

AQUARIUS PAINTBRUSH
(Castilleja aquariensis)

CONSERVATION AGREEMENT AND STRATEGY



CASTILLEJA AQUARIENSIS

U.S. Forest Service, Intermountain Region
U.S. Fish and Wildlife Service, Mountain-Prairie Region

I. INTRODUCTION

The U.S. Forest Service is required to manage the species that are found on National Forest System lands. The Secretary of Agriculture's Policy on Fish and Wildlife, Department Regulation 9500-4 (DR 9500-4), directs the Forest Service to:

1. Manage "habitats for all existing native and desired non-native plants, fish and wildlife species in order to maintain at least viable populations of species."
2. Habitats must be provided for the number and distribution of reproductive individuals to ensure the continued existence of a species generally throughout its current geographic range.

The Forest Service has recognized the need to implement special management direction for rare species on the lands it administers. Such species may be designated as sensitive by the Regional Forester. The objectives of management for such species are to ensure their continued viability throughout their range on National Forest System lands and to ensure that they do not become threatened or endangered because of Forest Service actions (FSM 2670.22). To meet these management objectives conservation strategies are prepared that will enable the Forest Service to initiate management strategies to ensure the continued long-term survival of sensitive species on National Forest System lands.

Aquarius paintbrush is designated as a sensitive species by Region 4 of the U.S. Forest Service. Sensitive species are those plant and animal species identified by a Regional Forester for which population viability is a concern. It is also included on the U.S. Fish and Wildlife Service Notice of Review (58 FR 51144) as a Category 1 species. Species assigned to Category 1 are those for which there is substantial information to support proposals to list as threatened or endangered under the Endangered Species Act.

In 1992, U.S. Fish and Wildlife Service reached a settlement agreement with the plaintiffs in a lawsuit (Fund for Animals v. Lujan) brought about to force the immediate consideration of listing of the species on the Category 1 list. As a result of the settlement, Fish and Wildlife Service is required to propose or make "not warranted" findings for all current Category 1 species in the *Federal Register* no later than September 1996.

The objective of this conservation strategy is to provide guidelines to ensure the future survival of *C. aquariensis* on National Forest lands. Special management is needed, owing to the narrow geographic range, limited numbers of the species, and vulnerability to intensive grazing. This document summarizes available knowledge concerning *C. aquariensis* and identifies management practices to conserve the species. This conservation strategy will be updated as new information is obtained.

II. BIOLOGICAL AND GEOGRAPHICAL INFORMATION

A. Nomenclature and Description

Aquarius paintbrush belongs to the genus *Castilleja*, family Scrophulariaceae. This species is a perennial with unbranched stems, linear leaves and yellow bracts subtending the flowers (Holmgren 1975). The following is a detailed description of the plant taken from Welsh et al. (1994) and Cronquist et al. (1984):

Herbaceous perennial herb, 1.2-3.0 dm tall; stems ascending to erect, unbranched, 1 to several, pubescence short, irregular in length, often blue-purple; leaves 1-4.5 cm long, 1-5 mm wide, linear-lanceolate, entire, finely and evenly pubescent, mostly cauline, appressed ascending and longer than the internodes; inflorescence villous-glandular pubescent, pale yellow; bracts broadly lanceolate to ovate, lower ones entire, upper ones with 1-2 pair of small lateral lobes departing from near the rounded apex; calyx 1.5-2.0 cm long, subequally cleft, deeper in front than in back; corolla 1.3-2.0 cm long; the galea 5-8 mm long; capsule 7-10 mm long; seeds ca 100.

Aquarius paintbrush was first collected in 1905 by Rydberg and Carlton. The location given on the label was "Aquarius Plateau." This collection was originally classified as *Castilleja sulphurea*. Another collection was made by Maguire in 1940. The location was given as Sage Park, 8 km north of Cyclone Lake. This area is not shown on any maps and has not been relocated. Aquarius paintbrush was described as a distinct species in 1973 by Noel Holmgren (1973). The type location is 1/2 mile north of the Clayton Spring Guard Station on the Bicknell-Escalante road.

B. Status

The present status of *Castilleja aquariensis* according to concerned federal, state and private agencies is as follows:

USFWS: Category 1-Taxa for which the U.S. Fish and Wildlife Service has on file substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species (58 FR 51144).

