Black greasewood
					Silver buffaloberry
					Purpleosier willow
					Tatarian honeysuckle
<b>Totals</b>	<b>20</b>	<b>10</b>	<b>21</b>	<b>10 1/2</b>	Rubber rabbitbrush
					Winterfat

Table 5 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Shadscale Associations. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Application		Alternate Species
	Broadcast	Drilled	
<b>Grasses:</b>			<b>Grasses:</b>
Russian wildrye	1 1/2	1	Alkali sacaton
Fairway crested wheatgrass	1 1/2	1	Bottlebrush squirreltail
Standard crested wheatgrass	1 1/2	1	Salina wildrye
Indian ricegrass	1 1/2	1	
<b>Forbs:</b>			<b>Forbs:</b>
Gooseberryleaf globemallow	1 1/2	1	Lewis (or blue) flax
Alfalfa	1 1/2	1	
<b>Shrubs:</b>			<b>Shrubs:</b>
Winterfat	1 1/2	1	Big sagebrush
Fourwing saltbush	1 1/2	1	Black sagebrush
			Bud sagebrush
			Fringed sagebrush
<b>Totals</b>	<b>12</b>	<b>8</b>	

Table 6 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Blackbush Associations, characterized by blackbush, creosotebush, Joshua tree, red brome and galleta grass. Also included are acceptable alternatives, if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Application		Alternate Species
	Broadcast	Drilled	
-Pounds per acre-			
<b>Grasses:</b>			<b>Grasses:</b>
Pubescent wheatgrass	2	1	Alkali sacaton
Intermediate wheatgrass	2	1	Orchardgrass (Mediterranean type)
Fairway crested wheatgrass	1	1/2	Bluestem wheatgrass
Sand dropseed	1	1/2	Standard crested wheatgrass
<b>Forbs:</b>			<b>Forbs:</b>
Alfalfa	2	1	Alfileria
Small burnet	3	1 1/2	German iris
Gooseberryleaf globemallow	1	1/2	Lewis flax
<b>Shrubs:</b>			<b>Shrubs:</b>
Fourwing saltbush	5	2 1/2	Antelope bitterbrush
Winterfat	3	1 1/2	Apache-plume
			Cliffrose
			Desert bitterbrush
<b>Totals</b>	<b>20</b>	<b>10</b>	

Table 7. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Subalpine Herblands and Aspen Openings, characterized by redberry elder, western yarrow, Letterman needlegrass and mountain brome. Also included are acceptable alternates if seed for a plant species is not available. Alternates marked with an asterisk(\*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Well drained soils		Moist soils		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Well drained Soils	Moist Soils
<b>Grasses:</b>						
Smooth brome (northern strains)	3	1 1/2	4	2	Bearded wheatgrass	Kentucky bluegrass
Smooth brome (southern strains)	3	1 1/2	4	2	Hard sheep fescue	Meadow barley
Intermediate wheatgrass	1	1/2	0	0	Kentucky bluegrass	Meadow brome
Meadow foxtail	1	1/2	2	1	Slender wheatgrass	Ovalhead sedge
Subalpine brome	1	1/2	1	1/2	Sulcata sheep fescue	Timothy
Tall oatgrass	1	1/2	0	0	Timothy	
Orchardgrass (Intermountain area)	1	1/2	0	0		
Mountain brome	1	1/2	0	0		
Reed canarygrass	0	0	2	1		
<b>Forbs:</b>						
Alfalfa (creeping type or Ladak)	1	1/2	1	1/2	Lewis (or blue) flax	Alpine leafybract aster
Mountain lupine	2	1	2	1	Nuttall lomatium	Fat solomon-plume
Common cowparsnip	0	0	1	1/2	Oneflower	Low goldenrod
Sweetanise	1	1/2	1	1/2	helianthella	Pacific aster
Chickpea milkvetch	2	1	0	0	Oregon fleabane	Edible valerian
					Porter ligusticum	
					Showy goldeneye	
					Silky lupine	
					Smooth aster	

Table 7 . Continued

Species	<u>Well drained soils</u>		<u>Moist soils</u>		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Well drained Soils	Moist Soils
Shrubs:						
Mountain snowberry	1	1/2	0	0	Big sagebrush	Bush cinquefoil
Yellowbrush	1	1/2	0	0	Bush cinquefoil	Geyer willow
					Parry rabbitbrush	Scouler willow
					Redberry elder	Silver sagebrush
Totals	20	10	18	9	Rubber rabbitbrush	
					Silver sagebrush	
					Squaw currant	
					Sticky currant	
					Woods rose	
					Wyeth erlogonum	

