

CONSERVATION ASSESSMENT

for

Galium kamtschaticum Steller *ex* J.A. & J.H. Schultes

Originally issued
as Management Recommendations
December 1998
Laura L. Potash

Reconfigured-November 2004
Tracy L. Fuentes

**USDA Forest Service Region 6 and
USDI Bureau of Land Management, Oregon and Washington**

Table of Contents

	Page
List of Tables	2
List of Figures.....	2
SUMMARY	4
I. NATURAL HISTORY	6
A. Taxonomy and Nomenclature.....	6
B. Species Description.....	6
1. Morphology	6
2. Reproductive Biology.....	6
3. Ecological Roles.....	7
C. Range and Sites	7
D. Habitat Characteristics and Species Abundance	8
II. CURRENT SPECIES SITUATION.....	10
A. Status History	10
B. Major Habitat and Viability Considerations.....	10
C. Threats to the Species	10
D. Distribution Relative to Land Allocations	11
III. MANAGEMENT GOALS AND OBJECTIVES	11
IV. HABITAT MANAGEMENT.....	12
A. Lessons from History	12
B. Identifying Species Habitat Areas	12
C. Managing in Species Management Areas	12
V. RESEARCH, INVENTORY, AND MONITORING OPPORTUNITIES	13
A. Data and Information Gaps	13
B. Research Questions	13
C. Monitoring Needs and Recommendations.....	13
VI. GLOSSARY.....	14
VII. REFERENCES.....	16

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

List of Tables

Table		Page
1	Documented occurrences of <i>Galium kamtschaticum</i> by administrator and district.	7
2	Species commonly associated with <i>Galium kamtschaticum</i> on the Mt. Baker-Snoqualmie NF.	9
3	<i>Galium kamtschaticum</i> sites, by administrator and land allocation.....	11

List of Figures

Figure		Page
1	Line drawing of <i>Galium kamtschaticum</i> Steller <i>ex</i> Schult. and Schult.	19

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

Preface

Converting Survey and Manage Management Recommendations into Conservation Assessments

Much of the content in this document was included in a previously transmitted Management Recommendation (MR) developed for management of the species under the previous Survey and Manage Standards and Guidelines (USDA and USDI 1994a, b). With the removal of those Standards and Guidelines, the previously transmitted MR has been reconfigured into a Conservation Assessment (CA) to fit the BLM Oregon/Washington and Region 6 Forest Service Special Status/Sensitive Species Programs (SSSSP) objectives and language.

Since the transmittal of the original MR in 1998, new information has been gathered regarding number of documented occurrences and distribution of the species relative to land allocation. This new information has been included in this document. However, most information presented here reflects information up to and including the year 1998. New information on habitat management has not been included in this document, and further updates should incorporate this and any other new information.

Assumptions on site management

In the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) to Remove or Modify the Survey and Manage Standards and Guidelines, assumptions were made as to how former Survey and Manage species would be managed under agency Special Status Species policies. Under the assumptions in the FSEIS, the ROD stated “The assumption used in the final SEIS for managing known sites under the Special Status Species Programs was that sites needed to prevent a listing under the Endangered Species Act would be managed. For species currently included in Survey and Manage Categories A, B and E (which require management of all known sites), it is anticipated that only in rare cases would a site not be needed to prevent a listing... Authority to disturb special status species lies with the agency official that is responsible for authorizing the proposed habitat-disturbing activity” (USDA and USDI 2004). This species was in Survey and Manage Category A at the time of the signing of the ROD, and the above assumptions apply to this species’ management under the agencies’ SSSSP.

Management Considerations

Under the “Managing in Species Habitat Areas” section in this Conservation Assessment, there is a discussion on “Management Considerations”. “Management Considerations” are actions or mitigations that the deciding official can utilize as a means of providing for the continued persistence of the species’ site. These considerations are not required and are intended as general information that field level personnel could utilize and apply to site-specific situations.

Management of this species follows Forest Service 2670 Manual policy and BLM 6840 Manual direction. (Additional information, including species-specific maps, is available on the Interagency Special Status Species website.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

SUMMARY

Species *Galium kamtschaticum* Steller ex J.A. & J.H. Schultes (boreal bedstraw)

Taxonomic Group Vascular Plants

Other Management Status NatureServe ranks *Galium kamtschaticum* with a Global Heritage Rank of G5, described as apparently to demonstrably secure globally. The Washington Natural Heritage Program has downgraded the species from Sensitive to Watch and no longer tracks this species. In Washington, *G. kamtschaticum* is a Forest Service Region 6 Sensitive Species and Bureau Assessment for the BLM in Washington.

