Conservation Strategies and Monitoring of Rare Plants On National Forests in Oregon

SCOFIELD

A. gormanii *field study site no. 3 looking southwest*

By JENNIFER DIMLING

Responsibility for rare plant populations on federal lands is a major challenge for National Forest botanists today. To assure population viability we must identify rare species, learn what we can about their habitat preferences, and try to figure out how management on federal lands can be tailored to their needs. Each Conservation Strategy is constructed to help us do this.

The first step in devising a Strategy is to determine who should be involved. The Regional Office has given National Forests responsibility for writing Conservation Strategies for all our rare (or sensitive) species. Forest botanists then use information from the Natural Heritage Database to determine if the species exists elsewhere on federal lands. An interagency working group is organized if the species occurs on federal lands managed by several agencies. One person has the honor of being writer for the group while the others are critics in the process outlined below. I will illustrate the process with a Strategy I edited. If you have comments, please let me know.

What is a Conservation Strategy?

Conservation Strategies are designed to help manage sensitive species and to evaluate their status. This information may be used by the United States Fish and Wildlife Service and the State of Oregon to list or delist candidate species. Although there is no standardized format, most Conservation Strategies contain several similar pieces: a summary of all known information, a monitoring strategy, and management objectives for the species.

The first section of each document contains a synopsis of all available information about the species. This include taxonomic information, morphological descriptions, distribution maps, habitat information, population dynamics and breeding systems, and potential threats due to anthropogenic and natural disturbances. This information is most commonly gathered through challenge cost-share agreements with The Nature Conservancy and the Plant Conservation Biology Program of the Oregon Department of Agriculture.

Management teams gather information from a number of sources. Literature searches locate research done on the species and identify specialists working on its taxonomic group. Searches in local herbaria lead to information on former distributions of species. Herbarium labels often indicate associated plant species and habitats. Field notes from botanists who have surveyed for the plant may be useful in determining where the species does and does not grow. Confirmed sightings are documented in a Region 6 sighting form format so that they may be included in the state wide Oregon Natural Heritage Database.

An excerpt from the Conservation Strategy for *Aster gormanii*, whose synopsis was written by Cheryl Ingersoll for a challenge cost-share project between the Mt. Hood National Forest and the Oregon Dept. of Agriculture, serves as a good example:

Plant Description

Aster gormanii is a member of the Asteraceae (Compositae) or aster family, and is placed in the section *Eucephalus*, which has been reviewed by Thompson (1977). Other closely allied species of the section *Eucephalus* are also endemic to the Pacific Northwest, including *Aster brickelloides*, *A. glaucescens*, *A. ledophyllus*, *A. paucicapitatus*, and *A. vialis*. Three (*A. gormanii*, *A. glaucescens*, and *A. vialis*) are highly restricted endemics in Oregon and Washington.

Technical descriptions of *Aster gormanii* are provided by Piper (1916), Hitchcock et al. (1955), Abrams (1960) and Peck (1961). Hitchcock et al. (1955) describe the species as:

> "Perennial from a short and stout to more slender and branched rhizome, 1-3 dm tall; herbage glandular; lowermost leaves reduced, others crowded, uniform, sessile, elliptic-oblong, entire, mostly 1.5-3 cm long, 3-10 mm wide; heads solitary or sometimes 2-4; involucre 7-11 mm high, the bracts well imbricate..."

Distribution

As of 1994, a total of 63 *Aster gormanii* populations have been reported: 22 of these are located within the Mt. Hood National Forest, 29 are located within the Willamette National Forest, 10 are located on the Salem District of the BLM, one on the Warm Springs Reservation and one on private land (see Table 1 for site listings of all populations according to the Natural Heritage Database).

The species is restricted to a narrow geographic range within the western Cascades and High Cascades physiographic provinces (Franklin and Dyrness 1973). The southernmost (Iron Mountain) and northernmost (South Fork Mountain) occur less than 50 air miles apart. The westernmost (Table Rock) and easternmost (Harvey Lake) localities are only 30 miles apart. Within this area, *Aster gormanii* is restricted to scattered open areas on ridge crests, mountain summits, and slopes between about 1200 and 1700 m. (3,900 and 5,500 ft.) elevations, with a single population at 1900 m. (6,200 ft.).

