

THE STATUS AND DISTRIBUTION OF  
CHRIST'S INDIAN PAINTBRUSH (CASTILLEJA CHRISTII) AND  
DAVIS' WAVEWING (CYMPTERUS DAVISII)  
IN THE ALBION MOUNTAINS, SAWTOOTH NATIONAL FOREST  
AND CITY OF ROCKS NATIONAL RESERVE

by

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## ABSTRACT

The Albion Mountains of Cassia County, Idaho, are an isolated massif rising over 5,000 feet above the eastern Snake River Plain. This high elevation "island" contains two endemic plants along its crest, *Castilleja christii* (Christ's Indian paintbrush) and *Cymopterus davisii* (Davis' wavewing). Due to their very restricted range, both are candidates for federal listing under the Endangered Species Act and are Intermountain Region Forest Service Sensitive Species. *Castilleja christii* occurs only on the summit of Mount Harrison at the north end of the Albion Mountains. *Cymopterus davisii* is somewhat more widespread, occurring on Mount Harrison with *Castilleja christii* and on Independence Mountain and Graham Peak at the southern end of the range.

In late July 1993, I delineated the known populations of these two species, as well as thoroughly searched potential habitat for additional populations. I found no new populations, although I greatly expanded the Independence Mountain population of *Cymopterus davisii*. The single paintbrush population occupies approximately 200 acres on the summit plateau of Mount Harrison and consists of several thousand individuals. I estimate that over 100,000 Davis' wavewing individuals occupy around 314 acres on Mount Harrison, several hundred thousand occupy at least 370 acres on Independence Mountain, and the small population on Graham Peak contains between 500-1000 individuals.

The Independence Mountain and Graham Peak populations of Davis' wavewing are isolated from any significant anthropogenic threats. Considerable disturbance has taken place on Mount Harrison and some habitat for both species has been destroyed. I make several recommendations regarding the conservation status and management of the two species.

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## INTRODUCTION

The National Forest Management Act and Forest Service policy require that Forest Service land be managed to maintain populations of all existing native animal and plant species at or above the minimum viable population level. A minimum viable population consists of the number of individuals, adequately distributed throughout their range, necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations.

The Forest Service, along with other Federal and State agencies, has recognized the need for special planning considerations in order to protect the flora and fauna on the lands in public ownership. Species recognized by the Forest Service as needing such considerations are those that (1) are designated under the Endangered Species Act as endangered or threatened, (2) are under consideration for such designation, or (3) appear on a regional Forest Service sensitive species list.

The upper elevations of the Albion Mountains are habitat for four rare plant species, *Castilleja christii* (Christ's Indian paintbrush), *Cymopterus davisii* (Davis' wavewing), *Machaeranthera laetevirens* (vivid green aster), and *Machaeranthera shastensis* var. *latifolia* (Shasta aster). The former three are candidates for federal listing under the Endangered Species Act (U.S. Fish and Wildlife Service 1990) and Intermountain Region Forest Service Sensitive Species (Spahr et al. 1991). Of particular interest are Christ's Indian paintbrush and Davis' wavewing because they are endemic to the Albion Mountains, with the paintbrush occurring only on the summit of Mount Harrison and the wavewing occurring on Mount Harrison, Independence Mountain, and Graham Peak. Recent proposals to pave the road to the summit of Mount Harrison make it imperative that the Sawtooth National Forest have precise data on the distribution and habitat of these species in order to assess the potential impacts of various road alternatives on their viability.

The primary objectives of this investigation are as follows:

- 1) Survey and delineate known populations of the four rare species in the Albion Mountains and search suitable habitat for additional populations.
- 2) Characterize habitat conditions for the populations.
- 3) Assess population data on, and threats to the existing populations and make management recommendations to the Forest based on these assessments. Particular attention was paid to areas near the Howell Canyon Road on Mount Harrison.

## RESULTS

In planning field work for this project, I anticipated doing inventories for all four plants at once, even though the two *Machaeranthera* species bloom latter than the wavewing or the paintbrush. My plan was to conduct field inventories during peak *Machaeranthera* flowering, because fruiting individuals of the other two are easy to survey for. The summer of 1993 was the coldest ever recorded for Idaho, and, even though I delayed field work from what I had originally scheduled, the asters were still in a vegetative state when I conducted my surveys during the week of July 26-30. This made it futile to search for them during my field work in the Albion Mountains in 1993.

Based on previous experience, I know that along the crest of the Albion Mountains, the *Machaeranthera* species occur on southerly, sagebrush-dominated slopes where the soil is unstable due to downslope movement. This habitat is widespread throughout the range, although it does not occur in the immediate vicinity of the road on Mount Harrison. In retrospect, it is probably better to inventory for the two *Machaeranthera* species separately because they occur in a widespread habitat. Not having done so left considerable time in 1993 to conduct a detailed search for the two Albion Mountains endemics, Christ's Indian paintbrush and Davis' wavewing. They are the rarest species and the ones most likely to be impacted by future development on Mount Harrison.

Following is the status of our knowledge of Christ's Indian paintbrush and Davis' wavewing, including information on taxonomy, habitat, distribution, conservation status, and management recommendations for each species. Sections containing line drawings, distribution maps, maps of areas searched unsuccessfully, and slides of the two species and their habitats are appended to the end of the report.

Castilleja christii N. Holmgren

TAXONOMY

Full bibliographic citation: Holmgren, N.H. 1973. Five new species of Castilleja (Scrophulariaceae) from the Intermountain Region. Bulletin of the Torrey Botanical Club 100:83-93.