Range and Habitat *Galium kamtschaticum* is circumboreal in its distribution and occurs sporadically from Kamchatka and Korea, through the Aleutian Islands and the Alaska panhandle, to the Olympic Mountains and Cascade Range of Washington, where it apparently does not extend south of Snoqualmie Pass. The species reappears in southeastern Canada and adjacent New England, New York State, and the northeastern side of Lake Superior. On federal lands in Washington, Oregon, and California, *Galium kamtschaticum* has been documented on the Mt. Baker-Snoqualmie, Wenatchee, and Olympic National Forests.

Galium kamtschaticum is described as inhabiting moist, cold, coniferous forests and mossy places throughout its range. Sites on the Olympic Peninsula are generally on northerly aspects, from 643-967 m (1930-2900 feet) in elevation, in the silver fir or mountain hemlock plant associations, in wet canopy gaps. In the western Cascades, this species most often occurs on low angle slopes with saturated soils, under dense shrub or ladyfern thickets, in old-growth forest canopy gaps, and in the silver fir/devil's club-Alaska huckleberry plant association. There are exceptions however - one of the largest and most vigorous populations in the Cascades occurs on steep talus with a dense shrub cover.

Threats

- Changes in hydrology resulting from management activities, or from climate change.
- Trampling, crushing, or other direct impacts to the fragile above-ground stems.
- Compaction of saturated soils; this could alter wetland hydrology and could destroy the shallowly rooted underground rhizomes.
- Increased light intensity; virtually all populations received only partial or indirect sunlight.

Management Considerations

- Maintain existing drainage patterns and avoid compaction of saturated soils.
- Maintain significant associated understory species and conditions that support their growth. Species that occurred in over 50 percent of the documented occurrences are salmonberry, devil's club, stink currant, and ladyfern.
- Avoid actions that would facilitate the invasion of weedy species.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

- Avoid direct impacts that would crush the plants such as yarding, moving of equipment, or trampling on the stems. For large populations of *Galium kamtschaticum* (e.g., several hundred stems), try to impact < 5% of the population.

Data and Information Gaps: Inventory of areas identified as suitable habitat on federal lands in Washington, excluding the Mt. Baker-Snoqualmie National Forest.

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Galium kamtschaticum Stellar ex J.A. & J.H. Schultes was originally documented from the Kamtschatka Peninsula in Siberia off the eastern coast of Russia (Schultes and Schultes 1827). It was subsequently called *Galium rotundifolium* var. *kamtschaticum* (Kuntze 1891). Meanwhile, a population discovered in the White Mountains of New Hampshire was considered to be a different species named *Galium littellii* (Oakes 1841). Modern day taxonomists have now accepted the earliest name as the one deserving specific status, and all of the other names mentioned are considered to be the same entity (Hitchcock et al. 1969; Anderson 1974; Calder and Taylor 1968; Hultén 1968; Scoggan 1979).

Kingdom: Plantae (Plants)
 Division: Magnoliophyta (Angiosperms)
 Class: Magnoliopsida (Dicotyledons)
 Order: Rubiales (Madders)
 Family: Rubiaceae (Madders)
 Genus: *Galium*
 Species: *kamtschaticum*

B. Species Description

1. Morphology

The following species description is based on Hitchcock, et al. (1969). *Galium kamtschaticum* is an inconspicuous perennial herb, about 1-2 dm (4-8") tall, in the Rubiaceae family. It has a smooth main stem and round leaves that are borne in whorls of 4. It is distinguished by having only 2-4 sets of whorls per plant and by having very few flowers. The leaves have narrow bases at the point of attachment to the stem, and are often mucronate at the tip. *Galium kamtschaticum* generally has only 2-3 flowers at the top of each flower stalk and has only 1-3 flower stalks per plant. The inconspicuous flowers are only about 3 mm wide, greenish-white in color, and 4-lobed. These develop into tiny fruits, 1.5 mm long, that are covered with hooked bristles.

