

*Draft Conservation Assessment
For*

Arrowleaf Sweet Coltsfoot (Petasites sagittatus)



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Hiawatha National Forest

Jan Shultz
2727 N. Lincoln Rd
Escanaba, MI 49829
906-486-4062



This Conservation Assessment/Approach was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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ABSTRACT

This conservation assessment provides information regarding *Petasites sagittatus* (Banks ex Pursh) Gray, including range, distribution, life history, habitat, status, and ecology. *Petasites sagittatus* occurs in the Great Lakes states in northern and central Minnesota, northwest Wisconsin, and the Upper Peninsula of Michigan. It occurs across Canada from Labrador to Alaska, extending southward in the United States to South Dakota, Colorado, Idaho, and Washington. This plant prefers wet meadows, marshes, sedge meadows, and open swamps (Chadde, 1999 and Wisconsin DNR, 1999) and has been found on the edge of alder thickets (USDA FS 1999). In the Great Lakes states, *P. sagittatus* is at its southern limit leading to its rarity in this region. In Michigan and Wisconsin, this species is considered rare and threatened and may need to be monitored for changes in health due to hydrological changes or microhabitat disturbance due to logging, road building, and wetland alteration.

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Don Henson, contract botanist in the Upper Peninsula of Michigan.

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Herbarium and Heritage Data

We appreciate information for this species from Heritage personnel both in the United States and Canada, along with the helpful assistance of herbarium personnel. See Contacts section at end of report for a complete list.

Editorial Committee

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INTRODUCTION/OBJECTIVES

The National Forest Management Act and U.S. Forest Service policy require that Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range within a given planning area. In addition to those species listed as endangered or threatened under the Endangered Species Act, or Species of Concern by the U.S. Fish and Wildlife Service, the Forest Service lists species that are sensitive within each region (Regional Forester Sensitive Species - RFSS). The objectives of management for such species are to ensure their continued viability throughout their range on National Forest lands, and to ensure that they do not become threatened or endangered because of Forest Service actions.

Petasites sagittatus is on the Regional Forester Sensitive Species List (dated 2/29/00) for the Eastern Region within the Hiawatha National Forest and Ottawa National Forest, both located in the Upper Peninsula of Michigan. *Petasites sagittatus* is found in the Chippewa National Forest and the Superior National Forests of Minnesota, but is not listed as R9 since it is more common statewide and is not state-listed or state-tracked. The Superior National Forest element occurrence is a result of recent field work (Ian Shackelford pers. comm. 2001).

The objectives of this document are to:

- Provide an overview of current scientific knowledge for this species.
- Provide a summary of the distribution and status of this species, both rangewide and within the Eastern Region of the USDA Forest Service.
- Provide the available background information needed to prepare a subsequent Conservation Approach

NOMENCLATURE AND TAXONOMY

(USDA Plant Database 1995)

Order: Asterales

Family: Asteraceae

USDA Plant Code: PESA5

Scientific name: *Petasites sagittatus* (Banks ex Pursh) A. Gray

Common name(s): arrowleaf sweet coltsfoot, arrowhead sweet coltsfoot, arrow-leaved colts-foot, sweet coltsfoot.

Synonyms: *Petasites dentatus* Blank.

Tussilago sagittata Banks ex Pursh (Welsh 1974)

Technical Species Description:

- Height:** Up to 1 m tall.
- Stems:** Underground rhizomes from which flower scapes arise with large-scale like bracts and individual leaves.
- Leaves:** Arrowhead to spade shaped (deltoid to hastate), arising from the rhizomes wavy to toothed, floccose on upper surface and heavily tomentose (white-wooly) on lower surface (Cherniawsky and Bayer 1998a). Leaves may not appear until 30-60 days after plant has flowered and arise from lateral creeping rhizomes (Root Woman 2001). Leaves maybe suppressed in various ways when the plant is disturbed or under stress (Henson pers. comm. 2003).
- Petioles:** Arrow-shaped leaves with petioles up to 5 dm long.
- Flowers:** Somewhat dioecious and insect pollinated (Plants for a Future 1997). Typically creamy white in color, racemose to somewhat corymbose; flower heads are 2-3 cm in length (Henson pers. comm. 2003) Male and female flowers may occur on separate plant stalks (Chadde 1999). Some flowers are pistillate only; others have mostly pistillate flowers. Fertile pistillate flowers tend to be ligulate and toward the outside of the flower head. The center/discord tubular flowers are mostly sterile. Flowering stalks arise from rhizomes in early spring, usually prior to arrow-shaped leaves (Cherniawsky and Bayer 1998b). Flowering May-June; stems wither by mid summer (Chadde 1999).
- Fruits:** Very narrow achenes with a tuft of bristles at tip (USGS 2001). Fruiting heads are covered with numerous long, silky hairs (Chadde 1999).
- Other:** Chromosome number (x) is 29 (Cherniawsky and Bayer 1998b). Type specimen described from Hudson Bay area (Hultén 1968).