USFS: Sensitive in Region 4-Those species identified by the Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population number or density, and/or b) significant current or predicted downward trends in habitat capability that would reduce a species existing distribution (FSM 2670.19). Species are rated using the following categories to help determine whether they meet the definition for a sensitive species: global rarity, population size, ecological amplitude, habitat loss, downward trend, regulatory mechanisms, taxonomic uniqueness, management responsibility and reproductive potential.

STATES: Utah: No status assigned
S2 (Utah Natural Heritage Program) Imperiled because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction.

The
Nature

Conservancy: G2 Imperiled globally because of rarity or because of other factors demonstrably making it very vulnerable to extinction.

C. Geographical Distribution and Population Information

Aquarius paintbrush (*Castilleja aquariensis*) is an endemic species confined to the Aquarius Plateau and Boulder Mountain of south-central Utah. All known habitat is found on the Teasdale and Escalante Ranger Districts of the Dixie National Forest (Boulder Mountain is in the NE portion of the Aquarius Plateau). The Utah Natural Heritage Program has identified 52 elemental occurrences of Aquarius paintbrush across the Aquarius Plateau and Boulder Mountain (Tuhy 1991). These occurrences range in size from historic and possibly extirpated populations, to populations containing as many as 12,000 individuals. The total number of individual plants is estimated at 45,000.

D. Habitat

The majority of occupied habitat on the Aquarius Plateau consists of small to extensive open meadows dominated by silver sagebrush-sheep fescue interspersed with aspen-conifer forest patches. The soils in the area are deep and well drained. They are grayish-brown loams formed from glacial till and residuum derived from Tertiary volcanic rocks. Populations on the Aquarius Plateau are found at elevations from 9,150-10,500 feet (2,790-3,200 m). Plants associated with Aquarius Paintbrush include *Artemisia cana*, *Festuca ovina*

Antennaria rosulata, *Cymopterus lemmonii*, *Penstemon procerus*, *Potentilla concinna*, *Potentilla hippiana* and *Taraxacum officinale* (Tuhy 1991).

Aquarius paintbrush is found in two slightly differing habitats on Boulder Mountain. The first is a dry meadow community dominated by sheep fescue and forbs. This habitat is similar to the meadow habitat of the paintbrush on the Aquarius Plateau except for the complete absence of silver sagebrush. The soils in this habitat are deep and well drained. They are formed from deposits of glacial drift and alluvium derived from late Tertiary basalt and basaltic andesite. The soils are a brown to grayish brown loam and gravelly loam. Plants commonly associated with Aquarius Paintbrush in this habitat are *Festuca ovina*, *Achillea millefolium*, *Cymopterus lemmonii*, *Geum triflorum*, *Penstemon procerus*, *Potentilla concinna* and *Taraxacum officinale* (Tuhy 1991).

Aquarius paintbrush also occurs in small to moderate sized openings in spruce forests on Boulder Mountain. The soils in this habitat type are similar to those found in the meadow habitats on the rest of Boulder Mountain. The main difference between this habitat and the other on Boulder Mountain is the plants are sometimes found in the understory of open spruce forests. Other common species in these areas include *Castilleja miniata*, *Festuca ovina*, *Helenium hoopesii*, *Penstemon procerus*, *Penstemon whippleanus*, *Picea engelmannii*, *Potentilla fruticosa* and *Ribes montigenum* (Tuhy 1991). Populations on Boulder Mountain range in elevation from 10,500-11,322 feet (3,200-3,451 m).

The largest populations of Aquarius paintbrush grow in areas that appear to have the lightest grazing intensity. Tuhy (1991) found that the areas where paintbrush was most abundant had good species diversity and ground cover, with little of the pedestalling common on Boulder Mountain. One of the most robust populations of Aquarius paintbrush is found in the South Point area. This area receives little use by cattle and the vegetation in this area displays more pristine characteristics than any other area on Boulder Mountain (Whittekiend 1992).

E. Life History

Little is known about the life history of Aquarius paintbrush. Most of the research done to date has concentrated on finding the plants, delineating the species populations, and determining how they are affected by grazing.