Galium kamtschaticum can sometimes be confused with *Galium oreganum*, which is the only other *Galium* in this area that has 4 leaves per whorl. However, *Galium oreganum* has 5 to 8 sets of whorls per plant, the inflorescence is more branched, and there are more flowers at the end of each flower stalk. In western Washington, boreal bedstraw emerges late in the season and cannot be positively identified until late July since immature species of *Galium* are virtually impossible to distinguish from each other with reliable accuracy (many other species of *Galium* have 4 leaves per whorl when in the juvenile stage).

2. Reproductive Biology

Boreal bedstraw is a perennial herb with creeping slender rhizomes (Hitchcock et al. 1969). Most populations observed on Canada's Queen Charlotte Islands showed well developed vegetative reproduction but only a few plants in any one colony produced flowers or fruit (Calder and Taylor 1968). Of the 18 sites studied on the Mt. Baker-Snoqualmie National Forest in 1991, an average of 48 percent of the plants were in flower or fruit on each survey date (Potash 1992). Of

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

these, 15 percent of the sites had plants in flower vs. 85 percent with the plants in fruit, even though sites were visited continuously from the time of first emergence until killing frost in the late fall. For this reason it appears that the actual time of blooming may be very brief. It is not known what the pollination vector is for *Galium kamtschaticum*.

Populations in the western Cascades varied from two "individuals" to several hundred stems. The term "individual" is used here in a general sense to mean a single stem arising from the ground; this species usually occurs in patches, and it is recognized that the single stems may not be genetically distinct entities.

3. Ecological Roles

Little is known about the ecological roles of *Galium kamtschaticum*.

C. Range and Sites

Boreal bedstraw is circumboreal in its distribution, but it is "rare and local" throughout its range (Hitchcock et al. 1969) and, in fact, "represents one of the rarest species in the Cordilleran region" (Calder and Taylor 1968). *Galium kamtschaticum* occurs sporadically from Kamchatka and Korea, through the Aleutian Islands and the Alaska panhandle, to the Olympic Mountains and Cascade Range of Washington, where it apparently does not extend south of Snoqualmie Pass. The species also occurs in southeastern Canada and adjacent New England, New York State, and the northeastern side of Lake Superior.

In Washington State, the vast majority of the documented occurrences/sites are in the western Cascades on the Mt. Baker-Snoqualmie National Forest (Table 1). On the Olympic Peninsula, all 8 documented occurrences occur on the Olympic National Forest.

Table 1. Documented occurrences of *Galium kamtschaticum* by administrator and district.

Data are from ISMS (2004). Documented occurrences are locations at least 100 m apart (ISMS Development Team 2000) and are not necessarily the same as Natural Heritage Element Occurrences.

Administrator	District	# occurrences
Mount Baker-Snoqualmie NF	Mount Baker Ranger District	12
Mount Baker-Snoqualmie NF	Darrington Ranger District	25
Mount Baker-Snoqualmie NF	Skykomish Ranger District	19
Mount Baker-Snoqualmie NF	Snoqualmie Ranger District	19
Wenatchee NF	Cle Elum Ranger District	2
Olympic NF	Hood Canal Ranger District	3
Olympic NF	Quinault Ranger District	5
Washington State		2
Total		87

D. Habitat Characteristics and Species Abundance

Galium kamtschaticum typically occurs in seepy areas below old-growth forest canopy gaps (Potash 1992). Most documented occurrences are in the wettest plant associations (Henderson, et al 1992) of the Pacific Silver Fir series: Pacific Silver fir/devil's club-Alaska huckleberry and Pacific Silver fir/skunk cabbage. After this correlation was observed (Potash 1992), it was possible to find many new *Galium kamtschaticum* sites in subsequent years by conducting inventories in wet microsites within these two plant associations. Salmonberry (*Rubus spectabilis*), lady fern (*Athyrium filix-femina*), and devil's club (*Oplopanax horridum*) are common understory species (Table 2).

Although technical wetland delineations have not been conducted, it is likely that all *Galium kamtschaticum* sites would be classified as wetland by the Federal Interagency Committee for wetland delineation (1987). If this species is ever given a "wetland indicator status" (Reed 1988) it would likely be classified as obligate, i.e., there is 99 percent probability that it would be found growing in an area technically classified as wetland.

The underlying bedrock or geologic type was determined from a geologic map of Washington (Weissenborn 1961) for some sites on the Mt. Baker-Snoqualmie National Forest. *Galium kamtschaticum* occurs on a variety of geologic types but was not usually found on sites with volcanic bedrock or unconsolidated glacial till. One possible explanation for this is that deeply fractured volcanic bedrock and unconsolidated tills are often well drained and not conducive to the shallow water table that this species appears to require.