Identification Notes

Petasites sagittatus, displays triangular, arrow-shaped leaves which occur after the plant has flowered. Since there is considerable morphological variation in both flowers and leaves it is important to collect flowers early for undocumented populations since the flowers will pass by the time the leaves are mature. However, leaf morphology is considered more reliable for delimiting taxa of *Petasites* in North America because of a high degree of morphological variation and overlap across taxa for staminate and pistillate flowers. Correct classification based on pistillate inflorescences was 62.5% for *P. sagittatus* and 72.7% for both *P. frigidus* var. *palmatus* and *P. x vitifolius* (Cherniawsky and Bayer 1998a). Having both flowers and leaves can be useful to aid with identification in less mature plants.

Gleason's Plants of Michigan by Rabeler (1998) and Gleason and Cronquist (1991) distinguishes the two native species:

Heads several; flowers whitish; moist woods:

Petasites frigidus: Leaf blades deeply palmately lobed and often

Petasites sagittatus: Leaf blades triangular-ovate, sagittate base, merely toothed

Similar Taxonomic Species

In Michigan, there are two native species of *Petasites*: *P. sagittatus* and *P. frigidus* (or *P. frigidus* var. *palmatus*) (Cherniawsky and Bayer 1998b). Also, an European species of *Petasites* (*P. hybridus*) has naturalized in Marquette County; it has pinkish-purple flowers without rays. The two native species both have creamy white flowers. *P. frigidus* is Michigan's only common species throughout most of the Upper Peninsula and the northern Lower Peninsula, represented by the variety *palmatus*. *P. sagittatus* apparently hybridizes with *P. frigidus* producing intermediate plants (*P. x vitifolius*) that are known from Alger, and Schoolcraft counties (Voss 1996). This hybrid was also recently found in Ontonagon County on the Ottawa National Forest (Garske pers. comm. 2000). This hybrid taxon exhibits a morphology intermediate to its parental taxa. It is characterized by cordate leaves, widest at the base, with 4-14 shallow primary lobes (Cherniawsky and Bayer 1998a). Juvenile forms closely resemble *P. frigidus* (Bogle 1961). Gleason and Cronquist (1991) list the same species breakdown with the two natives and the European species which has escaped from cultivation.

As many as ten species (Rydberg 1927) and as few as two species (Cronquist 1978, Bogle 1968) have been described for North American *Petasites* (Cherniawsky and Bayer 1998a). Cherniawsky and Bayer (1998b) found that "taxa of *Petasites* are not sufficiently differentiated, morphologically or isozymically, from one another to warrant the recognition of separate species". They suggest that *Petasites* be circumscribed as a single species containing three varietal taxa and one hybrid taxon between the two varieties. They also state the genus is loosely comprised of four similar polymorphic entities including the *P. frigidus* complex, *P. palmatus*, *P. sagittatus*, and the hybrid entity *P. x vitifolius* (Cherniawsky and Bayer 1998b).

Although many leaf characters overlap between the various subgroups, the number of primary lobes, depth of sinuses, and number of teeth are useful characters to aid in their delineation. Reproductive characteristics show even greater overlap than leaf shape. The most discriminating reproductive characters include number of heads, number and length of ray florets, and pappus length of ray florets (Cherniawsky and Bayer 1998a).

