

FIELD INVESTIGATION OF ALLIUM AASEAE
(AASE'S ONION),
ON THE BOISE NATIONAL FOREST

by

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ABSTRACT

A field investigation for Allium aaseae (Aase's onion) was conducted on the Boise National Forest by the Idaho Department of Fish and Game's Conservation Data Center¹. The investigation was a cooperative Challenge Cost-share project between the Department and the Boise NF. Aase's onion is endemic to southwestern Idaho. It is a Region 4 Sensitive Species for the Boise NF and a Category 1 candidate for federal listing.

Prior to our 1991 survey, the Conservation Data Center's data base contained 60 occurrence records for Aase's onion, including three reported for the Boise NF. During the 1991 field investigation we discovered that the separation between Aase's onion and the more common and widespread dwarf onion (Allium simillimum) is not as distinct as once thought. The Boise foothills, and contiguous mid-elevation areas to the east and northeast, especially in the Boise NF, appear to represent a contact zone between the two species. In this zone, several morphological characteristics overlap, resulting in populations that appear intermediate between Aase's onion and dwarf onion. The two Boise NF populations reported for the Danskin Mountains are judged to be misidentifications, with plants being more similar to dwarf onion. The upper Hulls Gulch population also proved not to be Aase's onion, having morphological characteristics more similar to those of dwarf onion. Overall, this intermediate-looking Allium was found to be common in the upper Boise foothills and Danskin Mountains in the Boise NF. It is our best judgement that no Aase's onion is known to occur on the Boise NF, but qualify this determination as tentative pending further taxonomic studies of these intermediates.

¹Formerly the Idaho Natural Heritage Program

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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.

Allium aaseae (Aase's onion) is endemic to southwestern Idaho, occurring in northern Ada County and the southern portion of adjacent Gem County. It is restricted to open, sandy, southerly slopes within the sagebrush-grassland zone. Prior to the Conservation Data Center's 1991 field investigation, our data base contained 60 occurrence records for Aase's onion, including three on the Boise NF. Several other populations of Aase's onion were known to occur close to the Forest boundary north and northeast of Boise, and areas of additional potential habitat were known to occur on Forest lands. This location information, combined with the serious conservation concerns for the species provided the justification for this Challenge Cost-share project.

Aase's onion is on the Intermountain Region Sensitive Species List for the Boise NF (Spahr et al. 1991). It is a category 1 candidate for federal listing (U.S. Fish and Wildlife Service 1990), and is also a Bureau of Land Management Sensitive Species in Idaho (Moseley and Groves 1990). A field investigation for Aase's onion was conducted on the Boise NF by the Idaho Department of Fish and Game's Conservation Data Center through the Cooperative Challenge Cost-share Program.

The primary objectives of this investigation were as follows:

- 1) Survey known populations of Aase's onion and search potential habitats for new populations on the Boise NF.
- 2) Characterize habitat conditions for Aase's onion on the Boise NF.
- 3) Assess population data on, and threats to existing populations and make management recommendations to the Boise NF based on these assessments.

RESULTS

Between April 11 and May 7, 1991, botanists from the Conservation Data Center surveyed suitable-appearing habitat for Aase's onion on Boise NF lands in the upper foothills of the Boise Front and in the Danskin Mountains. Some adjacent Bureau of Land Management, State, and private lands were also searched to gain a more comprehensive view of the distribution and conservation status of this species.

Three Aase's onion populations had been identified on the Boise NF prior to our 1991 investigation. Two of these populations were from the Danskin Mountains: (1) near the summit of Danskin Peak, and (2) a vague location given as Arrowrock Station near Woodtick Creek, and presumed to be in the vicinity of Woodtick Creek, a small tributary to Wood Creek about 0.75 mile north of Three Point Mountain and accessible via the Blacks Creek Road. Because both of these locations were relatively disjunct from other known populations for this narrow endemic, suspicion as to their correct identification existed. We were able to relocate both of these occurrences, and it was determined that neither were Aase's onion, but instead intermediate between Aase's onion and a closely related taxon, Allium simillimum (dwarf onion). All populations encountered in the Danskin Mountains, including the above two, are strongly suggestive of dwarf onion. Although somewhat atypical, we are tentatively calling these dwarf onion.