Canopy gaps can be formed by a variety of processes but the gaps where *Galium kamtschaticum* occurs appear to be the result of saturated soils, i.e., it is simply too wet for tree establishment in these areas. These gaps tend to be relatively narrow areas within the forest, so light penetration is modified by the surrounding stand. *Galium kamtschaticum* does seem to require shade because it is usually found underneath dense shrub cover and not in full sunlight. The few *Galium kamtschaticum* stems that were observed growing in direct sunlight were somewhat chlorotic (Debra Salstrom, personal communication).

Sites on the Olympic Peninsula are generally on northerly aspects, from 643-966m (1930-2900 ft.) in elevation, in the silver fir or mountain hemlock plant associations (Henderson et al. 1989), in wet canopy gaps. One site is on a terrace but the other 4 are on slopes ranging from 25 to 65 percent. There was not enough specific information to generalize further about plant associations, associated species, or other variables.

Sites in the Cascade Mountains generally occur on low angle slopes with saturated soils, under dense shrub (in some cases, ladyfern) thickets, in old-growth forest canopy gaps, from 500-1166m (1500-3500 ft.) in elevation. However, one of the largest and most vigorous populations on the Mt. Baker-Snoqualmie National Forest occurs on steep talus with a dense shrub cover, but the microsite had surface seepage.

Of the 28 sites on the Mt. Baker-Snoqualmie NF, 64% were located in old-growth coniferous forests (Potash 1992). Of the remaining sites, 17% were in young plantations (sapling-pole

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

stage), and 11% were in non-forested plant communities. Three sites had no seral stage recorded.

Table 2. Species commonly associated (present at least 20 of 76 documented occurrences) with *Galium kamtschaticum* on the Mt. Baker-Snoqualmie NF.

Species are ranked according to frequency of occurrence. Because not all of the sighting reports quantified the percent cover, mean cover calculations are followed by the sample size (n).

<u>Associated Species</u>	<u># sites</u>	<u>% of sites</u>	<u>Mean % Cover</u>
<i>Rubus spectabilis</i>	64	84	33 (n=48)
<i>Athyrium filix-femina</i>	62	82	9 (n=40)
<i>Oplopanax horridum</i>	58	76	36 (n = 38)*
<i>Abies amabilis</i>	55	72	24 (n = 40)
<i>Tsuga heterophylla</i>	51	67	23 (n = 22)
<i>Ribes bracteosum</i>	40	53	8 (n = 24)
<i>Tiarella unifoliata</i>	36	47	14 (n = 17)
<i>Vaccinium alaskense</i>	35	46	18 (n = 20)
<i>Lysichitum americanum</i>	31	41	21 (n = 19)
<i>Gymnocarpium dryopteris</i>	30	39	11(n = 13)
<i>Blechnum spicant</i>	27	36	7 (n = 16)
Moss (unidentified)**	22	30	63 (n = 11)
<i>Thuja plicata</i>	22	30	6 (n = 10)
<i>Rubus pedatus</i>	22	30	22 (n = 48)

* Although the mean was 36% because of a few low values, over half the occurrences had a mean of 85% cover.

** In addition to these unidentified genera of mosses, 10 occurrences (13%) had an average of 10% cover of *Sphagnum* spp.

II. CURRENT SPECIES SITUATION

A. Status History

NatureServe (2004) ranks *Galium kamtschaticum* with a Global Heritage Rank of G5, described as apparently to demonstrably secure globally. The Washington Natural Heritage Program (1997, 2004) has downgraded the species from Sensitive to Watch and no longer tracks this species. In Washington, *G. kamtschaticum* is a Forest Service Region 6 Sensitive Species, and Bureau Assessment for BLM in Washington.

Under the Northwest Forest Plan (USDA and USDI 1994a, b), *Galium kamtschaticum* was considered vulnerable because it is on the southernmost edge of its range, extending south just past Snoqualmie Pass in Washington State. Populations of species on the edge of their natural range are important to maintain because they are often genetically distinct from populations at the core of the range. They may respond differently to microclimatic changes induced by timber harvest, drought, or global climate change and, therefore, may provide genetic diversity for the species as a whole.