Geographical Distribution

Petasites sagittatus is circumpolar with a range that extends from northern Africa and western Europe to northern and central North America (Cherniawsky and Bayer 1998b). Within North America, *P. sagittatus* is distributed from southeast Alaska across Canada to Labrador, and in northern contiguous states of Washington, Idaho, Montana, and Colorado (Welsh 1974). It is rare in the Black Hills of North and South Dakota. *P. sagittatus* is also found in the Upper Peninsula of Michigan, northwest Wisconsin, and northern Minnesota (Judziewicz and Nekola 1997). *P. sagittatus* is often found growing with *P. frigidus* (var. *palmatus*) and the hybrid *P. x vitifolius*.

P. frigidus var. *palmatus* is the most widely distributed of all *Petasites* taxa in North America, although it is absent from Alaska; unlike *P. sagittatus* its range extends along the

west coast to southern California (Cherniawsky and Bayer 1998b). *P. frigidus* var. *palmatus* is widespread at low to mid elevations in the Pacific Northwest (Vance *et al.* 2001). *P. frigidus* (var. *palmatus*) also extends from northern Minnesota, Wisconsin and Michigan to New York, the New England states, and Maine (Cherniawsky and Bayer 1998b).

The geographic range of the hybrid is less extensive than the range of either parent. In the Great Lakes states *P. x vitifolius* distribution overlaps but extends further south than *P. sagittatus* (Cherniawsky and Bayer 1998b), making the task of correct identification more tedious.

Michigan

Petasites sagittatus can be found in the Upper Peninsula in Chippewa, Gogebic, Menominee, and Schoolcraft Counties (MNFI 1999). It was recently documented in Ontonagon County (Garske pers. comm. 2000). With the exception of Schoolcraft County, it is known from only one location per county (Penskar *et al.* 1997). Michigan Natural Features Inventory (1999) notes that there are three additional sites in Schoolcraft County besides the original two discovered in 1981 by Don Henson. Most known locations support one to a few localized clonal patches which may contain upwards of several hundred stems (Penskar *et al.* 1997).

National Forest populations in Michigan's Upper Peninsula are summarized as follows: Patch size for populations on the Ottawa National Forest are 0.02 acres or less (Garske pers. comm. 2000, MNFI 1996). One site on non-federal land within the Ottawa National Forest proclamation boundary has a fairly large population, but it has been invaded by many Eurasian weeds (MNFI 1996). Hiawatha National Forest records (1983) indicated two sites in Schoolcraft County in poor health (MNFI 1999, Henson 1983). A more recently discovered Hiawatha National Forest site found by Don Henson (1992) occurs in Chippewa County. At this site, over 100 plants were observed on an open *Sphagnum* mat with scattered willows. Another four acres with an additional 100+ plants were observed in 1997 (MNFI 1999). *P. sagittatus* was found for the first time in Mackinac County in a wetland complex of northern shrub swamp, northern wet meadow, and poor conifer swamp located between two low sand ridges in muck soil over sand (M. Jaunzems pers. comm. 2000). This population of about 300 single leaves may be the most easternmost population known in North America (M. Jaunzems pers. comm. 2000).

Minnesota

Petasites sagittatus is fairly well distributed across the northern half of Minnesota (Ownbey and Morley 1991), so its distribution has not been tracked by the Minnesota Natural Heritage Program. Sixty-seven herbarium specimens have been collected for 26 counties (University of Minnesota 2001). This species occurs in both the Chippewa and Superior National Forests in Minnesota (Shackleford pers. comm. 2001). However, after two field seasons at Chippewa National Forest, Ian Shackleford considers this species to be uncommon on the Chippewa. Maps by Cherniawsky and Bayer (1998b) show only a few occurrences for *P. frigidus* var. *sagittatus*, but many locations for *P. frigidus* var. *palmatus*. These maps may indicate some confusion as to what is actually classified as *P. sagittatus*.