Type specimen: Idaho, Cassia County, Cache Peak Range (Albion Mountains), near the top of Harrison Mountain, T13S R24E, S9, elevation 2780 m, 12 July 1966, Holmgren and Reveal 2866 (Holotype NY; Isotypes: ARIZ, BRY, C, DAO, JEPS, KANU, NCU, RSA, TENN, US, UTC, WTU) (Holmgren 1973).

Pertinent synonym(s): None.

Common name: Christ's Indian paintbrush

Size of genus: A large genus of about 200 species, occurring chiefly in western North America, but represented in eastern North America (two species), northern Asia (about five species), and Central and Andean South America (about 15 species) (Holmgren 1984).

Family name: Scrophulariaceae

Common name for family: Figwort

History of knowledge of taxon: Our knowledge of Christ's Indian paintbrush is relatively recent. John Christ first collected it in 1950, followed shortly by William Baker in 1952 (Holmgren 1973). It wasn't until Noel Holmgren and Jim Reveal collected it in 1966 and Holmgren formally described it in 1973, that it was recognized as a new species. He named it in honor of the first collector, John Christ, who has probably collected more plants in Idaho than any other person.

Conservation attention was focused on it when Bob Steele reviewed its status for the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council (1977; 1981). Duane Atwood also prepared a status report (Atwood 1984). There was a flurry of conservation activity in the mid-1980's when a management plan was developed (Atwood 1985), and a monitoring study was established (unpublished data on file at the U.S. Fish and Wildlife Service, Boise Field Office). These activities apparently were never followed-up on and quickly faded from the scene.

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Christ's Indian paintbrush is a category 1 candidate for listing under the Endangered Species Act (U.S. Fish and Wildlife Service 1990). The category 1 status indicates that the Fish and Wildlife Service has substantial information on hand to support the biological appropriateness of proposing to list it as endangered or threatened (Moseley and Groves 1992).

U.S. Forest Service: Christ's Indian paintbrush is currently a Forest Service Sensitive Species for the Sawtooth NF in Region 4 (Spahr et al. 1991).

Other current formal status recommendations: Because it is extremely narrowly distributed, it is given a global rank of 1 (Moseley and Groves 1992) by the Biodiversity Information Network (the International Association of Natural Heritage Programs and Conservation Data Centers).

State:

Idaho

Idaho Native Plant Society: Because Christ's Indian paintbrush is a federal candidate, the Idaho Native Plant Society does not assign a state priority rank to it (Idaho Native Plant Society 1993).

Conservation Data Center: Christ's Indian paintbrush is an Idaho endemic so the Biodiversity Information Network state ranking is the same as the global (Moseley and Groves 1992).

Review of past status: In his review of this taxon for the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Steele proposed that it be listed as endangered (Steele 1977; 1981).

DESCRIPTION

General nontechnical description: Perennial herb, 5 to 15 inches tall; stems erect to ascending, usually unbranched, several to a cluster; herbage glabrous to hispid with some hairs gland-tipped near the inflorescence.; the leaves are 2-5 inches long, narrowly to broadly lanceolate, with 1 or maybe 2 pairs of lateral lobes, although sometimes all entire; the inflorescence is glandular, yellow to yellow-orange, the bracts lanceolate to ovate, with 1 or 2 pairs of narrow lateral lobes; the calyx is 0.5 to 1 inch long, the primary lobes more deeply cleft in front than behind; the corolla is approximately 1 to 1.5 inches long, the galea about 0.5 inch and the lower lip much reduced with incurved teeth, the tube

0.5 to 0.75 inch long (adapted from Holmgren 1984).

Technical description: Perennial; caudex hard, woody; stems (1.3) 1.6-2.5 (3) dm tall, erect to ascending, usually several to a cluster, glabrescent to hispid with some of the hairs gland-tipped above and glandular-villosulous in the inflorescence; leaves 2.5-5 (6) cm long, lanceolate, sometimes ranging from linear to broadly lanceolate, entire below and 3- or sometimes 5-parted above, sometimes all entire, with 1 to 3 prominent nerves, glabrescent to pilose with scabrous margins, at least the upper leaves with some gland-tipped hairs; inflorescence yellow to yellow-orange; bracts broader and shorter than the leaves with 1 or 2 pairs of narrow lateral lobes, glandular pubescent; calyx (17) 18-22 (27) mm long with hispid, non-glandular hairs on the nerves and short-stalked glandular hairs between, the abaxial cleft 9-12 (13) mm deep, slightly deeper than the adaxial, this 7-10.5 mm deep, the segments 2.4-6 (-8.5) mm long, lanceolate to narrow-lanceolate; corolla 20-28 (30) mm long, the galea 8-10 (12) mm long, the tube 12-18 mm long; upper anthers 2.7-3.5 mm long and the lower 2.2-3.2 mm long; stigma relatively thick, 0.6-0.8 (1) mm across, usually yellowish or greenish; capsule 1-1.4 cm long (Holmgren 1973).