Because more documented occurrences/site of *Galium kamtschaticum* were identified from 1999-2000 and because all of the sites were in a more protected land allocation (Riparian Reserve), sites north of Snoqualmie Pass were removed in 2001 from Survey and Manage Standards and Guidelines (USDA and USDI 2001). The high number of populations that occur within protected land use allocations may warrant a reevaluation of the ratings for this particular species.

B. Major Habitat and Viability Considerations

The major viability considerations for *Galium kamtschaticum* are loss of populations due to management activities that impact the habitat or population, or trampling from recreational use. Climate change could result in a decline in vigor for this species if sites get much warmer and drier, since it appears to require saturated soils.

C. Threats to the Species

The major threat for this species may be change in hydrology resulting from management activities. Since *Galium kamtschaticum* grows in places with a shallow water table, management activities that affect downslope hydrology (e.g., construction of trails or roads) would have a detrimental effect on this species if a site becomes too dry. Conversely, if a site becomes inundated as a result of management activities (e.g., stream diversion), it would be too wet for *Galium kamtschaticum*, since it does not grow in standing water.

Although changes in hydrology resulting from climate change cannot be practically mitigated, the net effect would be the same as hydrologic changes as a result of management activities and it is important to recognize the role a species like *Galium kamtschaticum* may be able to play in documenting possible climate change (Maze and Robson 1992).

Trampling, crushing, or other direct impacts can be caused by hiking, mowing, yarding, etc. This species is small, inconspicuous, and has fragile herbaceous stems and slender rhizomes. The species seems unable to tolerate any direct impacts.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

Increased light intensity could possibly have a detrimental effect. Only two individual stems out of many hundreds were observed to be growing out in full sunlight; most plants received only partial or indirect sunlight (Potash 1992).

Noxious weed infestations could have a detrimental effect on this species. *Galium kamtschaticum* is generally found in relatively undisturbed native plant communities.

D. Distribution Relative to Land Allocations

Most documented occurrences occur in land allocations that currently afford a considerable degree of protection (Table 3).

Table 3. *Galium kamtschaticum* documented occurrences by administrator and by land allocation.

Administrator	Land Allocation*	# Documented occurrences
Mt. Baker-Snoqualmie NF	Administratively Withdrawn	9
	Congressionally Withdrawn	17
	Late Successional Reserve	44
	Matrix	7
Wenatchee NF	Administratively Withdrawn	2
Olympic NF	Late Successional Reserve	8
Washington State	unknown	2
Total		87

*Since *Galium kamtschaticum* appears to be an obligate wetland species, all occurrences would also be designated as Riparian Reserve (USDA 1994a, pp. C30-31).

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows FS Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or BLM Oregon and Washington Special Status Species (SSS) policy (6840).

For Oregon and Washington BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Region 6 of the Forest Service, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

IV. HABITAT MANAGEMENT

A. Lessons from History

Long-term monitoring of this species has not been conducted yet, so it is not possible to address this issue very well at this time. The fact that five of the documented occurrences occur in young plantations indicates that *Galium kamtschaticum* can survive these conditions but it is not known how long the populations have been there, how large they were prior to logging, or how long they will last. Two important points about these five sites located in younger stands are that the populations were continuous with a larger population in adjacent old-growth stands, and they were growing in seeps under dense shrub thickets.

B. Identifying Species Habitat Areas

All sites of *G. kamtschaticum* on federal lands administered by the FS and/or BLM in Washington and Oregon are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site.

C. Managing in Species Management Areas

The objective of Species Habitat Areas is to maintain habitat conditions for *Galium kamtschaticum* such that species viability will be maintained at an appropriate scale, in accordance with agency policies.

Specific management considerations include the following:

- Maintain wetland hydrology at documented occurrences. Soils are saturated nearly or completely year-round, but the species does not grow in standing water. Maintenance of the existing hydrology at the site is critical. This includes maintaining existing drainage patterns and avoiding compaction of saturated soils.
- Avoid direct impacts that would crush the plants. This species has fragile herbaceous stems. Activities such as yarding, moving of equipment, or trampling on the stems would likely kill the current year's growth and may damage underground rhizomes as well. Direct trampling is primarily a concern during the growing season when the plant is above ground. Off-trail use on frozen or snow covered ground is probably not a problem.
- Maintain shade. In general, this species does not grow in direct sunlight. It usually occurs in relatively narrow canopy gaps where sunlight is modified by the surrounding stand, and it is nearly always underneath a very dense growth of *Rubus spectabilis* (salmonberry), *Oplopanax horridum* (devil's club), *Ribes bracteosum* (stink currant), or *Athyrium filix-femina* (ladyfern). Maintain these associated species and the site conditions that support their growth.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

- Avoid actions that would facilitate the invasion of weedy species. *Galium kamtschaticum* is not out-competed by other native vegetation, but has not been observed growing in highly disturbed weedy areas.
- In larger populations (i.e. several hundred stems), if impacts are unavoidable, try to impact fewer than 5% of the stems. This rule of thumb is intended for *Galium kamtschaticum* only and is not an appropriate recommendation for most rare plants.