Wisconsin

In northwestern Wisconsin, *Petasites sagittatus* is locally common in marshes and shrub swamps in the vicinity of Superior (Douglas County) and the Bibon Swamp (Bayfield County), while scattered colonies occur on the Lake Superior clay plain near the Brule and Iron Rivers (Judziewicz and Nekola 1997). Besides marshes and shrub swamps, *P. sagittatus* is found in several road-side ditches and powerline corridors (U. of Wisconsin 2001). *P. sagittatus* is listed as threatened in Wisconsin with 23 specimens from Douglas, Bayfield, and Forest Counties (U. of Wisconsin 2001). This species is considered uncommon within the Chequamegon National Forest. The Forest is on the southern edge of the typically boreal range of *P. sagittatus* (USDA FS 1999).

HABITAT AND ECOLOGY

P. sagittatus occupies disturbed habitats and moist woods as well as alpine and subalpine slopes, fens, bogs, meadows, lake shores, stream banks (Cherniawsky and Bayer 1998b). In Canada, it is found at dry sites such as gravelly slopes and roadsides (Cherniawsky and Bayer 1998b), in addition to wet meadows, bogs, black spruce muskeg, and tundra habitats within its boreal range (Scoggan 1978). Alaska's Wilderness Medicines (2001) states that it prefers a habitat that is cold, moist, wet, and lime-rich. Ecological settings include wet meadows, cedar swamps, and low woods, as well as road-side ditches, sloughs, and marshes (Plants for a Future 1997). *P. sagittatus* tolerates light (sandy), medium (loamy) and heavy (clay) soils that are acidic, neutral or basic (alkaline). It can grow in full shade or semi-shade (Plants for a Future 1997).

The habitat of this species is not particularly unique or rare in Michigan's Upper Peninsula. Therefore, it is theorized that the distribution of *P. sagittatus* may be limited to relict colonies established during a post-glacial period under different climatic conditions (Penskar *et al.* 1997). The habitats of Michigan localities have been described as peaty swales, sedge fen, marsh, roadside swales, and weakly patterned peatland (Penskar *et al.* 1997). Chadde (1999) gives the habitat for the Upper Peninsula of Michigan as open marshland, lowland cedar forest, lowland spruce-fir, lowland brush, wetland meadow and wetland bog. Voss (1996) states that *P. sagittatus* grows in swampy ground, sedge fens, ditches, and swales between pine ridges. It also grows in the western Upper Peninsula of Michigan in a roadside ditch (S. Trull pers. comm. 2001).

Don Henson (pers. comm. 2003), who found the original Michigan Upper Peninsula sites and has visited many of the other colonies of *P. sagittatus* and *P. x vitifolius*, observed that the few truly healthy plants he found grew in areas with very cold spring water and black muck soils of the Carbondale series. In this type of habitat the plants can have leaves and flowering stalks up to a meter in height. Don Henson feels that the importance of cold ground water and cold air flow from up slope drainage provided by shade trees can not be overemphasized as these characteristics would emulate the boreal conditions where *P. sagittatus* normally thrives.

Associates at a Schoolcraft County site in open, wet, peaty swales between ancient dune formations include the sedges *Carex lasiocarpa*, *C. lacustris*, and *C. lanuginosa* along with wetland shrubs *Salix petiolaris*, *Betula pumila*, and *Alnus rugosa*. At another Schoolcraft County site *P. sagittatus* was found in a weakly patterned peatland dominated by *Carex*

lasiocarpa. Associates here included *Calamagrostis canadensis* (bluejoint), *Muhlenbergia glomerata* (marsh wild-timothy), *Solidago uliginosa* (bog goldenrod), *Caltha palustris* (marsh-marigold), and *Iris versicolor* (blue-flag) (Penskar *et al.* 1997).

In Wisconsin, as with Michigan, the habitat for this species is quite diverse. It has been collected in shrub swamps, sedge meadows, marshes, open muskegs, alder thickets, roadside and drainage ditches (University of Wisconsin Herbarium). In northwestern Wisconsin, typical habitats are cold, boggy meadows dominated by grasses or sedges such as *Calamagrostis canadensis* and *Carex lacustris* (Judziewicz and Nekola 1997). The earliest noted collection at the University of Wisconsin Herbarium was from 1929; three sites were found in the 70's, one in the 80's, and 12 from the 1990's (1995 most productive field season). This data would indicate that more sites are being found as botanists are now required to survey wetland areas more extensively than before.