Habitat Description

Soils

Most *Aster gormanii* sites on the Mt. Hood National Forest are pyroclastic outcrops composed of tuffs and breccias (e.g. North Dickey Peak and Granite Peaks). *Aster gormanii* also occurs on basalt or andesite outcrops (South Fork Mountain and Baty Butte). Soils associated with both types of outcrops are generally quite shallow and very well drained.

Plant Communities and Associated Species

Aster gormanii occurs in forest openings in the *Abies amabilis* and lower portions of the *Tsuga mertensia* Zones (Franklin and Dyrness 1973). The species grows predominantly on south to east exposures of open ridge crests and steep slopes, but is found on west and north aspects as well. Occasionally it inhabits dry meadows and rock outcrop habitats.

Aster gormanii

Although A. *gormanii* can grow in partial shade, it is rarely found under closed canopy or dense shrub cover. Where it occurs, it is often a dominant member of the plant community.

Hickman (1976) lists *Aster gormanii* as a major component of the non-forested *Lotus nevadensis / Chrysothamnus nauseosus / Allium crenulatum* "Tuffaceous Gravel Association" in the central-western Cascades. His observations were based on the only three sites at which the species was then known to occur.

Population Dynamics

Virtually nothing is known about the population dynamics of *Aster gormanii*. As the species had been rarely seen until recent years, its biology has received little attention.

Aster gormanii is a long lived herbaceous perennial. It exhibits extensive rhizomatous growth, and individual plants may reach 1 m. in diameter and have well over 100 stems. Beily (1980) suggests that the species is a poor competitor, and this is supported by observations of its growth form and habit. Plants generally reach their largest size and greatest density of stems and flowering heads when growing in full sun away from other vegetation.

Why Monitor?

Botanists use this information to add a monitoring protocol tailored to the species. The protocol is designed to fill gaps in knowledge not covered by the literature and herbarium surveys. The interagency group writes goals and objectives for monitoring that include accepted error rates and probabilities so that monitoring designs will detect real changes in populations. Sometimes populations are small enough to count all the plants, but, in most cases, one must sample plants to estimate the entire population size. Two types of monitoring may be conducted: demographic and experimental.

Demographic monitoring lets you know how the species is doing. Selected populations (or all of them if there aren't many individuals) are followed for a number of years to determine if individual populations are increasing, decreasing, or stable.

BORGIAS

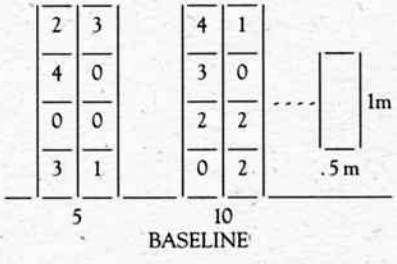
Plant monitoring

Demographic monitoring can be simple or complex, depending on the information needed, level of endangerment of the plant, time available and number of sites monitored. The simplest protocol counts the number of plants within each sample plot as a means of estimating stability in the population over time. A more complex Strategy is needed to discriminate between reproductive and vegetative individuals. Some studies also measure reproductive effort and attempt to correlate reproduction with environmental parameters such as temperature and precipitation. The most complex Strategies tag individuals and follow each plant through its life cycle. In addition to measuring reproductive output, this monitoring protocol enables the botanist to determine longevity of plants and whether changes in population numbers are due to death or recruitment.

Monitoring Protocol

Dr. Susan Kephart, Willamette University, designed a management protocol for *Aster gormanii* for the Salem District BLM. Our interagency group has adopted most of the original design. We count plant stems rather than individual plants of this rhizomatous species. When we count stems, their reproductive status (vegetative, flowering, or fruiting) is noted. We map clumps of aster within the plot so we can tell (a) if the clumps are growing or contracting, and (b) if new plants come into the plot.