V. RESEARCH, INVENTORY, AND MONITORING OPPORTUNITIES

The objective of this section is to identify opportunities for additional information which could contribute to more effective species management. The content of this section has not been prioritized or reviewed as to how important the particular items are for species management. The inventory, research, and monitoring identified below are not required. These recommendations should be addressed by a regional coordinating body.

A. Data and Information Gaps

Conduct surveys in areas identified as suitable habitat on federal lands in Washington, excluding the Mt. Baker-Snoqualmie National Forest.

The species is not very well distributed on the Olympic Peninsula, and the discovery and management of additional sites may aid in the chances of long-term survival of *Galium kamtschaticum* on the Olympic Peninsula.

B. Research Questions

- What variables should be measured to determine the health or fitness of an individual? Of a population? (For example: number of stems, number of fruiting stems, number of fruiting stems with viable seeds, presence of chlorotic (yellow) coloring in the leaves?)
- Is it necessary to distinguish between genetically distinct "individuals" or are the number of clonal stems an adequate way to quantify the population?
- Is it true that light level and wetland hydrology are the critical factors for maintaining optimal site conditions for this species? If so, can this species withstand canopy removal as long as its associated shrub layer is left intact and hydrology is not significantly altered? Are there other critical factors in addition to light and soil moisture?
- It is not clear what constitutes potential habitat since an entire mountainside may have vast acreages of what would seem like appropriate habitat, yet *Galium kamtschaticum* is not found there.
- What is the role of sexual reproduction vs. vegetative reproduction for this species? What is the pollination vector for this species?
- What distribution is necessary to maintain connectivity?

C. Monitoring Needs and Recommendations

Galium kamtschaticum usually grows in clumps or patches under very dense shrubs, so it is very difficult to move around these sites and often impossible to see more than 1 meter ahead.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

Because of this, sampling designs that require placement of gridlines over an entire site are not practical for this species.

Inventory strategies and/or monitoring designs that require mapping out or random sampling from all potential habitat are not practical for this species, since entire mountains can be covered with what could be called potential habitat.

VI. GLOSSARY

Documented Occurrence

Generically, it is the location of an individual of a species. Multiple occurrences may equal one or more Element Occurrence. Documented occurrences are at least 100 m apart (ISMS Development Team 2000). A physical record exists to indicate that the species either occurred historically or currently exists in the area defined. See also Site (Occupied).

Element Occurrence

An area of land/or water in which a species is, or was, present (Master et al. 2001). An element occurrence should have practical conservation value for the species or ecological community as evidenced by historical or potential continued presence and/or regular recurrence at a given location. Often corresponds with the local population, but, when appropriate, may be a portion of a population or a group of nearby populations.

Habitat Disturbance

Natural or human caused disturbances that likely may have impacts on the species habitat, its life cycle, microclimate, or life support requirements.

ISMS (Interagency Species Management System) database

An interagency database containing information about Survey and Manage species in the Northwest Forest Plan area. ISMS includes data for surveys, species locations, and associated habitats/environmental conditions.

Management Considerations

Potential management activities designed to achieve the conservation of a species at a site. Management Considerations are not mandatory

Monitoring

The collection of information used to determine if management actions are meeting objectives of standards and guidelines and if they comply with laws and management policy. Monitoring is used to determine if standards and guidelines are being followed (implementation monitoring), if they are achieving the desired results (effectiveness monitoring), and if underlying assumptions are sound (validation monitoring). Monitoring involves collecting information on a sampling basis, provides standardized data, and occurs at multiple levels and scales.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

Persistence

The likelihood that a species will continue to exist or occur within a geographic area of interest over a defined period of time. Includes the concept that the species is a functioning member of the ecological community of the area.