Associated Species:

“Trees: northern white cedar (*Thuja occidentalis*), tamarack (*Larix laricina*), black spruce (*Picea mariana*). Shrubs: bog birch (*Betula pumila*), speckled alder (*Alnus incana*), willows (*Salix*). Grasses and grass-like plants: sedges such as *Carex buxbaumii*, *Carex lasiocarpa*, and *Carex oligosperma*, and grasses such as reedgrass (*Calamagrostis canadensis*), and common reed (*Phragmites australis*). Herbs: northern blue flag (*Iris versicolor*)” (Chadde 1999). Other associates: *Potentilla palustris*, *Galium* spp. *Campanula aparinoides*, *Epilobium leptophyllum*, *Solidago ohioensis*, *Calamagrostis canadensis* (MI NFI 1999). In Canada, *P. sagittatus* often grows in association with *P. frigidus* var. *palmatus* and *x vitifolius* in moist woods and forest edges (Cherniawsky and Bayer 1998b).

PROTECTION STATUS

Currently, the official status for *Petasites sagittatus* with respect to federal, state, and private agencies is:

U.S. Fish and Wildlife Rank: Not Ranked

Global Heritage Status Rank: G5

United States National Heritage Status Rank: N? (01 August 1993)

U.S. Forest Service, Regional Forester Sensitive Species for Region 9:

Species is Sensitive, and is rare on both the Hiawatha National Forest and the Ottawa National Forest in Michigan.

P. sagittatus is listed as State Threatened in Michigan by the Michigan DNR and Threatened in Wisconsin by the Wisconsin DNR. This species is not listed or tracked by the Minnesota DNR.

State Rank: (Nature Serve 2002)

ALASKA	SR	NORTH DAKOTA	SR
COLORADO	SR	SOUTH DAKOTA	S1
IDAHO	S3	UTAH	SR
MICHIGAN	S1S2	WASHINGTON	SR

MINNESOTA	SR	WISCONSIN	S3
MONTANA	S3S4	WYOMING	S2

Canada:

National Heritage Status Rank: N? (09 August 1993)

Province Ranks: (Nature Serve 2002)

ALBERTA	S5	NUNAVUT	SR
BRITISH COLUMBIA	S5	ONTARIO	S5
LABRADOR (NEWFOUNDLAND)	S?	QUEBEC	SR
MANITOBA	S4	SASKATCHEWAN	S5
NEW BRUNSWICK	SU	YUKON TERRITORY	SR
NORTHWEST TERRITORIES	SR		

Definitions of State/Provincial Ranks:

S1 = Critically imperiled; typically 5 or fewer known occurrences in the state; or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Imperiled; typically between 6 and 20 known occurrences; may be susceptible to becoming extirpated.

S3 = Vulnerable; typically 21 to 50 known occurrences; S3 ranked species are not yet susceptible to becoming extirpated in the state but may be if additional populations are destroyed.

S4 = Apparently secure under present conditions; common; typically 51 or more known occurrences, but may be fewer with many large populations; usually not susceptible to immediate threats.

S5 = Secure; demonstrably common under present conditions.

SU = Status uncertain/unrankable; a species thought to be uncommon in the state, but there is inadequate data to determine rarity. Also includes uncommon species of uncertain nativity in the state and of questionable taxonomic standing.

SR = Reported from the state, but without persuasive documentation that would provide a basis for either accepting or rejecting the species.

LIFE HISTORY

Flowers appear before leaves in May-June, although many Michigan plants seldom flower (Penskar *et al.* 1997). “Flowers are white, minute, in dense terminal clusters”, sexes are usually on separate plants (Mountain Nature 2001). The fruit is a dry achene, 4 mm long, an unusual sight in the lush green of mid-June. Plumed wind-borne seeds are released in early summer. Growth habit is perennial; the thick coarse flower stem rises from the root crown to 8 to 30 inches (20-75cm). The flower stem soon dies back and the soft, flannel-like leaves develop (Jowsey, *et al.* 1984).