We are also questioning the identification of the upper Hulls Gulch population which extends onto the Boise NF from adjacent BLM land. It too appears intermediate to Aase's onion and dwarf onion, varying towards the latter, but not quite as strongly as the Danskin populations. Previous collections by Atwood (12445 - ID) and Prentice (2934,3022 - IFGH) were recently reviewed (Henderson pers. comm. for the Atwood collection) and tentatively identified as atypical dwarf onion.

During our survey we frequently encountered onion populations that looked to be intermediate between typical versions of Aase's onion and the more common and widespread dwarf onion, and to different degrees varying in the direction of dwarf onion. Collections verifying the presence of this intermediate were made at most places where it was found. After reviewing our collections, Roger Rosentreter (pers. comm.) and Bob Steele (pers. comm.), two botanists who know both onion species well, concluded that the morphological and ecological features of this intermediate more closely resembles (dwarf onion). Combining these opinions with our own field observations, we are tentatively calling this intermediate an atypical form of dwarf onion.

Dwarf onion is known from the mountains of central and southwestern Idaho, and ranges from the foothills to alpine elevations (Ownbey 1969). Further taxonomic research will be

necessary to positively assess the disposition of intermediate populations found during our investigation.

This intermediate onion was found restricted to open, sparsely vegetated, southerly slopes of relatively shallow granitic parent material formed from decomposing bedrock. This kind of habitat is locally common in several portions of the Boise and Mountain Home Ranger Districts, and is also one where the typical form of dwarf onion commonly occurs in other areas. At lower elevations, Aase's onion is found in similar habitats, with the important exception that it is restricted to deeper soil sites originating from lacustrine deposits.

Although not fully investigated, there appears to be a small altitudinal gap in the distribution between typical Aase's onion on lower elevation lacustrine deposits and the intermediate onion on shallow, granitic soils at higher elevations, at least in the foothills vicinity north of Boise. In the foothills area, using the Bogus Basin Road as a 'transect', we found no species of onion between approximately 3500 and 4200 feet elevation. At approximately 4200 feet the bedrock-derived, granitic soils first become evident. From this point near the Shingle Creek/Dry Creek confluence, and continuing north (upslope) to where the slopes change from open to forested at about 5500 feet, the intermediate onion is common in areas of suitable habitat. As one progressed to higher elevations along this 'transect', phenotypic characteristics of the intermediate begin to look more and more like typical dwarf onion (e.g. bulbs smaller and more shallow seated, more delicate stature overall, and pink tepals rarer within the population). Moving south (downslope) along the 'transect', several, what are clearly Aase's onion populations, have been documented below the 3500 foot level where deeper, lacustrine soils are present. The implications of this apparent gap and its associated substrate differences are unclear at this time, but may help provide a geographical and possibly an ecological basis for the separation of Aase's onion and the intermediate entity.

Intermediates that are strongly suggestive of dwarf onion occur further east on Boise NF lands in the Aldape Summit area, and by Crooked Summit there is little doubt left. But even this transition is uneven, as evidenced by collections (Mancuso 512 ID) made at McCarty Gulch east of Aldape Summit. A few individuals within this population very closely approach Aase's onion, but when looked at from a population perspective must be assigned intermediate status, at least for now. For the Boise foothills, we are seeing a cline of morphological characteristics from typical Aase's onion to typical dwarf onion, with a series of intermediates clouding the distinction between the two near their zone of contact. This cline varies more and more towards dwarf onion the further east and northeast from Boise and the higher in elevation, above about 4200, feet one proceeds. The most

problematic populations occur in the lower elevational reaches of the Boise NF, such as upper Hulls Gulch and Dry/Shingle Creeks (Moseley 2202, 2203), and on adjacent State land near North Fork Daniels Creek (Mancuso 510).