The species is a herbaceous perennial. The longevity of the plant is unknown. Plants begin to appear shortly after snowmelt emerging from the overwintering root. The growing plants are very difficult to locate until the first floral buds are formed, usually around the middle of June. Flowers of the inflorescences are fully developed around the beginning of July. The inflorescences continuously produce until the middle of August. Fruits begin maturing around the end of July and seed dispersal begins the middle of August. Each capsule produces approximately 100 small seeds, which are believed to be scattered by the wind. Aquarius paintbrush is not known to have any vegetative means of reproduction.

Some work has been done on the reproduction methods of Aquarius paintbrush by Agricultural Research Service Bee Biology and Systematics Lab at Utah State University. The initial results indicate that the plant is completely self-incompatible and only cross-pollinated flowers set fruit and produced seeds. There was also some indication that pollinators may be in short supply, which could limit fruit set (Tepedino pers. comm.).

The primary pollinators are bumblebees (*Bombus* sp.). There may be other secondary pollinators, however, they are not believed to be effective carriers of pollen because they are not able to reach into the flower and collect the pollen (Tepedino pers. comm.).

III. THREATS TO THE SPECIES

A. Domestic Livestock Grazing

Livestock grazing is believed to be the largest single threat to the continued survival of Aquarius paintbrush. Whittekiend (1992), Tuhy (1991) and Atwood (1989) felt that continued grazing at the level they observed would result in a loss of population viability. Aquarius paintbrush habitat is found in a number of grazing allotments on the Aquarius Plateau and Boulder Mountain. These include Dark Valley (1107 cattle), Coyote (1229 cattle), Pine Creek (618 cattle), Boulder (674 cattle), Pollywog/Government Point (1393 sheep), Antelope Spring/Donkey Point (1437 sheep) and Lake Philo/Surveyor Lake (1312 sheep). The paintbrush habitat on the Boulder allotment is only lightly grazed because of the difficulty of moving livestock into the area (Breeze-Orton pers. comm.).

Much of the grazing on Aquarius paintbrush appears to take place after domestic livestock enter the allotments (Whittekiend 1992, Tuhy 1991, Atwood 1989). Most of the grazing systems currently in place do not offer adequate protection for Aquarius paintbrush. A deferred rotation grazing system was recently put into place for Pine Creek allotment on the Escalante Ranger District, that allows the pastures that contain paintbrush to be grazed after seed set every other year. The plants in the other allotments are often grazed before seedset every year and are not able to successfully reproduce. Plants are scarce and scattered in the sheep allotments on the Aquarius Plateau and on Boulder Mountain. Because sheep tend to favor forbs, they use the plant more heavily than cattle.

B. Wildlife Grazing

Mule deer, Rocky Mountain elk and pronghorn antelope are the large wild ungulates found on Boulder Mountain and the Aquarius Plateau. All three species have been observed feeding on Aquarius paintbrush plants.

1. Mule Deer

The mule deer herd found on the Aquarius Plateau and Boulder Mountain is fairly small. All of the Aquarius paintbrush habitat is located within deer summer range. Very few deer use Boulder Mountain as summer range due to the high elevation and short growing season. Most deer on Boulder Mountain are found on the edges.

Use of Aquarius paintbrush by deer is limited due to the small numbers of deer. Deer numbers in the area have been declining due to drought, winter and summer range succession and depredation hunts on agricultural land. However, if populations increase in the future, use of the paintbrush by deer will also undoubtedly increase.

2. Pronghorn Antelope

Since their re-introduction 20 years ago, the pronghorn antelope population has been increasing. The current antelope population is estimated at 1500 to 1800 animals. Antelope are generally found on the Aquarius Plateau, however in 1991 and 1992 they were seen on Boulder Mountain. The sightings on Boulder Mountain were believed to be a result of the drought and not a permanent expansion of antelope summer range. The antelope may have been looking for areas with more abundant forage.

Antelope feed primarily on shrubs such as big sagebrush and bitterbrush, but they do make use of forbs when present. Tuhy (1991) was concerned that antelope using Boulder Mountain would add increased grazing pressure to the plants found there. He also felt that antelope would have the largest impact of the three large native ungulates. Whittekiend (1992) did not find that they were having a large impact.