It is most effective to survey for this species during the latter part of its flowering period in early spring, or secondary when in fruit from late spring to early summer. Sometimes botanists are confused when they see sweet coltsfoot during the early flowering period

before the leaves have flushed since most members of the aster family tend to flower much later in the growing season (Penskar *et al.* 1997). This confusion may lead to under-collection and under-documentation. During the summer the large arrowhead-shaped leaves can be used to distinguish it from the more common *P. frigidus*.

Petasites sagittatus reproduces vegetatively by rhizomes. Therefore, colonies may consist of only one or a few genetically distinct individuals (Penskar *et al.* 1997). Regeneration of *P. frigidus* after stem harvest (medicinal uses) is good if root crown and rhizomes are left intact (Vance *et al.* 2001). This may mean that *P. sagittatus* would be capable of regenerating after browsing by waterfowl or small mammals. *P. frigidus* is easy to propagate from division of rhizomes, and also it can be transplanted (Vance *et al.* 2001). Perhaps populations of *P. sagittatus* could be augmented by transplants. Greenhouse experiments are needed to determine if this is reasonable. Further research on the breeding biology of this species would provide insight on the reproductive potential of Michigan populations as well as determine their structure and genetic diversity (Penskar *et al.* 1997).

P. x vitifolius is a hybrid between *P. sagittatus* and *P. frigidus* (var. *palmatus*) (Cherniawsky and Bayer 1998b). Bogle (1961) discovered not only interbreeding, but backcrossing to the parental taxa as well. Furthermore, the hybrid species were shown to produce viable pollen (Bogle 1968). Bogle (1968) proposed the binomial *Petasites x vitifolius* to include the hybrid forms. Later Toman (1972) recognized this hybrid taxon as a subspecies of *P. nivalis* and thus named it as *P. nivalis* ssp. *vitifolius* (Cherniawsky and Bayer 1998b). Confusion over classification of this hybrid species could have led to misidentification of some previously collected specimens of *P. frigidus* or *P. sagittatus*.

POTENTIAL THREATS

In Michigan's Upper Peninsula, hydrological change often as a result of road building or logging (USDA Forest Service 1982, 1987 and MNFI 1999), along with disturbance and unnatural changes in the water table (MNFI 1999) are a threat to *P. sagittatus*. Logging in drainages immediately upslope of the species habitat has been observed and noted as a possible threat (MNFI 1999). Also, remnant tree logging could cause changes in microclimate (changes in air flow and temperature) which could adversely affect some populations (Garske pers. comm. 2000). Hybridization with *P. frigidus* is a possible threat as well if the resulting hybrid, *P. x vitifolius*, competes for habitat previously occupied by *P. sagittatus* (Judziewicz and Nekola 1997).

Infrequent flowering, and separate male and female plants may impede the sexual reproduction of this species in Michigan. This may impact this species ability to survive environmental changes and disturbances. It may also lower the chances for establishment of new colonies (Penskar *et al.* 1997).

Don Henson (pers. comm. 2003) found that because of the softness of the muck that even with the minor disturbance of botanists walking on the rhizomes the plants showed negative impacts in the field months later. Therefore, this species is particularly susceptible to disturbance and can not tolerate any breaking of its rhizomes.

There are many purported medicinal uses of dried leaves and flower shoots of *Petasites* sp. (*P. sagittatus* and *P. frigidus*) for ailments such as bronchitis, tuberculosis, chest troubles, and sore throats (Root Woman, 2001). Other uses are listed as cough medicine, antispasmodic, nerve sedative, and topical first aid (Vance *et al.* 2001). Unsustainable harvesting of this species for medicinal use could lead to rarity in some sections of the country. Vance (2001) suggests that *P. frigidus* should not be harvested in Idaho or Montana; and that in Washington and Oregon wild harvest should be conducted with restraint. In the Great Lakes Region, there are too few plants to make harvesting practical so this is not a threat. Don Henson (pers. comm. 2003) wondered if beaver and muskrats might prize these rhizomes, but he did not know of any study substantiating this.