Local field characters: Christ's Indian paintbrush is the only yellow- to yellow-orange-flowered paintbrush on the Mount Harrison summit. It is also the only Indian paintbrush occurring in the moist snowbed and graminoid communities of the summit "plateau." Three other species of *Castilleja* occur on and around Mount Harrison and can be told apart with the following key (adapted from Holmgren 1984 in combination with personal observations):

1. Calyx decidedly more deeply cleft in front (7-22 mm) than in back (2-8 mm). Calyx conspicuous, bearing most of the red coloration of the inflorescence. Occurs on the lower-elevation big sagebrush slopes of Mount Harrison, occasionally seen higher on south-facing slopes. Tall and many branched with red flowers.  
..... *C. linariifolia*
1. Calyx more nearly equally cleft in front and back. Bracts bearing most of the attractive coloration of the inflorescence and partly concealing the relatively inconspicuously colored flowers.
  2. Calyx more deeply cleft in back than in front. Low, unbranched plant on exposed ridgelines and shallow soils with low sagebrush (*Artemisia arbuscula*). Inflorescence is pale yellow to whitish, occasionally purple-tinged.  
.....  
..... *C. angustifolia* var. *flavescens*
  2. Calyx slightly more deeply cleft in front than in back.

3. Leaves, at least the upper, with 1 or more pair of long, narrow lateral segments. Inflorescence yellow to yellow-orange. Occurs in moist, gently sloping communities, usually not directly associated with sagebrush.  
.....  
..... C. christii
  
3. Leaves all entire, generally shiny-green, rarely the uppermost deeply 3-parted. Inflorescence scarlet. Generally in deep soils in conifer and aspen stands, although occasionally in swales in big sagebrush stands. .... C. miniata

Photos and line drawings: Reproductions of a line drawing of Christ's Indian paintbrush by Jeanne Janish appears in Holmgren (1973; 1984) and Appendix 1. Photographs of its habit and habitat appear in U.S. Forest Service (no date). The Conservation Data Center has an extensive collection of slides of Christ's Indian paintbrush, some of which appear in Appendix 5.

DISTRIBUTION

Global distribution: Christ's Indian paintbrush is endemic to Mount Harrison, Cassia County, Idaho.

Distribution by state:

Idaho: It is known from one population, covering approximately 200 acres on Mount Harrison, the highest peak at the north end of the Albion Mountains, Cassia County. More precisely, the southern limit of the population begins approximately 250 feet north of the lookout (down the hill, north of the parking area) and continues north for approximately 0.75 mile. The east-west extent of the population is somewhat over one mile in width. See Appendix 2 for a map of the global distribution of Christ's Indian paintbrush.

Precise occurrences in Idaho: There is only one known occurrence of this species (see above section). Further data are provided in the Occurrence Record that appears in Appendix 3. Searches by Holmgren (1973), Shultz (1980), and myself throughout the Albion Mountains and in adjacent ranges have failed to discover any new populations.

Historical sites: None.

Unverified/undocumented reports: None.

HABITAT

General habitat description: Christ's Indian paintbrush occurs in

three communities or cover types:

Snowbed - Occurs in areas of the latest-lying snowbanks. The community is forb-dominated, with *Solidago multiradiata*, *Aster foliaceus*, and *Cymopterus davisii* being the most prominent. Christ's Indian paintbrush has a low density in this community.

Graminoid - *Festuca idahoensis* and *Agropyron caninum* dominate this community; *Artemisia tridentata* ssp. *vaseyana* is absent. The paintbrush reaches its highest density in this community (and Davis' wavewing has low density here).

*Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* habitat type (Hironaka et al. 1983) - Much of the area covered by this community on Mount Harrison is patterned in biscuit and swale topography. The density of Christ's Indian paintbrush is inversely related to the density of sagebrush. It generally only occurs in openings in the sagebrush and in the nearly shrubless swales between the biscuits.

Christ's Indian paintbrush occurs almost exclusively on gentle, northerly-facing slopes. It only rarely occurs in deep soils on south- and west-facing slopes. Considerable pocket gopher digging takes place in all three communities.

Geology and Soils: Two metamorphic units underlie paintbrush habitat. Most is underlain by the Quartzite of Harrison Summit and to a lesser extent by Quartzite of Dayley Creek, both units of unknown age and correlation (Rember and Bennett 1979). The soils appear to have derived from the underlying bedrock, being relatively deep and gravelly. They tend to be fed by late-lying snow during the early part of the growing season, and probably remain moist well into August most years.

Associated species: *Artemisia tridentata* ssp. *vaseyana*, *Cymopterus davisii*, *Eriophyllum lanatum*, *Chrysothamnus viscidiflorus*, *Achillea millefolium*, *Lupinus argenteus*, *Solidago multiradiata*, *Spraguea umbellata*, *Valeriana sitchense*, *Stellaria jamesiana*, *Thlaspi montanum*, *Artemisia ludoviciana*, *Senecio integerrimus*, *Pedicularis contorta*, *Penstemon rydbergii*, *Rumex paucifloius*, *Agoseris glauca*, *Ligusticum tenuifolium*, *Lewisia pygmaea*, *Sibbaldia procumbens*, *Polygonum bistortoides*, *Taraxacum officinale*, *Agropyron caninum*, *Sedum lanceolatum*, *Festuca idahoensis*, *Arenaria capillaris*, *Linum perenne*, *Frasera speciosa*, *Eriogonum umbellatum*, *Potentilla diversifolia*, *Collomia linearis*, *Bromus inermis*, *Valeriana occidentalis*, *Antennaria anaphaloides*, *Erigeron peregrinus*, *Aster foliaceus*.

Other rare species: Davis' wavewing is sympatric with Christ's Indian paintbrush on Mount Harrison, although it occupies a larger area. It has the highest densities in the snowbed community.