The guidelines outlined by Dr. Kephart are designed to: (a) assess natural variation in population numbers through estimates of cover for *Aster gormanii* and co-occurring plants; (b) assess overall plant fitness through measurements of stem height and flower head diameter in three randomly chosen plants per plot; (c) assess fecundity through counts of flowers and fruits and through counts of seedlings.



DATA SHEET

m5	m10	m15
2.3	4.1	3.5
4.0	3.0	0.0
0.0	2.2	3.1
3.1	0.2	4.2

To get an idea of variability of plants across the habitat, use a half meter on either side of the perpendicular transect to create two sides of a plot. The other two sides of a plot are two meter lengths as measured along your perpendicular tape. For each meter along the perpendicular tape, take two readings, number of plants per plot on either side of the tape. Take plot data until you come to the edge of the habitat.

Population Monitoring

Population monitoring sites will consist of three populations on the Willamette NF, Bachelor Mountain, Marten Butte, Phantom Natural Bridge, and Pika on the Mt. Hood NF.

Table 1 **Monitoring Sites**

Monitor Site Name / No.	District Forest/Agency	Threat / Disturbance	Elevation (feet)	Habitat	Schedule
Granite Peak clearcut EO 022	Clackamas Mt. Hood NF	Timber sale Cut through middle of population	5,200	Open ridgeline (lithosol)	historic continue
Pika TS EO 008	Estacada Mt. Hood NF	Timber sale buffer 25-50 ft.	4,200	rock outcrop (lithosol)	historic continue
South Fork Mountain EO 028	Estacada Mt. Hood NF	Clearcut early 1970s Archeological site	4,300	rock outcrop XETE, ABAM, ABPR (forest edge)	initiate 1994
Bull of the Woods EO 014	Estacada Mt. Hood NF	Lookout Trail with human and horse use. Subpop. in burn Subpop. along trail	5,000	rock outcrop (lithosol)	initiate 1994
Baty Butte site no. 1 EO 006	Salem BLM	Timber sale Adjacent road/quarry Seedling recruitment monitoring	4,800	rock outcrop (lithosol)	initiate new plots 1994
Bachelor Mtn. EO 016	Detroit Willamette NF	Fire in the late 1960s Adjacent *A. ledophyllus*	5,500	scree (lithosol)	initiate 1994
Marten Butte EO 059	Detroit Wilamette NF	Scattered clumpy unhealthy pop? Adj. timber sale buffer	4,400	on banks of dry ravine (lithosol)	initiate 1994
Phantom Natural Bridge EO 051	Detroit Willamette NF	Trail, Adj. plantation	4,280	moss (lithosol)	initiate 1994

Plots will be read yearly for five years. After five years, plots will be read every other year and the results compared to the range of values (natural variation) obtained in years one to five. If there is a 30% decrease in the number of individuals or in the reproductive rate (with an 80% confidence level and sampling error rate of 0.05), there is a need for active management. If there is a need for active management, we will find out whether *Aster* responds positively or negatively to any of the management disturbance regimes we routinely produce through disturbance monitoring. If natural or human disturbance, as in pre-commercial thinning, would not be effective in increasing populations, perhaps habitat enhancement, such as prescribed fire or tree/brush cutting, would be necessary to improve populations in trouble.

Experimental monitoring is used to determine effects of both anthropogenic and natural disturbances on populations. We need to know whether plants will survive management actions, or if they need some type of disturbance for survival. This information is critical for designing management strategies for each sensitive species.

Experimental monitoring can be prescribed where management actions are proposed (a timber sale or a grazing allotment) where sensitive species occur. In such cases, an experiment is set up where the results of treatments are statistically analyzed against non-treatments (controls). For example, if one wished to know the effect of timber harvest on a species, one might sample some part of the plant population exposed to harvest and another buffered from harvest. Similar experiments are conducted to study the impact of trail construction, or prescribed burning. Monitoring is planned in conjunction with a statistician who aids in experimental and statistical analysis. Replication of treatments and number of plots naturally vary between experimental sites. Experimental monitoring is primarily used to infer responses of other populations of the species to similar treatments. Disturbance monitoring for *Aster gormanii* illustrates why the help of statisticians is vital to obtaining results from monitoring.