In the Danskin Mountains, what we are calling dwarf onion, was found to be locally common, paralleling the widely scattered nature of its suitable habitat. Populations appear restricted to mid-elevations and higher, as none were found in the few suitable-appearing sites searched below about 4400 feet elevation. Although they appear less problematic than some of the Boise foothills populations, collections from the Danskins will need to be considered for any taxonomic review of the Aase's and dwarf onion group.

Study of the western end of Aase's onion distribution in the Emmett area northwest of Boise was not part of this investigation. Whether any of the confounding situations already discussed apply to this western distribution remains uncertain.

It was impossible to adequately survey every area of potential Aase's onion habitat during our survey. This being especially true in that portion of the Boise Ranger District east of Cartwright Canyon, where access problems and time constraints hampered our efforts. The potential for Aase's onion occurring on the Boise NF therefore remains.

In summary, no populations of what we could confidently call Aase's onion were found on the Boise NF. At this time, no typical Aase's onion is known from the Boise NF. A reasonable doubt surrounds the upper Hulls Gulch population and a few other lower elevation populations noted above. Although taxonomically bothersome, the presence of this intermediate Allium does not pose a conservation dilemma because whatever its identity, it is common and no conflicts to its long-term viability are evident. We hope these questions provide an impetus for further taxonomic investigation.

The following is a detailed discussion of Aase's onion and its relationship to the intermediate populations found on the Boise NF in 1991. Included is information on its taxonomy and identification, range and habitat, conservation status, and recommendations to the Regional Forester, Boise NF, Bureau of Land Management, and U.S. Fish and Wildlife Service, concerning its status in Idaho.

Allium aaseae Ownbey

CURRENT STATUS USFS Region 4 - Sensitive (Boise NF)
USFWS - C1
Idaho BLM - Sensitive
Idaho Native Plant Society - None
Heritage Rank - G3/S3

TAXONOMY

Family: Liliaceae (Lily)

Common Name: Aase's onion

Citation: Research Studies of the State College of Washington.
18(1):38. 1950.

Synonymy: none

Technical Description: Bulb ovoid, the outer coats with or without obscure cellular reticulations; leaves 2 per scape, linear, channeled, concave-convex, 1-4 mm wide, entire or denticulate, twice as long as the scape or longer, green at anthesis but deciduous at maturity; scape 1-5 cm long, slightly flattened, with or without narrow wings, deciduous at maturity; umbels 5-10 flowered, the pedicels much shorter than the perianth; tepals pink with darker midrib, fading to white, 6-9 mm long, oblong to lanceolate, obtuse to acuminate, obscurely or distinctly serrulate-denticulate, not involute at the tip; stamens shorter than the tepals; ovary crestless; style included; stigma capitate, entire; seeds shining, the alveoli not pustuliferous (Cronquist 1977).

Nontechnical Description: Aase's onion is an early spring flowering member of the lily family. It is a perennial plant with an underground bulb that is usually at least a couple of inches below ground level in mature individuals. Bulb coat reticulations may or may not be evident. The two channeled leaves are 1-4 mm wide, often at least twice as long as the scape and typically lying on the ground when observed in the field, at least early in the season. The scape varies from 1-5 cm long (or longer?), with the below ground portion white in color. Its six similar-looking tepals are pink, often richly so, but fading to white, 6-9 mm long and with entire to serrulate margins. Stamens are shorter than the tepals and the ovary is without crests (elevated extensions at the top of the ovary around the style).

Distinguishing Features and Similar Species: Aase's onion is most likely to be confused with Allium simillimum (dwarf onion). To varying degrees, many of the populations we encountered during our survey on the Boise NF appeared intermediate to these two species and posed difficult identification problems. As currently

understood, Aase's onion is a very local endemic to relatively low-elevation areas in and near Boise, and commonly if not solely associated with lacustrine deposits belonging to the Glens Ferry Formation (Packard 1979, Prentice 1988a). In contrast, dwarf onion is much more common and widespread, occurring from the foothills to the alpine, mainly in the mountains of southwestern and central Idaho, and on a variety of substrates (Cronquist 1977; Ownbey 1969).

