

Conservation Assessment
for
***Juncus vaseyi* Engelmann** (Vasey's rush)



USDA Forest Service, Eastern Region

Hiawatha National Forest

April 2004

This Conservation Assessment was prepared to compile the published and unpublished information on *Juncus vaseyi* Engelman (Vasey's rush). This is an administrative review only and 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 and its review, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if the reader has any 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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Editorial Committee

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Beverly Braden, contract botanist

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INTRODUCTION/OBJECTIVES

The National Forest Management Act and USDA Forest Service policy require that National Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has established populations and a distribution of reproductive individuals sufficient to ensure the continued existence of the species throughout its range and 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). A designation of “sensitive” affords some additional regulatory protection.

Juncus vaseyi (Vasey’s rush) is a Regional Forester Sensitive Species (RFSS) in the Eastern Region for 3 of the 16 National Forests. In Michigan, it is listed as sensitive on the Hiawatha and the Huron-Manistee National Forests. In Minnesota, *Juncus vaseyi* is listed as sensitive on the Superior National Forest.

The objectives of this document are to:

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

The Hiawatha National Forest in Michigan prepared this Conservation Assessment. We needed to rely on other National Forests to provide us with information regarding *Juncus vaseyi* for their states.

EXECUTIVE SUMMARY

Vasey’s rush is principally a boreal species that occurs as a rare disjunct in southern portions of its North American range. A member of *Juncus* sect. *Poiophylli*, this grass-like perennial can be distinguished from other very similar species (such as *J. greenei*) by its narrowly channeled, terete leaves, inconspicuous involucre bract, and distinct seeds with prominent, white, tail-like appendages at each end. Though very little is known about this species’ life history, fertile collections have been made from late summer to early fall. It occurs in a wide variety of wetland habitats characterized by seasonally fluctuating water tables. Its affinity for seasonally saturated or inundated sites appears to be a key requirement. Tony Reznicek, a Curator at the University of Michigan, noted that this species always occurs in open sparsely vegetated areas where it can avoid competition (Reznicek pers. comm. 2003). Because these habitats are seasonally dry, and often prairie communities, fire is suspected to play an important role in the life history of *J. vaseyi*, as well as in maintaining suitable habitat and sustaining populations.

Though *Juncus vaseyi* is considered fairly stable globally, it remains vulnerable and at least somewhat threatened in the southern portion of its range. The primary threat to this species appears to be alterations of its wetland habitat through drainage, direct habitat destruction for agriculture and forestry, and to some extent the suppression of natural disturbances such as fire and water table fluctuations, which maintain suitable conditions in certain habitat types. The more vulnerable disjunct populations require protection measures. In particular, maintenance of the natural hydrological regime of *J. vaseyi* habitats is the primary conservation management requirement. The response to fire has not been studied for this species; therefore, prescribed burns should be applied experimentally to reduce woody plant competition and maintain open grassland habitat. Inventories of known occurrences and surveys of suitable habitat would likely result in the discovery of more populations.

NOMENCLATURE AND TAXONOMY

Order: Juncales

Family: Juncaceae

Scientific Name: *Juncus vaseyi* Engelman

Synonym: *Juncus greenei* Oakes & Tuckerman var. *vaseyi* (Engelm.) Boivin

Common Name: Vasey's rush

USDA NRCS Plant Code: JUVA

Taxonomy History: *Juncus vaseyi* was described as a new species by Engelman (1866). Boivin (1967) included *vaseyi* as a variety of *Juncus greenei*. However, Boivin's treatment has not been followed by later experts who have regarded *Juncus vaseyi* as a separate species (Brooks and Clemants 2000).

Recognized Hybrids: *Juncus vaseyi* has been suspected of hybridizing with *J. tenuis* resulting in the species *J. x oronensis*; a collection from the towns of Orono and Rangely, Maine appears to substantiate this cross (Catling & Spicer 1988; Gleason & Cronquist 1991). *Juncus x oronensis* has been found growing with *J. vaseyi* at both known locations in Maine. This hybrid has a more open inflorescence with branches of secund flowers, usually the leaf blades have a channel on the upper surface (Haines 2003). Specimens from Lesser Slave Lake in Alberta appears to be a cross between *Juncus dudleyi* and *J. vaseyi*. The Canadian material had been incorrectly referred to as *J. oronensis* in previous literature (Catling & Spicer 1988).

DESCRIPTION OF SPECIES

Rushes are recognized by their grass-like morphology, small flowers with 6 inconspicuous sepals and petals (called tepals) and 3-valved capsules (Maine Department of Conservation-MDOC 2003). *Juncus vaseyi* belongs to a group of rushes (section *Poiophylli*) that are perennial, have terete leaves (round in cross-section), and each flower is borne separately on a short pedicel. In addition, there is a pair of bracteoles at the base of each flower in addition to the bract at the base of the pedicel. Identification of this group involves qualitative characters that are difficult for non-specialists to evaluate and up to 40% of the material in some collections is misidentified (Catling & Spicer 1987).