Disturbance Monitoring

Disturbance monitoring determines how populations react to active management regimes. There is some evidence that *Aster gormanii* can reestablish individuals within a quarried site (Baty Butte) and survive disturbances associated with timber harvest (Granite Peak and South Fork). Lack of information on pre-disturbance population numbers or the extent of direct disturbance makes it difficult to evaluate the response of *Aster gormanii* to these disturbances.

Most monitoring projects initiated prior to this Conservation Strategy (Granite Peak, South Fork) determined pre-disturbance population sizes. These sites will continue to use the methods that were set up when the monitoring was initiated. New monitoring sites, including one site which has been disturbed by recreational activities (Bull of the Woods) and one which has been quarried (Baty Butte), will follow the protocol of this Strategy. New monitoring plots will be read before disturbance (if possible) and after one, three and five years to determine whether there are any long-term adverse effects due to the disturbance.

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SSW of A. gormanii *study site no. 3 near Baty Butte*

Evaluating effects of disturbance using information gathered from monitoring plants set up prior to this Conservation Strategy could be difficult because of the lack of control plots. Control plots would have allowed comparison of population trends influenced by environmental factors. For example, if there were a sharp decline in plant numbers in the disturbed population, but not in the control, the decline could be due to the disturbance. Without controls, it may be difficult to separate normal fluctuations from change due to disturbances.

What Do We Do With All That Data?

Once all available information is examined, the management team responsible for the species may develop an initial Strategy for the species (usually quite protective, especially when little is known about the species response to management). Management plans often contain specific goals and objectives for the species. One goal common to all Conservation Strategies is the maintenance of at least viable populations of the species throughout their range. Management objectives may recommend that certain populations remain unmanaged and that others be used for experimental monitoring purposes. Or management objectives may apply to the species as a whole. For example, all populations should be buffered 500 feet from activities liable to affect the plant; or management will occur on a site-by-site basis with reasoning clearly stated in the environmental document.

A management plan with clearly defined objectives is outlined for *Aster gormanii*. Recommendations for the most common management activities likely to affect populations are noted:

Objective

The objective of *Aster gormanii* management is to maintain healthy, reproducing populations of the species at a variety of sites within its range. In order to accomplish this objective the following steps are recommended:

1. Protect populations from immediate threats to their existence;
2. Evaluate population responses to site disturbance in areas where planned projects or heavily used trails are adjacent to large populations;
3. Continue species inventory, particularly in areas that are protected from development;
4. Collect additional baseline data on habitat requirements and community characteristics; and
5. Monitor demographic trends in populations on sites representing a range of environmental conditions throughout the range of the species.

Management of Populations

Management strategies for each population will be designed on a site specific basis by the resident botanist. In most cases, timber harvest directly adjacent to the population is discouraged. However, selective harvest, meant to thwart encroachment of trees on the population, habitat improvement, could occur. Road building and quarrying adjacent to the population is also discouraged.

Agencies included in the Conservation Strategy often schedule a meeting to ensure information exchange on a regular basis. The Conservation Strategy document is not meant to be static, but fluid. If problems arise during monitoring, the group discusses it and the plan is amended. Monitoring results are discussed and the group may change the management strategy based on new information about the species' response to disturbance or to management activities. If populations are in decline and some type of habitat enhancement regime seems necessary, then recommendations will be made to managers.

How Can NPSO Members Help?

Native Plant Society members can help USFS botanists in a number of ways. Get your chapter to coordinate with agency botanists to help with monitoring. You will learn about sensitive species in your area and the botanists will have help doing their monitoring. Or you could volunteer to visit populations that haven't been seen in a long time to determine whether they still exist. If you are more comfortable in the library, you could volunteer to do literature searches. Herbarium work is often time consuming and this information is always needed. If you know about computers, you could help write and edit a Conservation Strategy. If you are just interested in final products or specific plants, get in touch with your local Forest botanist and let him or her know you are interested.