Both vivid green aster and Shasta aster occur on the south slopes of Mount Harrison, but are not known to be sympatric with the paintbrush.

#### POPULATION BIOLOGY

Phenology: Growth begins slightly before or soon after the snow melts in early July. Peak flowering occurs from mid-July to mid-August depending on the year. Fruits begin to mature soon afterward and probably dehisce by mid-September.

Population size and condition: The population occupies approximately 200 acres, largely in one contiguous population (see Appendix 2). Two small areas, disjunct from the main body of the population, occur to the north and west. Approximately 23% of the population (90 acres) occurs in the proposed Mount Harrison Research Natural Area. Christ's Indian paintbrush occurs throughout the area although its density varies depending upon habitat (see Habitat section). It is difficult to precisely estimate the numbers of individuals in the population but it is at least several thousand and may be over 10,000. The population appears to be in excellent vigor and all size classes of plants are represented, possibly indicating a healthy age class distribution.

A population monitoring program was established by Duane Atwood (USFS R4) and Bob Parenti (USFWS, Boise) in 1985, consisting of one 9 yd<sup>2</sup> plot and four transects. These were read again in 1986 and 1987 by the Fish and Wildlife Service, although the data were never summarized. My understanding is that they were supposed to be permanent, in that the same site was to be monitored over a period of years. They were never monumented in any way, however, and when I tried to locate them in 1993, it was unclear from the hand-drawn sketch maps where they were located.

Reproductive Biology: Christ's Indian paintbrush reproduces by seed. Nothing is known about seed dispersal or viability; no pollinators were observed.

Biological Interactions: Pocket gopher digging disturbs considerable areas of the soil surface in the paintbrush population. The plant appears to be vigorous in these areas and it may be a positive interaction related to more favorable conditions for seed germination and establishment or reduced competition.

Competition: The density of Christ's Indian paintbrush was observed to be inversely related to the density of sagebrush. It reaches its highest density in the snowbed and graminoid communities where there is no sagebrush. Within the sagebrush stands, the paintbrush only occurs in the openings between the

shrubs.

Herbivory: None observed. The summit of Mount Harrison is currently closed to domestic livestock grazing.

Land ownership: U.S Forest Service, Sawtooth National Forest, Burley Ranger District.

Land use: The summit of Mount Harrison has high recreation and watershed values. Deep snows deposit on the paintbrush population through the winter and spring and don't melt until July and even August in some years. Major human activities in the area include recreation and activities associated with the Mount Harrison Fire Lookout.

The following discussion is modified from Hudak (1992). Recreational activities are seasonally very important and account for the largest influx of human activity during the snow-free summer and fall (five to six months) due to the vistas available. The Forest Service restricts vehicle traffic to established roads, although there is ample evidence that this is ignored and 4WD vehicles traverse the paintbrush population away from the roads. The steep slopes, cliffs, and rugged terrain surrounding the summit plateau are somewhat restrictive to vehicles and people. Limited hiking takes place from near the lookout as a cutoff to the Skyline Trail, west of and approximately 800 feet below the lookout. There is no designated trailhead at the summit. Use of the summit as a hang-glider launch site has increased rapidly in the past several years.

Currently parking at the summit is occurring at random over approximately a 1-2 acre area near the lookout, which is outside of the limits of the Christ's Indian paintbrush population. During the 1960's there was interest by the Air Force to develop an electronic site at the summit. Considerable road improvement took place bringing the road to its present standard. A large underground vault was constructed and is still present at the summit. The area adjacent to the vault was disturbed during construction and is currently used for random parking. It is not known whether this activity affected the Christ's Indian paintbrush population, but none presently occupies the area. In approximately 1970, this site was abandoned by the military and all improvements were turned over to the Forest Service. No other road improvements have occurred except annual maintenance of the gravel road. The Forest Service reconstructed the fire lookout during 1977.

A large portion of the population, occurring northeast of the lookout, is within the boundaries of a proposed Research Natural Area (Mancuso 1992).

#### ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: Although habitat has been lost to the construction of several roads, overall site quality of the Christ's Indian paintbrush population appears good. Christ's Indian paintbrush does not occur around the lookout, although *Castilleja angustifolia* does. Some flower picking of this attractive plant may occur near the road below the lookout, however densities of paintbrush in the vicinity of the road appeared to be similar as those away from the road. This wildflower collection may increase if the access road is paved.

The greatest direct threat to extant habitat is from 4WD vehicles that leave the existing road. Due to the extensive churning by pocket gophers, the vehicles sink deep into the soil and create large erosion runnels. Much of this activity probably results from late-lying snow-banks blocking access to the lookout and the electronic sites on Pk 9033; not wanting to walk the remaining distance, people head out across the relatively gentle slopes to get around the drifts. I witnessed one truck driving off road through Christ's Indian paintbrush because snow blocked access to and from the electronic sites north of Mount Harrison (see slide 6, Appendix 5).

I have observed over the years that most people that drive to the summit of Mount Harrison park at the lookout and enjoy the views from there. They don't appear to wander far from the lookout. This activity has little affect on the Christ's Indian paintbrush population. However, recreation use of the summit area will probably increase even if the road is not paved.