The technical descriptions for Aase's and dwarf onion are similar and overlap for many morphological characteristics. Regional keys (Ownbey 1969; Cronquist 1977) rely on tepal color (white versus pink) and the presence or absence of a crested ovary to distinguish the two species. The crested ovary character can be difficult to assess and seems to be of limited value. In light of the intermediates encountered during our survey, these characteristics can be insufficient for consistent, accurate field identification, at least in some instances. A combination of additional morphological and ecological characteristics will often have to be considered.

Because nearly all published morphological measurements for these two species overlap, they are not useful in constructing a key. Using the terms 'relatively' and 'typically' to qualify morphological characteristics, as the following key does, may prove frustrating to someone with only one species in hand. Until further taxonomic study clarifies the distinction between these two taxa the construction of a precise key is impossible. When attempting field identification it is imperative to look at as many individuals as possible to gauge the variability within the population. Only then can this key be used with any confidence. Noting the above qualifications and limitations, the following key incorporating information from Cronquist (1977) and field observations of several Boise-area botanists, should help distinguish Aase's onion from dwarf onion.

1. Tepals pink, usually richly so (rare individuals albino); ovary crestless; mature bulbs more teardrop than round in outline, relatively large and deeply buried; bulb coat reticulations evident or not; leaves typically larger and more succulent-looking than A. simillimum, the entire plant typically of a more robust stature than A. simillimum; occurring in relatively deep lacustrine soil with the bulb often seated on a clay layer, not found over bedrock.
..... Allium aaseae

1. Tepals white or light pink (only rare individuals richly pink); ovary crested; mature bulbs often more round in outline, relatively small and located just below the soil surface; bulb coat with cellular, isodiametric to transversely elongate reticulations; leaves typically more

delicate and less succulent than A. aaseae, and plants with an overall more diminutive stature compared to A. aaseae; typically growing in relatively shallow granitic soils, often over bedrock..... Allium simillimum

Plants intermediate to these two species were the norm in the upper Boise foothills portion of the Boise NF, and to a lesser extent in the Danskin Mountains. Tepal color, depth of bulbs, bulb size, scape length, robustness of plants, and ovary crest traits were particularly variable, with one trait suggestive of Aase's onion and another of dwarf onion on the same plant. Morphological characteristics that fell outside the published range of variability for either species were not uncommon either, including length of scape, number of flowers per umbel, and number of nerves on the involucre bracts. Other features suggestive of neither species were also occasionally seen, such as bulb coats somewhat fibrous and the perianth irregularly or sparingly denticulate instead of the more typical regular denticulations (Packard pers. comm.).

DISTRIBUTION

Range: Aase's onion is endemic to southwestern Idaho, from near Emmett on the its western edge, arcing southeast to the Boise foothills. This is an aerial distance of approximately 18 miles (see Appendix 3, Map 1 for an overview map of this distribution). Populations are located in the northern part of Ada County and contiguous portions of southeastern Gem County, and one in adjacent Boise County. Additionally, one outlying population east of Weiser in the Rebecca Sand Hills, Washington County, has been documented. As a result of this investigation, two previously reported disjunct populations from the Boise NF are now judged not to be Aase's onion. Aase's onion is therefore no longer known from Elmore County.

As a result of our 1991 survey, no typical Aase's onion is now known on the Boise NF. However, the precise taxonomic disposition of a number of intermediate-looking populations, especially in the upper Boise foothills, are presently unresolved (see Appendix 2 for a list of dwarf onion sites on the Boise NF and adjacent lands, and Appendix 3 for a map showing the locations of the upper Boise foothill populations). In addition, no onion was found along the South Fork Boise River from the Danskin Bridge upstream to Anderson Ranch Reservoir, in the Dixie area, and north of East Fork Long Tom Creek (vicinity of USFS Road #164).