3. Rocky Mountain Elk

Elk were re-introduced to the east slope of Boulder Mountain in 1977. In the time since, the herd has grown to around 900 animals. As the herd has grown, they have expanded to the Aquarius Plateau and are beginning to make use of the top of Boulder Mountain.

Elk tend to make use of forbs in the spring and they have been observed using the paintbrush. With the present numbers, elk are not believed to be a threat to Aquarius paintbrush (Whittekend 1992, Tuhy 1991). According to the Boulder Mountain elk herd plan, completed in 1993, the herd will be maintained at current population numbers.

C. Roads and Logging

Road building associated with timber harvest and recreation use may impact Aquarius paintbrush. Most of the roads on Boulder Mountain have been established after a logging truck drove through a meadow. Informal road construction (i.e. logging trucks driving through meadows) is still ongoing, with some roads threatening isolated populations of paintbrush. In other cases, forest users may drive around a rough spot in a road creating a new track which then becomes established. These new alternate routes may also threaten paintbrush populations close to roads.

Construction or reconstruction of roads through meadows could divide or remove local populations of Aquarius paintbrush. As a result, large populations may become increasingly fragmented and small populations may be lost. Log decking areas in meadows may also affect small populations, if logs are stacked on plants.

D. Recreation

Recreation activities are a growing threat to Aquarius paintbrush. Off highway vehicles are creating new roads and trails across Boulder Mountain. These new trails and roads may destroy individual plants and divide populations. Dispersed camping may also impact the plant. Camping is increasing on Boulder Mountain and some campsites are located within populations of Aquarius paintbrush. These populations are then subjected to trampling by the recreationists using the area.

IV. CONSERVATION STRATEGY

A. Goals

The primary goal of this document is to provide direction that will lead to long-term protection of Aquarius paintbrush, while minimizing conflict with other resource values and land management activities. This will help to ensure that federal actions do not contribute to loss of viability or permanent degradation of habitat, resulting in a need for federal listing.

To achieve the above goals the following objectives have been defined. If these objectives are met, management of Aquarius paintbrush populations will be in line with the stated goals.

1. Determine the life history and biological needs to maintain or improve population viability of Aquarius paintbrush.
2. Move Aquarius Paintbrush habitat to a mid to late seral stage.
3. Monitor populations to determine current trends and determine the effectiveness of management plans in maintaining or improving viability of populations.

4. Revise land management plans and incorporate the conservation strategy into the Dixie National Forest Land and Resource Management Plan.

B. Objectives

1. Determine the life history and biological needs to maintain or improve population viability of *Aquarius* paintbrush.

There are several aspects of the life history and biological needs of *Aquarius* paintbrush that need to be studied. These include seed set, viability and longevity, genetic variability within and between populations and pollinator biology and density. In addition, several populations should be protected from grazing using exclosures to study demographics and plant longevity.

a. Seed Set, Viability and Longevity.

Seeds that receive lethal genes will abort and cease development. If a large number of seeds are not developing, it may indicate that there are a lot of lethal genes in the population as a result of inbreeding or genetic drift. If seeds are getting genes that are not lethal, but decrease the fitness of the seed, they may not germinate or may not survive long after germination. Seed longevity is important in creating a buffer or "seed bank" to protect populations from stochastic events. All of these aspects of seed biology will be determined.

b. Genetic Variability.

In a large population, a great deal of genetic variability is expected. As populations get smaller or more isolated, genetic variability can be lost due to inbreeding and genetic drift. As populations become reproductively isolated, they become more vulnerable to lethal and sub-lethal genes. Eventually, small populations can be lost due to decreased viability and fertility. Studies of genetic variability within and between populations of *Aquarius* paintbrush will give an idea whether variability is being lost and if there needs to be intervention by managers to increase genetic variability.

c. Pollinator Biology and Density

Knowledge of the pollinator's biology is essential to managing *Aquarius* paintbrush. Because it is an obligate outcrosser and dependant on a pollen vector, preservation of the principle pollinator is essential to the continued long-term viability of *Aquarius* paintbrush. Utah State University will be studying the pollinators to determine the primary pollinator and its biology.

d. Population Demography and Plant Longevity

This will be an extension of the monitoring studies already underway. Local populations will be mapped using Global Positioning Systems for input into the Geographic Information System on the Dixie National Forest. Accurately mapped locations along with estimates of population numbers will aid in tracking population increases or decreases. Efforts to locate new populations will continue. Intensive monitoring of populations excluded from grazing will continue and additional populations will be protected from grazing. Tagged plants will be revisited to determine the longevity of individual plants.