#### Recommendations:

- o Christ's Indian paintbrush should remain a C1 candidate for listing and a Forest Service Sensitive Species. Due to its rarity, listing as Threatened under the Endangered Species Act is appropriate.
- o The Forest Service and the Fish and Wildlife Service should enter into a pre-listing conservation agreement concerning the long-term management of Christ's Indian paintbrush habitat. This plan should be adhered to better than the last attempt. A Management Plan for Christ's Indian paintbrush and Davis' wavewing was prepared, reviewed, and signed by these two agencies in 1985 (Atwood 1985). Aside from setting up a monitoring program, I am not aware of any activities specified in this six year plan that have been carried out. The monitoring program was dropped after the third year and the results were never summarized.
- o Very restrictive specifications should be placed on any road construction activities. It should not be allowed outside the existing corridor on the summit, because it will destroy paintbrush and Davis' wavewing habitat. All materials should

be hauled to the summit; no excavation should take place in the summit area.

- o 4WD vehicles should be discouraged from traversing paintbrush habitat to get around snow banks. The two options I can think of to remedy this are: (1) keep the gate across the Howell Canyon Road, located near Pomerelle Ski Area, closed to limit vehicle access until the drifts melt, or (2) plow the drifts prior to allowing vehicle access to the summit of Mount Harrison.
- o An interpretation program for visitors should be developed that will increase their awareness of the biological importance of the summit of Mount Harrison and hopefully their sensitivity. The population is large enough, both in terms of size and numbers of individuals, that highlighting it to the public will probably have no impacts on viability. Much could be made in these interpretive materials about evolution in the basin and range country of the Intermountain West. These high elevation "islands" are surrounded by a "sea" of inhospitable habitat and, in this relative isolation, have evolved unique life-forms (e.g., Christ's Indian paintbrush and Davis' wavewing) as well as containing disjunct populations of species more common to the north (e.g., the conspicuous wildflower *Pedicularis contorta*, which is abundant on the summit of Mount Harrison). The biogeographic story of the Albion Mountains is similar to many other ranges in the Intermountain Region. The Idaho Native Plant Society may be helpful in a project like this.
- o Recreation impacts to the paintbrush population need to be monitored. This will be especially important if the road is paved. Any recreation management planning for the Mount Harrison summit must be flexible enough to accommodate changes if monitoring determines that deleterious impacts are taking place.
- o A draft Establishment Record for the proposed Mount Harrison Research Natural Area has been prepared (Mancuso 1992). Once established, approximately 23% of the population will be included. The Forest should expedite the review and establishment of this important area.

*Cymopterus davisii* R.L. Hartman

TAXONOMY

Full bibliographic citation: Hartman, R.L. 1985. A new species of *Cymopterus* (Umbelliferae) from southern Idaho. *Brittonia* 37:102-105.

Type specimen: Idaho, Cassia County, Albion Mountains, Mt. Harrison, 0.8-1.6 km NNW of fire lookout, T13S R24E, S4, SW4, elevation 2700-2770 m, 11 July 1982, R.L. Hartman 14024 (Holotype RM; Isotypes: BRY, CM, COLO, CS, F, GH, ID, MICH, MO, MONTU, NY, PH, RSA, TEX, UC, UNM, US, UT, UTC, WS, WTU) (Hartman 1985).

Pertinent synonym(s): None, however, there has been considerable confusion in the last 20 years regarding the identification of several high elevation *Cymopterus* in Idaho and Nevada. Immature specimens of Davis' wavewing have been annotated by Mathias and Constance as *Cymopterus humboldtensis* and more recently as *C. nivalis*. Recent field work and a taxonomic review have determined that these species occur only in Nevada and that the Albion Mountains, Idaho, material is unique (Hartman 1985). Nevertheless, prior to its description by Hartman in 1984, Davis' wavewing was treated as *C. nivalis* by several authors (Henderson 1977; 1981; Shultz 1980).

Common name: Davis' wavewing.

Size of genus: About 50 species occurring in western North America (Constance 1993).

Family name: Apiaceae (Umbelliferae)

Common name for family: Celery

History of knowledge of taxon: Our knowledge of Davis' wavewing is relatively recent. Ray J. Davis first collected it in 1939 on Mount Harrison, followed by William Baker in 1952 (Hartman 1984). It wasn't until the 1980's that more collections were gathered from the Albion Mountains and it was recognized and described as a new species by Ron Hartman. He named it in honor of the first collector, Ray Davis, botany professor at Idaho State University for many years and author of the Flora of Idaho.

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Davis' wavewing is a category 2

candidate for listing under the Endangered Species Act (U.S. Fish and Wildlife Service 1990). The category 2 status indicates that there is information indicating that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules (Moseley and Groves 1992).

U.S. Forest Service: Davis' wavewing is currently a Forest Service Sensitive Species for the Sawtooth NF in Region 4 (Spahr et al. 1991).

Other current formal status recommendations: Because it is extremely narrowly distributed, it is given a global rank of 1 (Moseley and Groves 1992) by the Biodiversity Information Network (the International Association of Natural Heritage Programs and Conservation Data Centers).

State:

Idaho

Idaho Native Plant Society: Because Davis' wavewing is a federal candidate, the Idaho Native Plant Society does not assign a state priority rank to it (Idaho Native Plant Society 1993).

Conservation Data Center: Davis' wavewing is an Idaho endemic so the Biodiversity Information Network state ranking is the same as the global (Moseley and Groves 1992).

Review of past status: Past reviews by the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council (Henderson 1977, 1981) and Shultz (1980) considered Davis' wavewing to be conspecific with *Cymopterus nivalis* and are not pertinent today.