Habitat and Associated Species: Aase's onion is restricted to a narrow range of habitat conditions. It occurs on open, relatively barren, xeric, gentle to very steep, sandy slopes, generally with a southerly aspect, but ranging from east to west. It is usually associated with depauperate bitterbrush (Purshia tridentata) or bitterbrush/sagebrush (Artemisia tridentata) communities. Its

sandy substrate is of granitic origin, and typically coarse textured, well-drained and relatively deep. This substrate was derived from lacustrine deposition, and much, if not all belongs to the Glenns Ferry Formation (Packard 1979; Prentice 1988a). Aase's onion has a fairly narrow elevational amplitude and is found between approximately 2800 to perhaps as high as 5000 feet, with the majority of populations from around 3000 feet.

Species diversity within Aase's onion habitat is relatively low. Associated native species include Purshia tridentata, Artemisia tridentata, Eriophyllum lanatum, Balsamorhiza sagittata, Achillea millefolium, Aristida longiseta, Agropyron spicatum, Sporobolus cryptandrus, Sitanion hystrix, Phacelia heterophylla and occasionally the rare plant Astragalus mulfordiae. A number of exotic species are also common associates and may be very abundant, especially Bromus tectorum (cheatgrass) and Erodium cicutarium (storksbill).

CONSERVATION STATUS

Conservation Status - Idaho: Aase's onion was first collected in 1881, with only a handful of subsequent collections prior to Ownbey (1950) describing the species in 1950 (Mingrone 1968). Aase's onion was originally recommended for Endangered status by the Smithsonian Institution in 1975, and in 1976 was recommended as Endangered by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service n. d). In his evaluation of Aase's onion for the Idaho rare plant project of the Idaho Natural Areas Council, Steele (1977) recommended retaining it on the Endangered list, citing threats to its habitat and limited distribution. Steele (1981) later recommended changing this status from Endangered to Threatened, noting that new sites had been located and extinction unlikely.

Aase's onion is currently a Category 1 candidate for federal listing (U.S. Fish and Wildlife Service 1990). Category 1 ranking indicates that the U.S. Fish and Wildlife Service has enough biological information on hand to proceed with listing Aase's onion as threatened or endangered under the Endangered Species Act. Aase's onion is a Forest Service Region 4 Sensitive Species for the Boise NF (Spahr et al. 1991). It is also on the Idaho Bureau of Land Management Sensitive Species list (Moseley and Groves).

The Idaho Native Plant Society does not place a ranking on species that are federally listed or candidates for listing. Aase's onion meets this latter criteria and is therefore not ranked by the Idaho Native Plant Society (Idaho Native Plant Society 1991).

The Idaho Conservation Data Center currently ranks Aase's onion as G3/S3 [G3 = Allium aaseae is either very rare and local throughout

its range or found locally in a restricted range or because of other factors making it vulnerable to extinction; S3 = since Allium aseae is endemic to Idaho, the state (S) rank equals the global rank for the taxon (G)(Moseley and Groves 1990)].

Conservation Status - Elsewhere: Aase's onion is endemic to Idaho.

Ownership: Ada County, the City of Boise, Idaho State Department of Lands, Bureau of Land Management and private individuals and companies all own land where Aase's onion is known to occur. More than 50 of the 57 known locations of Aase's onion occur at least partly on private land. At least 38 of these solely on private land. All three previously reported Boise NF populations are now tentatively considered to be atypical forms of dwarf onion and not Aase's onion, including the upper Hulls Gulch population which extends onto BLM land.

Threats: There are two basic reasons why Aase's onion is considered to be in jeopardy: 1) it has a very limited distribution and occurs in a restricted habitat, and 2) its location adjacent to a major population center subjects it to numerous and varied threats (Moseley and Caicco 1989).

Prentice (1988b) listed the following threats to Aase's onion populations:

1. Mining - Several populations are threatened by a silica sand mining operation near Emmett.
2. Urban developments - Many onion populations have been and are being destroyed by housing developments in the Boise foothills.
3. Weed invasions - Competition from fall-germinating Eurasian weeds appears to be significant enough to reduce vigor or even exclude some onion populations.
4. Off-road vehicles - Several populations are found in a designated motorcycle park near Emmett and are being negatively impacted. Other populations throughout its range are also threatened to dispersed off-road activity.
5. Trampling - Trampling by domestic livestock appears to reduce the vigor of onion populations.