Table 8 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Black Greasewood Association, characterized by black greasewood, shadscale saltbush, Gardner saltbush, bottlebrush, squirreltail and alkali sacaton. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Wet to moist soils with high water table.		Dry soils with low water table.		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
	-Pounds per acre-				
<b>Grasses:</b>					<b>Grasses:</b>
Tall wheatgrass	3	1 1/2	1	1/2	Alkali sacaton
Fairway crested wheatgrass	1	1/2	3	1 1/2	Bluestem wheatgrass
Pubescent or intermediate wheatgrass	1	1/2	1	1	Bottlebrush
Reed fescue	2	1	0	0	squirreltail
Russian wildrye	2	1	4	2	
Quackgrass <sup>1</sup>	2	1	2	1	
<b>Forbs:</b>					
Strawberry clover	1	1/2	0	0	
Yellow sweetclover	3	1	2	1	
<b>Shrubs:</b>					<b>Shrubs:</b>
Fourwing saltbush	1	1/2	2	1	Big sagebrush
Gardner saltbush	1	1/2	1	1/2	Russet buffaloberry
Rubber rabbitbrush	1/2	1/4	1	1/2	Russian-olive
Winterfat	0	0	1	1/2	Yellowbrush
<b>Totals</b>	<b>17 1/2</b>	<b>8 1/4</b>	<b>18</b>	<b>9 1/2</b>	

<sup>1</sup> Not recommended if site is near agricultural areas onto which it might spread.

Table 9. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Big Sagebrush Associations, characterized by big sagebrush, rubber rabbitbrush, Nevada ephedra, bluebunch wheatgrass, and Indian ricegrass. Also included are acceptable alternatives if seed for a plant species is not available. Alternates marked with an asterisk (\*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Precipitation less than 11 inches		Precipitation 11 inches or more		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
<b>Grasses:</b>					
Fairway crested wheatgrass	3	2	4	2	Alkali sacaton*
Standard crested wheatgrass	2	1	0	0	Bottlebrush squirreltail
Bearded bluebunch wheatgrass	1/2	1/2	1	1/2	Bulbous barley*
Bluestem wheatgrass	1/2	1/2	1	1/2	Bulbous bluegrass*
Intermediate wheatgrass	1/2	1/2	1	1	Great Basin wildrye
Pubescent wheatgrass	1/2	1	1	1	Hard sheep fescue*
Russian wildrye	1	1	1	1	Indian ricegrass
<b>Forbs:</b>					
Alfalfa (Rambler, Nomad or Ladak - equal amount of each)	1	1	1	1	Bouncing-bet*
Utah sweetvetch	0	0	1/2	1/2	Cushion eriogonum*
Arrowleaf balsamroot	1/2	1/4	1/2	1/2	Cutleaf balsamroot*
Small burnet	0	0	1/2	1/2	Eaton penstemon*
<b>Shrubs:</b>					
Fourwing saltbush	1	1/2	1	1/2	Gooseberryleaf globemallow*
Rubber rabbitbrush	1/2	1/2	1/2	1/2	Lewis flax
<b>Totals:</b>					
	11	8-3/4	13	9-1/2	Louisiana sagebrush*
					Nevada lupine*
					Nevada showy goldeneye*
					Oneflower helianthella*
					Pacific aster*
					Palmer penstemon*
					Showy goldeneye*
					Silky lupine*
					Smooth aster*
					Vegetable-oyster salsify*
					Wasatch penstemon*
					Sicklepod milkvetc

Table 9 . Continued

Species	Precipitation less than 11 inches		Precipitation 11 inches or more		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
<b>Shrubs:</b>					
Shrubs for separate planting in major disturbance areas - pits, tractor cleat marks, and dozer scalps:					
Antelope bitterbrush	2	1	3	2	Big sagebrush
Cliffrose or desert bitterbrush	1	1/2	1-1/2	1	Black sagebrush
Fourwing saltbush	2	2	2	2	Bud sagebrush*
Utah serviceberry	1	1	1	1	Desert peachbrush*
Winterfat	1-1/2	1	1	1	Douglas rabbitbrush
					Gardner saltbush*
					Green ephedra
					Longflower snowberry*
Totals:	7-1/2	5-1/2	8-1/2	7	Martin ceanothus*
					Nevada ephedra
					Rocky Mountain smooth sumac*
					Spineless hopsage*
					Spiny hopsage*
					Squaw-apple*
					Wyeth eriogonum*