DESCRIPTION

General nontechnical description: Davis' wavewing is a low-growing perennial from a thick taproot, reaching approximately 7 inches in height. The stem is very short and sheathed by persistent, papery and fibrous leaf bases. Numerous leaves, either prostrate or somewhat erect, form a rosette or whorl around several, short, yellow-flowered umbels. The leaves have a bluish-green cast and are deeply divided into pinnate or bipinnate segments. The fruits small fruits are compressed on one face and have small wings.

Technical description: Low, herbaceous perennial 2-16 cm tall, acaulescent to short-caulescent, not markedly aromatic unless crushed, with a straight to curved primary root 10-20 cm long or more, 3-8 mm in diameter at the summit, the crown simple or with a

few branches arising 1-6 cm below the ground, the crown and branches enveloped by persistent, papery or somewhat fibrous leaf sheaths which often double the apparent diameter; leaves petiolate, herbaceous, (1.5) 3-15 cm long, 0.5-1.5 (2.5) cm broad, mostly pinnate-pinnatifid to bipinnate, somewhat glaucous, glabrous except margins often minutely granular-roughened; petiole flat to U-shaped in cross section, (0.5) 1-6 cm long, often with a scarious margin 0.1-1.2 mm wide, gradually expanded below into an often prominent sheath; blade lanceolate to oblong or oblanceolate in outline, (1) 2-5 (6) cm long; lobes linear-lanceolate to elliptic or sometimes ovate; leaflets in 1-3 (5), opposite or subopposite pairs, the terminal leaflet deeply pinnatifid, usually confluent with the upper pair or pairs, the lower distinct, remote, the apices apiculate; inflorescence of subcompact, compound umbels 3-15 mm in diameter; peduncle terminal or axillary, ascending to erect, (2) 4-12 (15) cm long, shorter than to much exceeding the leaves, glabrous; involucre none; rays (3) 6-8, 1-3 (5) mm long, subterete to flattened, erect to spreading, often scariously winged, glabrous; umbellets andromonoecious, of 1-8 staminate and 1-4 (sometimes more) perfect flowers on pedicels 1-2.3 and 0.1-1 mm long, respectively, or wholly staminate; involucre dimidiate, the bractlets 3-7, linear to lanceolate or sometimes ovate, with scaberulose margins in at least the upper half, 1-3.2 (4) mm long and about equalling the flowers, distinct or connate for up to 1/5 (2/3) of length, white-margined; flowers yellow; sepals broadly rounded to triangular, 0.1-0.4 mm long or obsolete, not enlarging in fruit; petals 1.5-1.8 mm long, obovate to obcordate below with a triangular, inflexed, plicate apex less than half the length; anthers yellow, 0.4-0.5 mm long; filaments 1.5-2 (2.8) mm long; styles filiform, terete, 1.5-2.2 mm long, spreading to recurved, not elongating in fruit; stylopodium none; disc present; ovary minutely granular-roughened, somewhat compressed laterally; carpophore bipartite, persistent; fruit subterete to somewhat flattened laterally, broadly elliptic to suborbicular, not constricted at commissure, 3.5-4.8 mm long, 2.2-3 mm broad, minutely granular-roughened, dull, reddish-brown with light brown to whitish wings, the dorsal and intermediate wings 0.3-0.8 mm broad, the lateral wings 0.5-1.1 mm broad; oil tubes narrow, flat, reddish-brown, 5-9 in the intervals, 8-10 on the flat to somewhat curved commissural face; seed face involute (Hartman 1984).

Local field characters: The only other species in the celery family that is sympatric with Davis' wavewing is *Ligusticum tenuifolium*. Unlike the *Cymopterus*, it is a taller, white-flowered plant with an obvious stem that is erect, approximately one foot tall. They are easy to tell apart. On the southerly, sagebrush slopes, adjacent to Davis' wavewing habitat, occurs another member of the celery family, *Lomatium triternatum*. Although it has yellow flowers, it is much taller, with an obvious stem, and has just a few, widely-spaced leaves that are dissected into a few, very narrow segments.

Photos and line drawings: The reproduction of a line drawing of Davis' wavewing appears in Hartman (1984), U.S. Forest Service (no date), and Appendix 1. Photographs of its habit and habitat appear in U.S. Forest Service (no date), although it should be noted that the best close-up of Davis' wavewing actually appears on page 95, mislabeled as *Cymopterus douglassii*. The Conservation Data Center has an extensive collection of slides of Davis' wavewing, some of which appear in Appendix 5.

## DISTRIBUTION

Global distribution: Davis' wavewing is endemic to the Albion Mountains, Cassia County, Idaho.

### Distribution by state:

Idaho: Three populations are known, all in the Albion Mountains of the Sawtooth National Forest. The northern population on Mount Harrison is extensive, as is the even larger population on Independence Mountain (which includes Mount Independence and Cache Peak), approximately 7.5 miles south. A third, smaller population occurs on Graham Peak, at the southern end of the range approximately four miles SSE of Independence Mountain. Searches by Shultz (1980), Tom John, and myself throughout the Albion Mountains and in adjacent ranges have failed to discover any new populations. See Appendix 2 for maps of the global distribution of Davis' wavewing.