However, a few key characteristics distinguish Vasey's rush from other members of the *Poiophylli* group. In a study of major Canadian herbaria to evaluate diagnostic characters and clarify the status of the *Poiophylli* group, the terete and narrowly channelled leaves of *J. vaseyi* distinguished it readily from the other species in the group, which have more or less flat and broadly channelled leaves (Catling & Spicer 1987). Its narrow, terete leaves are largely confined to the basal portion of the plant. Unlike other species with terete leaves, the blades of *J. vaseyi* lack prominent septa (Haines 2003). The most distinguishing feature of this species is the prominent white, tail-like appendages at each end of the seeds of *J. vaseyi* since all of the other species in this group have seeds that are short-apiculate (abruptly short-pointed) (Catling & Spicer 1987).

Juncus greenei Oakes & Tuckermann is a very similar and probably closely related species to *J. vaseyi*. The two species share a similar feature in the structure of their seeds, low, irregular nodules along the ridges of the inner integuments of their seed (Brooks 1989). *J. greenei* can be distinguished from Vasey's rush by its longer involucre bract (which usually exceeds the inflorescence), its are about equal to the subtending tepals, its shorter capsules (3-4 mm long as opposed to 4.1-5.4 mm long in *J. vaseyi*) and its seeds (that lack the distinct long white tails characterizing Vasey's rush) (Catling & Spicer 1987). Another difference in the mature capsules is that in *J. vaseyi* the mature capsules are golden tan while those of *J. greenei* are usually dark brown, a trait that holds throughout its range (Ralph Brooks pers. comm. 2004).

In New England *Juncus greenei* grows in mesic to xeric sandy and stony substrates and would not likely be found growing with *Juncus vaseyi* (Haines 2003). In Michigan the habitat is less distinctive *Juncus vaseyi* occurs in low sandy ground and *Juncus greenei* occurs in either moist or dry sandy open ground (Voss 1972). A qualitative character observed in Michigan, but perhaps not present elsewhere, is the presence of somewhat shiny capsules in *J. greenei*, in contrast to the relatively dull capsules of *J. vaseyi* (Penskar 1993).

Species Technical Characteristics:

(Catling & Spicer 1987, Churchill 1986; Brooks & Clements 2000; Mohlenbrock 1970; Chadde 1999; Voss 1972)

Roots: Rhizomes densely branching, compact

Stems: Culms tufted, stiffly erect, reddish or pinkish at base, 8-24 inches (20-60 cm) high

Leaves: Basal, slender with a narrow shallow groove on the upper side to 12 in (30 cm) long & 1 mm wide usually 2-3 lvs; creamy white membranaceous auricles 0.2-0.4(-0.6) mm long, scarious

Inflorescence: Compact terminal cyme of many-clustered flowers (5-15); involucre bract usually shorter (often under 3 cm) or just surpassing inflorescence; bracteoles 2, ovate to triangular-ovate; perianth segments 3.5-4.5 mm long, pale green to greenish-tan, outer and inner series nearly equal, margins scarious; stamens 6, $\frac{1}{2}$ perianth length; anther equal to filament length (0.4-0.9 mm)

Fruits: Small obtuse capsule, oblong-cylindrical, surpassing persistent perianth by 1 mm or more [3.3-4.7 x 1.3-1.7 mm], completely 3-celled, golden tan or light brown, many seeded

Seeds: Tan, ellipsoid to lunate, body 1-1.5 mm long; both ends tailed, each white tail $\frac{1}{2}$ to $\frac{3}{4}$ seed length.

LIFE HISTORY

Reproduction

Juncus vaseyi is a perennial species arising from a short, compact rhizome. According to Churchill (1986), Chadde (1999), Brooks and Clemants (2000), and the MDOC (2003), it flowers and fruits from late summer to early fall. In northern Michigan, fertile collections have been made from late-July to mid-September. Fertile collections from Wayne County were made in late-June and mid-August (Crispin *et al.* 1985). In New England fruit sets in early July and capsules will contain seeds through August (Haines, field observation 2003). Herbarium specimens with mature seeds were gathered from July 12 to August 22 in New England (Haines 2003).

Most *Juncus* taxa retain very few incompletely developed ovules in a ripe seed-containing capsule (Catling & Spicer 1987); therefore, *J. vaseyi* might be expected to show good seed production. Normally *J. vaseyi* has between 5 to 15, 3-locular capsules with each capsule containing many seeds (Catling & Spicer 1987). The seeds are too heavy for wind dispersal. However, when wet the seeds develop a mucilaginous coating and can be carried to other areas (R. Brooks pers. comm. 2004).

Although germination rates and viability of seeds for *J. vaseyi* are not known, the genus as a whole shows good germination and viability. For example, seeds of *Juncus acutus* germinated in the greenhouse with no pretreatment (Young & Young 1986). In northern hardwoods, good densities of viable seeds persist in seed banks for the genera *Prunus*,

Betula, *Rubus*, *Carex*, and *Juncus* (Pickett & McDonald 1989). Probably the rareness of *J. vaseyi* is due to its avoidance of competition, and that it is at its southern-most range limit in the United States.