Table 10. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed Pinyon-Juniper Associations, characterized by green ephedra, big sagebrush, antelope bitterbrush, bluebunch wheatgrass, and Sandburg bluegrass. Also included are acceptable alternatives if seed for a plant species is not available. Alternatives marked with an asterisk (\*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species Mixture	Lower elevation (Precipitation less than 12 in.)		Upper elevation (Precipitation 12 in. or more)		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
<b>Grasses:</b>					
Fairway crested wheatgrass	4	2	3	1-1/2	Grasses:
Standard crested wheatgrass	1	1	1	1/2	Bearded or beardless blue-bunch wheatgrass
Bluestem wheatgrass	1	1/2	0	0	Bottlebrush squirreltail
Intermediate wheatgrass	1	1/2	1	1	Bulbous barley
Pubescent wheatgrass	1	1/2	1	1	Bulbous bluegrass
Russian wildrye	1	1/2	1	1/2	Great Basin wildrye
Smooth brome (southern strain)	0	0	1	1	Hard fescue
					Indian ricegrass
					Meadow brome*
<b>Forbs:</b>					
Alfalfa ( Rambler, Nomad, Travois, or Ladak - equal amount of each	1	1	2	1	<b>Forbs:</b>
Chickpea milkvetch	0	0	1	1/2	Lewis flax
Utah sweetvetch	1	1/2	1	1/2	Nevada showy goldeneye
Yellow sweetclover	1	1/2	1	1/2	Nuttall lomatium
Arrowleaf balsamroot	1	1/2	1	1/2	Pacific aster
Small burnet	1	1	1	1	Showy goldeneye
					Eaton penstemon*
					Gooseberryleaf globe- mallow*
					Louisiana sagebrush*
					Nevada lupine*
					Bouncing-bet*
					Bramble vetch*
					German iris*
					Mountain ryegrass
					Orchardgrass
					Sheep fescue
					Siberian wheatgrass
					Sulcata sheepshead
					Tall wheatgrass
					Winter rye
					Cutleaf brome
					Sicklepod
					Oneflower
					helianthus
					Palmer persimmon
					Parry goldeneye
					Silky lupine
					Small aster
					Tarragon
					Thickleaf
					Toadflax
					Vegetable
					salsify
					Wasatch p

Table 10 . Continued

Species Mixture	Lower elevation (Precipitation less than 12 in.)		Upper elevation (Precipitation 12 in. or more)		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
<b>Shrubs:</b>					<b>Shrubs:</b>
Big sagebrush	1	1/2	1	1/2	Nevada ephedra
Black sagebrush	1	1/2	1	1/2	Littleleaf mountain-
Rubber rabbitbrush	1	1/2	1	1/2	mahogany
Winterfat	1	1/2	1	1/2	Squaw-apple
Fourwing saltbush	1	1	1	1	Tatarian honeysuckle
					Apache-plume*
<b>Totals:</b>	19	11-1/2	20	12-1/2	Arizona cypress*
					Black common chokecherry*
<b>Shrubs for pits, major disturb-</b>					Blueberry elder*
<b>ance areas, and tractor cleat</b>					Common lilac*
<b>marks by dribblers:</b>					Desert peachbrush*
Antelope bitterbrush	2	1	3	2	Fringed sagebrush*
Cliffrose or desert bitterbrush	1	1/2	0	0	Gardner saltbush*
Fourwing saltbush	2	2	1-1/2	1	
Utah serviceberry	1	1/2	0	0	
Green ephedra	1	1/2	1	1	
Birchleaf mountain-mahogany	1	1/2	1-1/2	1	
Curleaf mountain-mahogany	1	1/2	1-1/2	1	
Woods rose	0	0	1	1	
Golden currant	0	0	1/2	1/4	
<b>Totals:</b>	9	5-1/2	10	7-1/4	

Longflower snowbe  
 Martin ceanothus\*  
 Mountain snowberr  
 Peking cotoneaste  
 Rocky Mountain  
 smooth sumac  
 Roundleaf buffalo  
 berry  
 Russian-olive\*  
 Siberian peashrut  
 Skunk bush sumac\*  
 Spineless hopsage  
 Spiny hopsage\*  
 Wyeth eriogonum\*