2. Move *Aquarius* paintbrush habitat to a mid to late seral stage.

This will involve managing the use by ungulates on the vegetation in *Aquarius* paintbrush habitat. Heavy grazing by domestic livestock can change species composition in mountain meadows, such as the ones the paintbrush is found in. Changes in composition induced by heavy grazing usually favor lower seral stage species. Tuhy (1991) and Whittekiend (1992) found that large populations were usually found in communities that appeared to be in better condition ecologically.

Range trend and analysis transects are in place within paintbrush habitat. These transects should be read on a continuing basis. If the trend is downward or the plant community is at a low seral stage, steps will be taken to reverse the trend or change the seral stage. These steps may include changing the rotation for domestic livestock, delaying grazing within paintbrush habitat until seedset and/or reducing the number of wild ungulates through hunting.

3. Monitor populations to determine current trends and determine the effectiveness of management plans in maintaining or improving viability of populations.

A monitoring plan has been prepared in conjunction with this conservation strategy. This plan has been reviewed by experts from U.S. Forest Service, U.S. Fish and Wildlife Service and universities. When fully implemented, this plan will enable the Forest Service to closely follow population trends and effects of management on Aquarius paintbrush. The monitoring plan is included in Appendix 1.

4. Revise land management plans and incorporate the conservation strategy into the Dixie National Forest Land and Resource Management Plan.

a. Domestic Livestock Grazing

As stated above, most of the existing grazing rotations in paintbrush habitat do not provide adequate protection for Aquarius paintbrush. Pastures with paintbrush present or with habitat should be rested or deferred from domestic livestock grazing until after seed set (around August 15th) one year in three (Whittek-iend 1992). This should give paintbrush plants the opportunity to successfully reproduce. Any new grazing allotment management plans in an allotment with paintbrush or its habitat present will include a rest or deferred rotation. Future monitoring will indicate whether livestock numbers need to be adjusted.

b. Wildlife

Aquarius paintbrush populations will continue to be monitored before domestic livestock enter the area. If greater than 25% of the flowering plants have been grazed, then wildlife populations may need to be reduced. Forest Service botanists and biologists will need to work with the state if this becomes a problem.

As wildlife management plans are developed by the state in cooperation with the Forest Service, the Forest Service biologists will make sure that the results of monitoring are included in the planning process for determining wildlife population goals. Before big game herds are increased, the Forest Service must ensure that Aquarius paintbrush is able to maintain population viability throughout its range.

c. Roads and Logging

Roads should not be built through populations of Aquarius paintbrush. All proposed roads will be surveyed for Aquarius paintbrush and any other Threatened, Endangered, Sensitive, and Proposed plants that may occur. Roads in areas of potential habitat will be constructed to affect a minimum of the habitat. This will include building the road at the edge of the habitat, recontouring and reseeding with native species after use and designing the road to the highest and most economical standards. Roads located in meadow areas where resource damage is occurring will be obliterated and rehabilitated in compliance with the Dixie Land and Resource Management Plan. Logs will not be decked in meadows containing Aquarius paintbrush. Sale administrators will designate decking areas that won't affect meadow habitat.

d. Recreation

The Dixie National Forest is in the process of identifying roads impacting meadows on Boulder Mountain. Those roads causing damage will be closed. Boulder Mountain will also be changed to a closed unless posted open travel plan. These changes will help control the present unrestricted use on Boulder Mountain.

Camping will be restricted in areas where it will have an impact on Aquarius paintbrush. Camping should be designated in areas that will not impact paintbrush populations or its habitat.

e. Dixie N.F. LRMP

The conservation strategy will be incorporated as an amendment to the Forest Plan in FY 95. The conservation strategy will also be included in the revision of the Forest Plan due out in 1996.

V. ACTION PLAN

The following actions have been proposed to insure implementation of the conservation strategy. Actions in year one were accomplished in FY 94.