Urban development, especially in the form of housing projects, represents the most serious and pressing of these threats. The majority of Aase's onion populations occur on private land, at least in part, and present difficult problems for their defense. In addition, Ada County owns land containing numerous populations of Aase's onion, much of which is scheduled to be developed as the county landfill (Moseley and Caicco 1989).

ASSESSMENT AND RECOMMENDATIONS

Summary: Prior to our 1991 field investigation, three populations (Woodtick Creek, Danskin Peak and upper Hulls Gulch) of Aase's onion were reported for the Boise NF. Results of our investigation have raised some taxonomic questions concerning Aase's onion. Several taxonomic questions remain unresolved over the break between dwarf onion and Aase's onion. The Woodtick Creek and Danskin Peak populations seem to vary strongly enough toward dwarf onion that it is very unlikely they could be Aase's onion. The upper Hulls Gulch population and the Dry/Shingle Creek population discovered in 1991, are more problematic. Although we believe they also tend towards dwarf onion, a reasonable doubt as to their identification still exists. Due to this doubt, we recommend management of these two populations on the Boise NF as if they were Aase's onion. Further taxonomic work is needed to clarify this ambiguity and may result in a reevaluation of this recommendation when/if completed.

Overall, there are now 57 known occurrences for Aase's onion, a species endemic to southwest Idaho. It is restricted to open, often sparsely vegetated, sandy, generally south-facing slopes. It is typically associated with depauperate bitterbrush and/or sagebrush communities and occupies a fairly narrow elevational range between approximately 2800 to perhaps as high as 5000 feet.

Aase's onion has been a serious conservation concern for nearly two decades and continues to face a number of threats throughout its range. Over the years, a number of Aase's onion populations have been destroyed and others are known to be imperiled, especially in the Boise foothills area. Although no typical Aase's onion is known to occur on lands it administers, the cooperation of the Boise NF is still important for the long-term conservation of Aase's onion in Idaho.

Recommendations to the Regional Forester - Region 4: Aase's onion remains a very restricted and uncommon species and faces several threats to its long-term viability. The exact identification of the upper Hulls Gulch and Dry/Shingle Creeks populations on the Boise NF remains unresolved and a taxonomic study is warranted. Aase's onion could also be present in areas of suitable habitat that have not yet been adequately surveyed on the Boise NF, particularly the upper Cartwright Canyon area. For these reasons it is recommended that Aase's onion remain on the Region 4 Sensitive Species list for the Boise NF.

Recommendations to the Boise National Forest: Our survey found numerous onion populations on the Boise NF. For now we have identified these Boise NF onion populations as follows:

- Danskin Mountains populations - all appear to be dwarf

onion.

- Populations from higher elevation and generally forested portions of the Boise front - appear to be dwarf onion.
- Populations near the Forest boundary in the Boise front, especially Dry/Shingle Creeks and upper Hulls Gulch (see Appendix 3, Maps 4 and 5) - morphologically intermediate between dwarf onion and Aase's onion, but more similar to dwarf onion.

All of these populations, however, should be evaluated in a rigorous taxonomic study of the dwarf onion-Aase's onion complex. Part of this study should include ecological considerations. For instance, soil pH, which generally decreases with elevation in the study area, can be checked to see if there is a correlated trend between the pH and Aase's and dwarf onion traits. Soil pH is known to influence several phenotypic traits such as flower color. Such a taxonomic study would better define the limits of the two species and facilitate the conservation and recovery of Aase's onion. Such a study should be supported by the Forest Service, in cooperation with the BLM and Fish and Wildlife Service.

Until the taxonomic questions are resolved, we recommend a conservative approach. The Boise NF should treat the upper Hulls Gulch and Dry/Shingle Creek populations to all of the management considerations mandated for sensitive species (USDA Forest Service 1988). If these populations are Aase's onion, they are two of the few known to occur solely on federal land.

There is a population of Aase's onion reported for the Cartwright Canyon/upper South Fork Willow Creek area at around 5000 feet elevation on BLM land. Access and time constraints limited our field work in this area. Based on patterns found elsewhere at similar elevations, it is reasonable to question the validity of this population's identification. We recommend further survey work that includes revisiting this population, and if it really is Aase's onion, determine if it extends onto the Boise NF.