Precise occurrences in Idaho: (the three digit code preceding the occurrence is the reference number used by the Conservation Data Center and others for that occurrence; further data are provided in the Occurrence Record that appears in Appendix 3)

- 001 Mount Harrison - The population here is approximately 314 acres in size, occurring largely as one contiguous mass. A small group of plants is disjunct from the main body of the population to the east. The oblong shaped population is approximately 1.25 miles long, north to south, and nearly an equal distance east to west (see Appendix 2 for the precise location of this occurrence).
- 002 Independence Mountain - The largest population occurs on the peaks and ridges of Independence Mountain, including Cache Peak and Mount Independence. Although I was unable to precisely determine the southeastern boundary due to lightning storms, the population is at least 370 acres in size and is more or less contiguous. It is over 1.5 miles in length, north to south, and at least 1.25 miles east to west (see Appendix 2 for the precise location of this occurrence).
- 003 Graham Peak - A small population occurs on the steep, eastern

slope of Graham Peak. It is restricted to the areas of late-lying snow on the lee side of the ridge. The population is long and narrow, parallelling the ridgeline. It is approximately 2 acres in size (see Appendix 2 for the precise location of this occurrence).

Historical sites: None.

Unverified/undocumented reports: None.

#### HABITAT

General habitat description: Davis' wavewing occurs in the three communities described in the habitat discussion of the Christ's Indian paintbrush section. In addition, this species occurs in two others, described below:

*Abies lasiocarpa*/*Ribes montigenum* habitat type (Steele et al. 1983) - Davis' wavewing occurs in the openings of the these subalpine fir woodlands. It is usually excluded from the dense stands of trees by a thick understory of *Ribes montigenum*.

Scree and ledges - this habitat occurs in all three populations, and is the only habitat at the Graham Peak occurrence. This habitat occurs on cirque headwalls.

Davis' wavewing can occur on any aspect, although it is rare on southerly slopes, occurring there only in areas of late-lying snow. Slope declivity ranges from nearly flat and gently rolling to quite steep in the scree and ledge community. Extensive pocket gopher digging occurs in the gently sloping habitats (all but the scree and ledges). Elevations range from 8800 feet at the Graham Peak population to 10,339 feet on the summit of Cache Peak.

Geology and Soils: Two metamorphic units underlie wavewing habitat on Mount Harrison. Most is underlain by the Quartzite of Harrison Summit and to a lesser extent Quartzite of Dayley Creek, both units of unknown age and correlation. Most of the Independence Mountain population is underlain by granite and to a lesser extent the Precambrian Elba Quartzite. Quartzite also underlies the Graham Peak population (Rember and Bennett 1979). The soils appear to have derived from the underlying bedrock, being relatively deep and gravelly on the gentle slopes. They tend to be fed by late-lying snow during the early part of the growing season, and probably remain moist well into August most years.

Associated species: *Geum triflorum*, *Castilleja christii*, *C. angustifolia*, *C. miniata*, *Allium brandegei*, *Phleum alpinum*, *Linanthastrum nuttallii*, *Juniperus communis*, *Artemisia tridentata* ssp. *vaseyana*, *Eriophyllum lanatum*, *Chrysothamnus viscidiflorus*,

Achillea millefolium, Lupinus argenteus, Solidago multiradiata, Spraguea umbellata, Valeriana sitchense, Stellaria jamesiana, Thlaspi montanum, Artemisia ludoviciana, Senecio integerrimus, Pedicularis contorta, Penstemon rydbergii, Rumex paucifloius, Agoseris glauca, Ligusticum tenuifolium, Lewisia pygmaea, Sibbaldia procumbens, Polygonum bistortoides, Taraxacum officinale, Agropyron caninum, Sedum lanceolatum, Festuca idahoensis, Arenaria capillaris, Linum perenne, Frasera speciosa, Eriogonum umbellatum, Potentilla diversifolia, Collomia linearis, Bromus inermis, Valeriana occidentalis, Antennaria anaphaloides, Erigeron peregrinus, Aster foliaceus.

Other rare species: Davis' wavewing is sympatric with Christ's Indian paintbrush on Mount Harrison, although it occupies a larger area. It has the highest densities in the snowbed community. Both vivid green aster and Shasta aster occur on the south slopes of Mount Harrison, but are not known to be sympatric with the wavewing. The cactus, *Pediocactus simpsonii*, occurs near the Graham Peak population on the exposed, windswept ridgeline.

#### POPULATION BIOLOGY

Phenology: Growth begins slightly before or soon after the snow melts in early July. Peak flowering occurs from mid-July to mid-August depending on the year. Fruits begin to mature soon afterward and probably disperse by late August.

Population size and condition:

- 001 Mount Harrison - Davis' wavewing is well distributed within the area delineated in Appendix 2. The population appears vigorous, with a good distribution of size classes (=age classes?). I estimate the population to contain over 100,000 individuals. Some habitat here has been destroyed, but what remains is of high quality.
- 002 Independence Mountain - This is the largest population and I estimate that it contains several hundred thousand individuals of all ages classes. The habitat quality is excellent.
- 003 Graham Peak - This population is small compared to the others. I estimate that it contains 500-1,000 plants. The habitat quality is excellent and undisturbed, but limited in extent.

Reproductive Biology: Davis' wavewing reproduces by seed. Nothing is known about seed dispersal or viability; no pollinators were observed.

Biological Interactions: Pocket gopher digging disturbs

considerable areas of the soil surface in the wavewing population. The plant appears to be vigorous in these areas and it may be a positive interaction related to more favorable conditions for seed germination and establishment or reduced competition.

Competition: The density of Davis' wavewing was observed to be inversely related to the density of shrubs and trees. It reaches its highest density in the snowbed and graminoid communities where there is no shrub cover and where pocket gopher activity is the highest.