<u>Year 1</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read Monitoring plots	USFS	\$2,000
		USFWS	\$1,000
	Construct two exclosures	USFS	\$4,000
		USFWS	\$2,000
	Prepare Conservation Strategy	USFS	\$2,000
		USFWS	\$3,000
<u>Year 2</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read monitoring plots	USFS	\$2,000
		USFWS	\$1,000
	Construct two exclosures	USFS	\$6,000
		USFWS	\$6,000
	Seed Viability, Set and Longevity Study	USFS	\$ 50%
		USFWS	\$ 50%
<u>Year 3</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read monitoring plots	USFS	\$2,500
		USFWS	\$1,500
	Reconstruct one exclosure	USFS	\$5,000
		USFWS	\$5,000
<u>Year 4</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read monitoring plots established by Tuhy	USFS	\$1,500
		USFWS	\$ 500
<u>Year 5</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read monitoring plots established by Whittekiend	USFS	\$2,000
		USFWS	\$1,000
<u>Year 6</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
	Read monitoring plots established by Tuhy	USFS	\$1,500
		USFWS	\$ 500

<u>Year</u>	<u>Action</u>	<u>Responsibility</u>	<u>Cost</u>
Year 7	Read monitoring plots	USFS	\$2,000
	established by Whittekiend	USFWS	\$1,000
Year 8	Read monitoring plots	USFS	\$1,500
	established by Tuhy	USFWS	\$ 500
Year 9	Read monitoring plots	USFS	\$2,000
	established by Whittekiend	USFWS	\$1,000
Year 10	Read monitoring plots	USFS	\$1,500
	established by Tuhy	USFWS	\$ 500

VI. REFERENCES

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"General Direction" standards and guidelines found within the Dixie LRMP that provide further resource protection to Aquarius paintbrush populations:

Diversity on National Forests

Dixie LRMP IV - 25: 1,

- 1 Maintain structural diversity of vegetation on management areas that are dominated by forested ecosystems.

Dispersed Recreation Management

Dixie LRMP IV - 29: 2-4

- 2 Close or rehabilitate dispersed sites where unacceptable environmental damage is occurring.
- 3 As needed to prevent deterioration, manage dispersed recreation activities to not exceed the established ROS/PAOT/ACRE capacity. Manage use of trails in dispersed areas to not exceed the established POAT/MILE of trail guidelines. Manage dispersed areas around developed Campground facilities by those who are unwilling to pay.
- 4 Discourage camping within a minimum of 100 feet from lakes and streams unless exceptions are justified by terrain or specific design which protects the riparian and aquatic ecosystems.

Wildlife and Fish Resource Management

Dixie LRMP IV - 33: 1, 2, 2a, 5, 6, 6a, 6b, 7.

- 1 Where present, the following species are management indicator species:
 - Deer,
 - Elk, and
 - All federally-listed endangered or threatened plant and animal species that might be affected by management activities.
- 2 In addition to the above, use indicator species that represent the following categories:
- 2a Riparian and/or wetland dependent species (yellow-breasted chat).
- 5 Manage riparian ecosystems to contain adequate habitat to sustain viable populations of riparian dependent on related species.
- 6 Cooperate in the establishment of elk, pronghorn, bighorn sheep, or other suitable species, and threatened and endangered species on sites that can supply the habitat needs of the species and the population levels and distribution agreed to with the State and other concerned parties only where conflict with established uses can be established.
- 6a Maintain 40 percent or more of overhanging grasses, forbs, sedges, and shrubs along banks of streams.

- 6b Maintain 50 percent or more of total streambank length in stable condition.
- 7 Manage and provide habitat for recovery of endangered and threatened species.

Wildlife Habitat Improvement and Maintenance

Dixie LRMP IV - 34: 1b, 2, 7.

- 1b In management areas dominated by non-forested ecosystems, maintain deer and elk hiding cover as follows:

% of Unit Forested	% of Forested Area in Cover
35-50	At least 50%
20-34	At least 60%
Less than 20	At least 75%

These levels may be exceeded temporarily during periods when stands are being regenerated to meet the cover standard, or to correct tree disease, problems, in aspen stands, or where windthrow or wildfire occurred. In critical big game habitat maintain hiding cover along at least 75 percent of the edge of arterial and collector roads, and at least 60 percent along streams and rivers, where trees occur.

- 2 Improve habitat capability through direct treatments of vegetation, soil, and waters.
- 7 Manage and provide habitat for recovery of endangered and threatened species.