A number of other known Aase's onion populations occur within a couple of miles of the Boise NF, west of the Bogus Basin area (see Appendix 3, Maps 2 and 3 for locations of these populations). The Harris Creek, upper Cartwright Canyon and Valley Creek areas on the Boise Ranger District may contain potential Aase's onion habitat.

Any scheduled project clearance work done in the non-forested, low elevation areas of the Boise Ranger District, should include plant surveys for Aase's onion. If any Aase's onion is found, actions to negate impacts to this species should be part of the planning process. Land managers and field personnel on the Boise Ranger District should be informed of the possibility of this species

occurring in non-forested, lower elevation areas. Possible sightings of Aase's onion should be documented by specimens (only if the size of the population warrants collecting), and should be sent to the Conservation Data Center, who will arrange for a verification of their identity. Confirmed sightings should be reported to the Conservation Data Center, using Region 4 TES Plant Forms, for entry into their permanent data base on sensitive species.

Recommendations to the Bureau of Land Management: Aase's onion should remain a BLM Sensitive Species for Idaho. The BLM should join the Forest Service and Fish and Wildlife Service to cooperatively fund a taxonomic study of the Aase's onion/dwarf onion complex. The BLM should also be aware that the identification of the reported Aase's onion population on BLM land in the Cartwright Canyon/upper South Fork Willow Creek area, is being questioned.

Recommendations to the U.S. Fish and Wildlife Service: Aase's onion remains an uncommon plant with a very limited distribution and faces numerous and varied threats to its long-term viability. The great majority of populations occur in part or fully on private land, where protection measures are difficult to establish. The loss of habitat and destruction of populations or parts of populations due to urban development in the Boise foothills is probably its most serious threat. With the population of Boise expanding we can only expect this threat to grow increasingly serious. For all of these reasons, we recommend listing Aase's onion as a Threatened Species under the Endangered Species Act.

We recommend the Fish and Wildlife Service cooperate with the Forest Service and BLM to cooperatively fund a taxonomic study of the Aase's onion/dwarf onion complex.

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References

Cronquist, A. 1977. Allium. Pages 508-522 In: Intermountain flora. Vascular plants of the Intermountain west, U.S.A., Volume 6, By A. Cronquist, A.H. Holmgren, N.H. Holmgren, J.L. Reveal, and P.K. Holmgren. Columbia University Press, New York.

- Henderson, D. 1991. Personal communication. Director, University of Idaho Herbarium. Department of Biological Sciences, University of Idaho, Moscow, ID.
- Idaho Native Plant Society. 1991. Results of the seventh annual Idaho Rare Plant Conference. Unpublished list on file at the Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 6 p.
- Mingrone, L.V. 1968. A comparative study of the Allium falcifolium alliance. Pullman, WA: Washington State University; 180 p. Thesis.
- Moseley, R.K., and S.L. Caicco. 1989. Status and distribution of Aase's onion (Allium aaseae), a federal candidate species, on Ada County lands in Seaman Gulch. Unpublished report on file at Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 6 p. plus appendices.
- Moseley, R., and C. Groves. 1990. Rare, threatened and endangered plants and animals of Idaho. Natural Heritage Section, Nongame and Endangered Wildlife Program, Idaho Department of Fish and Game. 33 p.
- Ownbey, M. 1950. The genus Allium in Idaho. Research Studies of the State College of Washington. 18(1):3-39.
- Ownbey, M. 1969. Allium. Pages 739-760 In: Vascular plants of the Pacific Northwest, Part 1, By C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thompson. University of Washington Press, Seattle.
- Packard, P.L. 1979. Status report: Allium aaseae. Unpublished report on file at: U.S. Fish and Wildlife Service, Boise Field Office, Boise, ID. 11 p.
- Packard, P.L. 1991. Personal communication. Professor, retired. College of Idaho. Caldwell, ID.
- Prentice, C. 1988a. 1988 progress report: a study of the life cycle of Allium aaseae Ownbey, Aase's onion. Unpublished BLM report on file at Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 34 p.
- Prentice, C. 1988b. Threats to Allium aaseae. Unpublished report on file at Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 2 p.
- Rosentreter, R. 1991. Personal communication. Botanist. U.S. Department of Interior, Bureau of Land Management, Idaho State Office, Boise, ID.