Site (Occupied)

The location where an individual or population of the target species (taxonomic entity) was located, observed, or presumed to exist and represents individual detections, reproductive sites, or local populations. Specific definitions and dimensions may differ depending on the species in question and may be the area (polygon) described by connecting nearby or functionally contiguous detections in the same geographic location. This term also refers to those located in the future (USDA and USDI 1994a). See Documented Occurrence and Element Occurrence.

Range

The limits of the geographic distribution of a species

Species Habitat Area

The geographic area identified that requires management to provide for the continued persistence of the species. May include occupied and unoccupied habitats and sites.

Suitable Habitat

Abiotic and biotic environmental conditions within which an organism is known to carry out all aspects of its life history.

Viable Populations

A wildlife or plant population that contains an adequate number of reproductive individuals appropriately distributed on the planning area to ensure the long-term existence of the species (USDA and USDI 1994a). For invertebrate, non-vascular plant, and fungi species, “appropriately distributed” may include the following conditions: the species is well-distributed, the species is distributed with gaps, or the species is restricted to refugia. Refer to page 123 in Chapter 3 and 4 of the FSEIS for the Northwest Forest Plan for further clarification.

Well-distributed

Distribution of the species is sufficient to permit normal biological function and species interactions. This distribution considers life history characteristics of the species and the habitats for which it is specifically adapted.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

VII. REFERENCES

- Anderson, J. P. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham Young University Press. Provo, Utah. 724pp.
- Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 3: 261. Charles Scribner's Sons. 2052pp.
- Calder, J. and R. Taylor. 1968. Flora of the Queen Charlotte Islands. Monograph No. 4, part 1. Canada Dept. of Agriculture, Plant Research Institute. Ottawa, Ontario.
- Federal Interagency Committee for Wetland Delineation. 1987. Federal Manual for identification and delineating jurisdictional woodlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Soil Conservation Service. Washington D. C. Cooperative technical publication. 76 pp + appendices.
- Henderson, J., R. Leshner, D. Peter, and D. Shaw. 1989. Forested plant associations of the Olympic National Forest. Technical paper R6-Ecol-TP-001-88.
- Henderson, J., R. Leshner, D. Peter, and D. Shaw. 1992. Field guide to the forested plant associations of the Mt. Baker-Snoqualmie National Forest. Technical paper R6-Ecol-TP-028-91.
- Hitchcock, C. L., A. Cronquist, M. Owenby, and J. W. Thompson. 1969. Vascular Plants of the Pacific Northwest. University of Washington Press, Seattle.
- Hultén, E. 1968. Flora of Alaska and neighboring territories: a manual of vascular plants. Stanford University Press, Stanford, CA. 1008 pp.
- ISMS Development Team. 2000. Vascular plant known site definitions. Maintained by USDA Forest Service and USDI Bureau of Land Management. Portland, OR.
- Interagency Species Management System (database). 2004. Known sites of *Galium kamtschaticum*. Maintained by USDA Forest Service and USDI Bureau of Land Management. Portland, OR.
- Kuntze, C. E. O. 1891. [Taxonomic treatment of *Galium rotundifolium* var. *kamtschaticum*]. Revisio Generum Plantarum 1:282.
- Master, L.L., L.E. Morse. A. S. Wealkley, G. A. Hammerson, and D. Faber-Langendoen. 2001. Heritage Conservation Status Assessment Factors. NatureServe, Arlington, VA.
- Maze, J. and K. Robson. 1992. Tracking changes in northern and southern distributional limits in interior British Columbia and Washington. Northwest Environmental Journal 7(2), p 351.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

- NatureServe. 2004. *Galium kamtschaticum*. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>.
- Oakes, W. 1841. [Taxonomic treatment of *Galium littellii*]. Magazine of Horticulture 7:179.
- Potash, L. 1992. Species Management Guide for Boreal Bedstraw (*Galium kamtschaticum*). USDA Forest Service publication # R6-MBS-006-92.
- Reed, P. B. Jr. 1988. National List of plant species that occur in wetlands; Northwest (Region 9). U.S. Fish and Wildlife Service Biological Report 88 (26.9). 89 pp.
- Salstrom, D. 1994. Personal communication. Mt. Baker-Snoqualmie National Forest Botany Program files. Mountlake Terrace, WA.
- Schultes, J. A. and F. Schultes. 1827. [Taxonomic treatment of *Galium kamtschaticum*]. Mantissa 3:186.
- Scoggan, H. J. 1978-1979. The Flora of Canada. National Museum of Science, national museums of Canada marketing services. Ottawa.
- USDA Forest Service and USDI Bureau of Land Management. 1994a. Record of Decision for amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Washington, DC: U.S. Government Printing Office. 74p.
- USDA Forest Service and USDI Bureau of Land Management. 1994b. Results of Additional Species Analysis. Appendix J2. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, OR.
- USDA Forest Service and USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Washington, DC: U.S. Government Printing Office. 74p.
- USDA Forest Service and USDI Bureau of Land Management. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl. Portland, OR. 52 p.
- Washington National Heritage Program. 1997. Endangered, threatened, and sensitive vascular plants of Washington -with working lists of non-vascular species. Department of Natural Resources. Olympia. 62 p. + appendices.