Range Resource Management

Dixie LRMP IV - 36: 2, 3, 4, 5.

- 2 Remove livestock from allotments for the remainder of the grazing season when proper use is reached.
- 3 Manage livestock and wild herbivores forage use by implementing allowance use guides.
- 4 Achieve or maintain satisfactory range conditions on all rangelands.
- 5 Salt blocks shall be placed so as to minimize impact upon riparian ecosystem.

Dixie LRMP IV - 37: 2

- 2 To facilitate the control of soil erosion within acceptance tolerance, soil survey or site specific soils data will be used to develop revegetation projects.

Silvicultural Prescriptions

Dixie LRMP IV - 40: 5, 6

- 5 Minimize soil surface compaction and disturbance by curtailing logging activities during periods of high soil moisture. Design skid trail system to minimize extent of area impacted.
- 6 The maximum size of openings created by the application of even-aged silviculture will be 40 acres regardless of forest cover type. Exceptions are:

- A. Proposals for larger openings are subject to a 60-day public review and are approved by the Regional Forester.
- B. Larger openings are the result of natural catastrophic conditions of fire, insect or disease attack, windstorm, or
- C. The area does not meet the definition of created openings.

Riparian Area Management

Dixie LRMP IV - 41: 1, 2, 3, 4, 4a, 4b, 5.

- 1 Special protection and management will be given to land and vegetation for a minimum of 100 feet from the edges of all perennial streams, lakes, and other bodies of water or to the outer margin of the riparian ecosystem if wider than 100 feet.
- 2 Design and implement activities in management areas to protect and manage the riparian ecosystem.
- 3 Prescribe livestock grazing systems to achieve riparian objectives.
- 4 Prescribe silvicultural systems to achieve riparian area objectives.
- 4a Maintain shade, bank stability and sediment standards as specified under Wildlife and Fish Resource Management, Standards and Guidelines.
- 4b Maintain at least 70 percent of the linear distance of all riparian ecosystems in at least an upper mid-seral successional stage.
- 5 Limit use of herbicides, insecticides, rodenticides, or other chemicals which are harmful to either the aquatic ecosystem, desired terrestrial fauna or human health. Use these chemicals only when and where possible transport to surface water has a low probability of occurrence. Follow all label requirements concerning water quality protection.

Water Resource Improvement and Maintenance

Dixie LRMP IV - 42: 1-5.

- 1 Maintain needed instream flows and protect public property and resources.
- 2 Improve or maintain water quality to meet State water quality standards. However, where the natural background water pollutants cause degradation, it is not necessary to implement improvement actions. Short-term or temporary failure to meet some parameters of the State standard, such as increased sediment from road crossing construction or water resource development may be permitted in special cases.
- 3 Evaluate all management activities within 100 feet of any spring for impacts on springflow, riparian habitat and soil disturbance.
- 4 Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover.
- 5 Limit use of herbicides, insecticides, rodenticides, or other chemicals which are harmful to either the aquatic ecosystem, desired terrestrial fauna or human health. Use these chemicals only when and where possible transport to surface water has a low probability of occurrence. Follow all label requirements concerning water quality protection.

Water Use Management

Dixie LRMP IV - 42: 1.

- 1 Maintain needed instream flows and protect public property and resources.

Mining Law Compliance and Administration

Dixie LRMP IV - 44: 1.

- 1 Minimize or, as appropriate, prevent adverse impacts on surface resources.

Minerals Management Leasables

Dixie LRMP IV - 44: 1, 1A

- 1 Leasing, permitting, or licensing of National Forest System lands will be based on site specific considerations using appropriate standards and guidelines for the management unit concerned. Criteria for these actions should minimize impacts on or conflicts with other resource uses and should return disturbed lands to planned surface resources or uses.
- 1A Forest Service authorization of geophysical exploration will include terms and conditions controlling operating methods and times to prevent or control adverse impacts on surface resources and uses.

Minerals Management Salables

Dixie LRMP IV - 45: 1

- 1 Forest Service Authorizes common variety exploration and disposal under terms and conditions to prevent, minimize or mitigate adverse impacts on surface resources and uses. The objective of reclamation requirements will be to return disturbed land to the planned uses.