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Cimicifuga elata — Tall Bugbane

By THOMAS KAYE

This year's featured plant is a rare species that has attracted the attention of botanists concerned with its survival in western forests. Tall Bugbane *(Cimicifuga elata)*, a member of the buttercup family *(Ranunculaceae)*, occurs from the lower Fraser Valley in British Columbia, through western Washington, to southern Oregon. It is an herbaceous perennial usually four to six feet tall with compound leaves and spray-like clusters of white flowers. The flowers themselves do not have any petals, but instead are made showy by an abundance of white stamens. The species has special management status with the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM), and it is a candidate for listing as threatened or endangered with the state of Oregon.

Tall bugbane is unusual compared to most rare plants. Typically, rare species have populations composed of hundreds or thousands of individuals, but populations are restricted to a small geographic area. Tall bugbane, in contrast, usually has small populations (over half contain fewer than 25 plants) and it occurs over a large range. Oddly, though, in the southern part of the species' distribution its populations are almost always very large, with plants numbering in the thousands. There is no confirmed explanation for this peculiar pattern, but some hypotheses have been proposed. For example, more extensive optimum habitat may be available in southern Oregon, and/or populations in this area may be evolutionarily and taxonomically divergent.

Tall bugbane is one of fifteen *Cimicifuga* species in the world. All are north-temperate and six occur in North America. One other species in the genus, Mt. Hood bugbane *(C. laciniata)*, occurs in Oregon in the vicinity of its lofty namesake. In ***Flora of the Pacific Northwest***, Hitchcock and Cronquist explain that the genus name *Cimicifuga* comes from the latin *cimex* (bug) and *fugere* (to repel), because at least one species can be used to repel bed-bugs! The entire genus is well known for its medicinal properties, especially as an anti-inflammatory, anti-spasmodic, sedative, and soother of menstrual cramps. The medicinal potential of these plants underscores the practical need for conservation and protection of tall bugbane.

The presence of tall bugbane in west-side forests creates the potential for conflict with timber harvests, so federal and state agencies collaborated recently to evaluate the species' current status, habitat requirements, and response to logging. According to Natural Heritage Program database records, there are about 100 populations in Oregon and 30 in Washington. Field research indicates that the species almost always occurs under a patch of deciduous trees (such as big-leaf maple) in an otherwise coniferous forest (usually dominated by Douglas fir, western hemlock, and western red cedar). In addition, the species prefers north-facing slopes and some source of moisture, either in the form of a nearby stream or subsurface flow. Beyond these commonalities, however, the plant communities in which bugbane populations occur differ significantly from one region to another, such as the Columbia Gorge, central Cascades, and southern Oregon. Descriptions of regional habitat-types for tall bugbane have already improved the efficiency and success of searches for the species.

Conventional wisdom holds that tall bugbane should be negatively affected by timber harvest because it typically occurs in old-growth forest. However, analysis of populations in several different types of managed and unmanaged forests shows clearly that plants in clearcuts and thinned stands are taller and have more flowers than in uncut forests or old second growth (greater than 70 years). In addition, recruitment (birth) and growth of new individuals is greater in clearcut and thinned stands. Some timber harvest is probably compatible with tall bugbane conservation, but we do not advocate clearcuts as a means to improve conditions for the species. This is primarily because we have no information on what happens to populations 15-30 years after timber harvest, when some young forests are so dense that light levels are even lower than in old-growth forests. Instead, conservation of tall bugbane should rely on protection of some populations combined with careful manipulation of the forest habitat of others, such as thinning and prescribed fire. The short-term (or longer) tolerance of bugbane populations to forest disturbance coupled with the relatively large number of reported populations is encouraging, and will allow conservation efforts to be flexible and creative.

The wide distribution of tall bugbane in Oregon makes it fairly accessible to interested NPSO members. Populations are best viewed in June and July when plants are in bloom. If you live in southern Oregon, the easiest population to visit is at Grizzly Peak east of Ashland. In the Willamette Valley, try the "New Growth Trail" in Oregon State University's McDonald Forest.

Additional information on tall bugbane research by botanists from the Oregon Department of Agriculture, USFS, and BLM is available from the author in a technical report entitled, "*Cimicifuga elata:* Status, Habitat Analysis, Monitoring, Inventory, and Effects of Timber Management."