Herbivory: None observed. The summit of Mount Harrison is currently closed to domestic livestock grazing, and there appeared to be little or no grazing at the other two occurrences.

Land ownership: The Mount Harrison and Independence Mountain occurrences are entirely managed by the U.S Forest Service, Sawtooth NF, Burley Ranger District. The Graham Peak population appears to be partially on the Sawtooth NF and the City of Rock National Reserve, managed by the National Park Service.

Land use: For the Mount Harrison occurrence, the land use pattern is the same as for Christ's Indian paintbrush, with two exceptions. Davis' wavewing occurs near the electronic sites on Pk 9033 and some habitat was undoubtedly destroyed by construction of the access road and the five electronic facilities. Secondly, unlike Christ's Indian paintbrush, Davis' wavewing does occur around the lookout and parking area.

The population on Independence Mountain is little disturbed. Livestock grazing may reach the lower fringes of the population on the southwest edge, and undeveloped, lightly used hiking trails go to the summits of Mount Independence and Cache Peak from the intervening saddle. None of these activities pose a threat

The Graham Peak site is isolated, being well protected from most human and livestock activity by very steep slopes and quartzite cliffbands.

#### ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: Virtually no anthropogenic impacts threaten the Independence Mountain and Graham Peak populations. Many of the same threats discussed for Christ's Indian paintbrush on Mount Harrison are applicable here. The population of Davis' wavewing, however, is at least ten times larger, in terms of individuals, than the paintbrush, so the relative impacts aren't as great.

Recommendations:

- o The U.S. Fish and Wildlife Service should change Davis' wavewing to a category 3c candidate, meaning that listing as threatened or endangered is not warranted at this time. There are at least 500,000 individuals in three populations, with little external threats to two of the populations.
- o The Forest Service should continue to treat Davis' wavewing as a Sensitive Species, because they manage 99+% of the global distribution of this narrow endemic.
- o The National Park Service should also treat Davis' wavewing as a sensitive species in developing management plans for the City of Rocks National Monument.
- o Many of the recommendations made for managing Christ's Indian paintbrush habitat on Mount Harrison apply here also.

Approximately 33% of the Davis' wavewing population on Mount Harrison occurs within the boundaries of the proposed RNA. The Forest should expedite its establishment.

Unlike Christ's Indian paintbrush, some wavewing individuals occur in the immediate vicinity of the lookout, including the parking area. Destruction of these individuals by reconstruction of the parking area will have negligible impacts on population viability.

Monitoring of the Davis wavewing population should be included in the Christ's Indian paintbrush monitoring program.

Recommendations concerning 4WD vehicles, road construction, and an interpretation program are the same.

- o I will change the Biodiversity Information Network global (G) and state (S) ranking from G1 S1 to G2 S2, to better reflect the change in our knowledge of the abundance and distribution of Davis' wavewing.

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## Appendix 1

Line drawings of *Castilleja christii* (from Holmgren 1984)  
and *Cymopterus davisii* (from Hartman 1985).

## Appendix 2

Maps of the distributions of *Castilleja christii* and *Cymopterus davisii*.

- Map 1. Distribution of *Castilleja christii* and *Cymopterus davisii* in the Albion Mountains, Cassia County Idaho. Portion of the Sawtooth National Forest Travel Plan Map.
- Map 2. *Castilleja christii* on Mount Harrison. Portion of the 1968 USGS Mount Harrison 7.5' quadrangle, enlarged to 155%.
- Map 3. *Cymopterus davisii* 001 on Mount Harrison. Portion of the 1968 USGS Mount Harrison 7.5' quadrangle, enlarged to 155%.
- Map 4. *Cymopterus davisii* 002 on Independence Mountain. Portion of the 1968 USGS Cache Peak 7.5' quadrangle.
- Map 5. *Cymopterus davisii* 003 on Graham Peak. Portion of the 1968 USGS Cache Peak and Almo 7.5' quadrangles.

## Appendix 3

Occurrence records from the Conservation Data Center for *Castilleja christii* (001) and *Cymopterus davisii* (001, 002, 003).

#### Appendix 4

Maps of areas searched in the Albion Range for *Castilleja christii* and *Cymopterus davisii* in 1993.

- Map 1. Conner Ridge, Pomerelle Ski Area, and ridge north of Thompson Flat Campground. Portion of the 1968 USGS Conner Ridge 7.5' quadrangle.
- Map 2. Vicinity of Mount Harrison and Lake Cleveland. Portion of the 1968 USGS Mount Harrison 7.5' quadrangle.
- Map 3. Independence Mountain. Portion of the 1968 USGS Cache Peak 7.5' quadrangle.
- Map 4. Almo Park area. Portion of the 1968 USGS Cache Peak 7.5' quadrangle.

#### Appendix 5

Slides of *Castilleja christii* and *Cymopterus davisii* and their habitats.

- Slide 1. Close-up of *Castilleja christii*; note pencil for scale.
- Slide 2. Close-up of *Castilleja miniata* for comparison; similar in size to slide 1.
- Slide 3. Close-up of *Cymopterus davisii*; note pencil for scale.
- Slide 4. Close-up of *Cymopterus davisii*.
- Slide 5. *Castilleja christii* and *Cymopterus davisii* habitat on Mount Harrison; the habitat pictured is the graminoid community described in the text.
- Slide 6. 4WD truck traversing graminoid and snowbed community over *Castilleja christii* and *Cymopterus davisii* on Mount Harrison.