Rights-of-Way and Land Adjustments

Dixie LRMP IV - 46: 2, 3, 3b, 3c, 3d.

- 2 Ensure floodplain and wetland values are approximately equal on both offered and selected tracts in proposed land exchanges or that values are in favor of the United States.
- 3 Classify lands or interest in lands for acquisition where lands are valuable for NFS purposes according to the following priorities:
 - 3b Where lands or rights-of-way are needed to meet resource management goals and objectives.
 - 3c Lands which provide habitat for threatened and endangered species of animals or plants.
 - 3d Lands which include floodplain or wetlands

Dixie LRMP - 47: 4, 4d

- 4 Classify lands for disposal according to the following priorities:
 - 4d When critical or unique resource (wetlands, floodplains, essential big game winter range, threatened or endangered species habitat, historical or cultural resources, critical ecosystems, etc.) exist. Effects are mitigated by reserving interests to protect the resource, or by exchange where other critical resources to be acquired are considered to be of equal or greater value.

Soil Resource Management

Dixie LRMP IV - 48: 1, 1d, 1e, 3, 4.

- 1 Maintain soil productivity, minimize man-caused soil erosion, and maintain the integrity of associated ecosystem.
- 1d Revegetate all areas capable of supporting vegetation, disturbed during road construction and/or reconstruction to stabilize the area and reduce soil erosion.
- 1e Prevent livestock and wildlife grazing which reduces the percent of plant cover to less than the amount needed for watershed protection and plant health.
- 3 Maintain watershed improvement structures as necessary.
- 4 Identify at the project level, upland areas that are immediately adjacent to riparian (prescription (A) management areas. Adjacent upland areas are those portions of a management area which, when subjected to management activities have a potential for directly affecting the condition of the adjacent riparian management area. The magnitude of effects is dependent upon slope steepness, and the kind, amount, and location of surface and vegetation disturbance within the adjacent upland unit.

Transportation System Management

Dixie LRMP IV - 49: 1, 2, 2A, 2C, 3, 3G

- 1 Classify areas as to whether off-road vehicle use is permitted.
- 2 Manage road use by seasonal closure if:
 - 2A Use causes unacceptable damage to soil and water resources due to weather or seasonal conditions.
 - 2C Use causes unacceptable wildlife conflict or habitat conditions.
- 3 Keep all existing, and newly constructed, roads open to public motorized use unless:
 - 3G Use conflicts with wildlife management objectives.

Dam Administration and Maintenance

Dixie LRMP IV - 52: 7, 8, 9, 10, 11.

- 7 Encourage riparian habitat by establishing vegetation on potential areas around the periphery of the impoundment.
- 8 Resolve conflicts between livestock use and recreation/water quality/wildlife in favor of the latter.
- 9 Clear merchantable and unmerchantable trees and shrubs to a line two feet above the high water line when this vegetation will later substantially interfere with water level regulation, recreation use or public safety.

- 10 Coordinate design, water rights, diversions, etc., with State laws and regulations.
- 11 Revegetate areas of exposed soils.

Vegetation Treated by Burning

Dixie LRMP IV - 55: 2

- 2 Limit use of prescribed fire on areas in or adjacent to riparian areas to protect riparian and aquatic values.

Range Resource Management

Dixie LRMP IV - 138: 2

- 2 Prohibit trailing of livestock along the length of riparian areas except where existing stock driveways occur. Rehabilitate existing stock driveways where damage is occurring in riparian areas if possible, and if necessary to achieve riparian-area goals.

Silvicultural Prescriptions

Dixie LRMP IV - 139: 1, 7

- 1 Manage Forest cover types to perpetuate tree cover and provide healthy stands, high water quality and wildlife and fish habitat.
- 7 Limit skidding equipment within the riparian area. Do not skid logs across live stream channels or wetlands.

Water Resource Improvement and Maintenance

Dixie LRMP IV - 140: 1, 3

- 1 Prevent or remove debris accumulations that reduce stream channel stability and capacity.
- 3 Prevent stream channel instability, loss of channel cross-sectional areas, and loss of water quality resulting from activities that alter vegetative cover.

Mining Law Compliance and Administration

Dixie LRMP IV - 142: 2

- 2 Locate mineral removal activities away from the water's edge or outside the riparian area.