POPULATION VIABILITY AND PROTECTION

The majority of *Petasites sagittatus* occurrences in Michigan are on State and National Forest lands (Penskar *et al.* 1997). Within the Hiawatha National Forest in Michigan's Upper Peninsula one healthy site of 100+ plants has been documented in Chippewa County (MNFI 1999). Two other sites exist in Schoolcraft County but one appeared to be inundated, perhaps due to a nearby logging road which blocked drainage and plants had yellow leaves when observed (Henson 1983, MNFI 1999). This underscores the importance of avoiding hydrologic disturbance to this species habitat. The Chippewa site and another Schoolcraft County site were assigned rankings of B indicating good short term viability, and fair long-term viability; the other inundated site has a ranking of CD indicating relatively poor viability (MNFI 2001).

Recent surveys on the Ottawa National Forest have found an additional site of 0.02 acres with over 200 leaves. The wetland site appears to be maintained by beaver activity along with a cold air flow down the valley. Changes to this airflow pattern from the north could adversely affect the plants at this site (Garske 2000 pers. comm.). The Ottawa National Forest in Michigan considers distribution, population trend, habitat integrity and habitat vulnerability as being at moderate risk (USDA Forest Service 1999 and Garske 2000 pers. comm.). In 1983, one population on non-federal land within the Ottawa proclamation boundary was a vigorous colony, but over time this site has become overrun with Eurasian weeds (MNFI 1996). This site is on the corner of a U.S. and State highway thus roadside weeds have easy access (S. Trull pers. comm. 2001).

The trend on the Chequamegon-Nicolet National Forest in Wisconsin is unknown (USDA FS 1999). *Petasites sagittatus* populations have moderate habitat integrity, and vulnerability is unassessed. The viability of this species is not considered in jeopardy on National Forest land in Minnesota (Shackleford pers. comm. 2001).

REASONS FOR ONGOING CONCERN/MANAGEMENT

This species may be dependent on the cooling effect of groundwater flow for its health (Garske pers. comm. 2000). Therefore, hydrological changes, including road building and logging, are a threat for the survival of this species. For example, Henson (1983) reported a population on the Hiawatha National Forest that had yellow leaves and appeared to be inundated. Research studies are needed to determine the specific hydrological requirements

of this species. Also, overstory trees or shrubs often provide a level of shading that is critical (Garske pers. comm. 2000). Efforts need to be taken not to disturb drainage and keep a sufficient buffer of trees around the swales where *P. sagittatus* occurs (Reznicek 1981). If road building changes water flow to or from sites this species could be lost (Reznicek 1981).

As described under the Similar Taxonomic Species section, *Petasites sagittatus* occasionally hybridizes with the more common *P. frigidus* to produce *P. x vitifolius*. It has not been determined whether this hybridization puts *P. sagittatus* at risk. Research on the breeding biology of this species could shed light on its reproductive potential in Michigan and its genetic diversity (Penskar *et al.* 1997).

SUMMARY

Petasites sagittatus is a circumpolar species occurring in North America, western Europe, and northern Africa. In North America its greatest concentration is in western Canada and the prairie provinces (it becomes more scattered around the Hudson Bay area). In the United States, it occurs along the northern tier from Washington to Michigan's Upper Peninsula. It also occurs in scattered mountain areas in the western United States. This species is at its southern distribution limit in the Great Lakes region. *Petasites* is a taxonomically difficult genus (Cherniawsky and Bayer 1998a) therefore, misidentification of current specimens is a possibility; some specimens may be incorrectly assigned to *P. frigidus* or the hybrid *P. x vitifolius*. Hydrological changes, infrequent flowering, and logging are the main threats to this plant's viability in the Great Lakes region.

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Forest Contacts:

Chippewa National Forest, Minnesota: Ian Shackleford, Forest Botanist (218) 335-8620
(Ian was the contact for the material in this paper, though now he is on the Ottawa)
Hiawatha National Forest, Michigan: Jan Schultz, Forest Plant Ecologist (906) 228-8491
Hiawatha National Forest, Michigan: Mark Jaunzems, Seasonal Botanist (906) 643-7900
Don Henson, Contract Botanist, PO Box 453,
Manistique, MI 49854
Ottawa National Forest, Michigan: Sue Trull, Forest Botanist (906) 932-1330
University of Wisconsin – Madison, Botany Dept. – Herbarium: Merel Black
mblack@facstaff.wi
Steve Garske, Contract Botanist for 2000. Special Plant Survey Form for MNFI.