- Spahr, R., L. Armstrong, D. Atwood. and M. Rath. 1991. Threatened, endangered, and sensitive species of the Intermountain Region. USDA Forest Service, Intermountain Region, Ogden, UT.
- Steele, R. 1977. Allium aaseae Ownbey. Page 46 In: Endangered and threatened plants of Idaho - a summary of current knowledge, by the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Bull. No. 21, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Steele, R. 1981. Allium aaseae Ownbey. Page 1 In: Vascular plants of concern in Idaho, by the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Bull. No. 34, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Steele, R. 1991. Personal communication. Research forester. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Boise, ID.
- USDA Forest Service. 1988. Sensitive Plant Program Handbook R-4 FSH 2609.25. Intermountain Region, Ogden, UT.
- U.S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; review of plant taxa for listing as endangered or threatened species; notice of review. Federal Register 50 CFR Part 17:6184-6229 (Wednesday, 21 February 1990).
- U.S. Fish and Wildlife Service. No date. Listing package for Allium aaseae. Unpublished report on file at Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. not paged.

Appendix 1

Line drawings of Allium aaseae and A. simillimum.
(From Cronquist 1977)

Appendix 2

List of areas on the Boise National Forest and adjacent lands where atypical Allium simillimum populations were found.

Boise front area

Boise National Forest

1. Aldape Summit area T4N R3E S35 NE4

State land

1. McCarty Gulch T4N R3E S36 SE4 (also on private land)

Danskin Mountains

Boise National Forest

1. Danskin Peak summit T1N R7E S19 NE4
2. Woodtick Creek T2N R4E S13 NE4NW4
3. Station Creek T2N R5E S7 NE4SE4 (also on private land)
4. Graves Creek T2N R7E S8 NE4SW4 (also on private land)
5. Long Gulch T3N R7E S31 N2

Bureau of Land Management

1. Danskin Road (USFS #167, ca 1.7 mile N of Mayfield Road) T1S R6E S10 SW4SW4

State land

1. Upper Case Creek T1N R6E S13 NE4 and S12 SE4NE4
2. Willow Creek T1N R6E S22 SW4

Private land

1. Danskin Lake area T1N R7E S18 NE4

Appendix 3

Locations for Allium aaseae
near the Boise National Forest,
and for intermediate-looking Allium on and near the Forest.

- Map 1. Overview of the distribution of Allium aaseae. Portion of Boise, Idaho; Oregon 1:250,000 USGS map (revised 1976). Note that the Rebecca Sand Hills population near Weiser is not shown on this map.
- Map 2. Location of known Allium aaseae populations occurring within two miles of the Boise National Forest. Portion of Boise North 7.5' USGS quadrangle.
- Map 3. Location of known Allium aaseae populations occurring within two miles of the Boise National Forest. Portion of Cartwright Canyon 7.5' USGS quadrangle.
- Map 4. Locations for the intermediate-looking Allium on and adjacent to the Boise National Forest. Portion of Boise North 7.5' USGS quadrangle.
- Map 5. Locations for the intermediate-looking Allium on and adjacent to the Boise National Forest. Portion of Robie Creek 7.5' USGS quadrangle.

Appendix 4

Slides of Allium aaseae and its habitat.

1. Close-up of Allium aaseae; note rich pink color of the flowers and robust leaves (lower Hulls Gulch population).
2. Open slope Allium aaseae habitat in the lower Boise foothills.
3. Allium in upper Hulls Gulch, Boise NF; both pink and white-flowered plants present.
4. Overview of Allium habitat in upper Hulls Gulch.
5. Allium simillimum in Woodtick Creek area, Boise NF; both pink and white flowers present.
6. Allium simillimum habitat, Woodtick Creek; note shallow granitic soil and open, barren nature of slope.