CONSERVATION ASSESSMENT FOR *GALIUM KAMTSCHATICUM*

Washington National Heritage Program. 2004. Washington Rare Plant List Changes Since 1997. Department of Natural Resources. Olympia. Available on-line:
http://www.dnr.wa.gov/nhp/refdesk/lists/plant_changes.html.

Weissenborn, A. E. 1961. Geologic map of Washington. Washington Division of Mines and Geology.

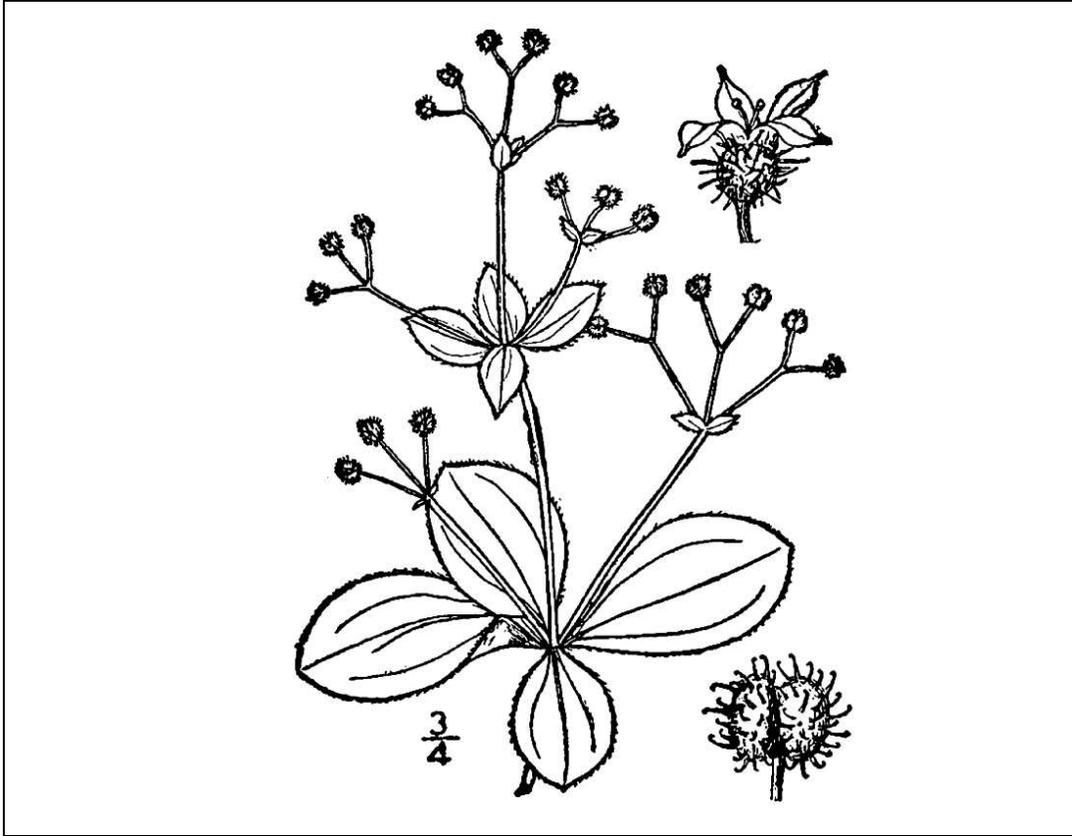


Figure 1. Line drawing of *Galium kamtschaticum* Steller ex Schult. and Schult. From Britton and Brown (1913) in USDA-NRCS PLANTS Database. Available at <http://plants.usda.gov/>.