Juncus vaseyi grows from short erect rhizomes (Catling & Spicer 1987) so vegetative reproduction might be less important for this species than for *Juncus* with spreading rhizomes such as *J. compressus*. One population in Schoolcraft County, Michigan has over 100 individuals (Crispin *et al.* 1985, MNFI 2003) so one would likely expect some vegetative reproduction at this site. The Illinois Plant Information Network (IL PIN 2003) lists both sexual and vegetative reproduction as means for reproduction for this species. *Juncus vaseyi*, like other members of its family, is a wind pollinated species. This is indicated by its reduced perianth (dull green to brown), stigmatic surfaces with numerous, hair-like structures for collecting air-borne pollen and the absence of nectaries (Judd *et al.* 1999).

Ecology

Little is known of the biology and ecology of *Juncus vaseyi*, but knowledge of its habitats strongly suggests that seasonally fluctuating water tables, and possibly the occurrence of fire, are important factors in this species life history (Penskar 1993).

Because most coastal plain marshes occur adjacent to fire-dependent communities such as oak-pine barrens and sand prairies, it is likely that *J. vaseyi*, a coastal plains associate, might benefit from fire. Fire does promote seed bank expression and rejuvenation in various wetland communities. In addition, fires during extended drawdown years or periods of drought may prevent woody species from establishing (Kost 2000).

The dynamics of seasonal water level fluctuations for coastal lakeshore marshes act as an important mechanism for seed dispersal for many species. As water levels rise during the spring season, seeds, and already sprouted seeds, float to the surface and are carried by wave action to the basin's outer margin (Schneider 1994).

In New England it is hypothesized that water may be a primary factor in long-distance movement of propagules. This hypothesis is corroborated by the number of New England occurrences (historic and extant) that are found on shorelines. In addition, wet seeds with their extra long tails could adhere to waterfowl and be transported between watersheds (Haines 2003).

Although *Juncus vaseyi* may be persistent at some sites such as rock outcrops, it appears this species is relatively ephemeral in its occurrence at many locations. This species is apparently capable of utilizing disturbed sites such as cleared land, sandy excavations, and ditches as a temporary site for growth and reproduction. It is not known if *J. vaseyi* utilizes seed-banking or merely relies on sites as a temporary "stop-over", awaiting dispersal of propagules to another suitable location. *Juncus vaseyi* is normally an early successional plant that colonizes sites after disturbance only to be outcompeted through community succession and growth of woody species (A. Reznicek, pers. comm. 2003).

Obligate Associations

A Hymenoptera larva is responsible for the galls which are sometimes present on other *Juncus* such as *Juncus torreyi* and *J. nodosus*. The galls appear in the flower head as clusters of overlapping, bractlike leaves, yellow and red in color (Chadde 1998). Galls are not commonly known to occur on *J. vaseyi*.

HABITAT

Range-wide

Juncus vaseyi is a boreal wetland species occurring in a number of wetland habitats including marshes, damp thickets, meadows, and margins of bogs. It also occurs in depressions along sandy lakeshores and low sandy ground with pines, wet prairie, lakeplain wet prairie, and other intermittently wet ground (Churchill 1986; Brooks & Clemants 2000; Crow & Hellquist 2000; Gleason & Cronquist 1991; NatureServe 2003).

Vasey's rush is one of the rare plants associated with the coastal plain marsh community in the Great Lakes Region (Kost 2000). Occurring on sand deposits associated with postglacial lakes and outwash channels, coastal plain marshes are dominated by grasses and rushes, and harbor numerous plant species disjunct from their primary ranges. The sandy soils underlying the coastal plain marsh are strongly to very strongly acidic and nutrient poor. Organic deposits of peat, muck, or sandy peat may overlay the sandy substrate and in some basins a clay layer may occur several meters below sand. The greatest concentration of coastal plain marshes is found on sand deposits associated with postglacial stages of Lake Michigan (Kost 2000).

In New England, currently known from Maine and Vermont, extant locations are influenced by high pH bedrock. Sites are seasonally saturated or inundated; much of the season they would be characterized as dry-mesic to xeric (open river shore ledges) (Haines 2003).

State or Province Specific

Canada

In Canada, *J. vaseyi* inhabits damp thickets, meadows, and shores. Where it is uncommonly scattered throughout eastern New Brunswick, Vasey's rush occurs in rock crevices, wet sandy shores, and dune hollows (Hinds 1986). Catling & Spicer (1987) note that this species is found in periodically moist, open areas that are seasonally dry, in sandy areas and on rocks, usually in acidic conditions. In the Canadian prairie provinces, Catling & Spicer (1987) emphasize that *J. vaseyi* occurs mainly in the boreal forest region as scattered occurrences in southeastern and central Manitoba, more extensively in central to northern Saskatchewan, and throughout Alberta.

Northern Midwest States

Michigan populations of *J. vaseyi* occur in a number of different wetland community types characterized by marked water table fluctuations, including northern intermittent wetland, wet mesic prairie, lakeplain wet prairie, and seasonally inundated swales in northern pine barrens (Penskar 1993). In Schoolcraft County, this species grows in seasonally wet swales dominated by jack pine, along a relict Great Lakes shoreline. Crispin *et al.* (1985) list the associated species at this site as *Oenothera perennis* (evening primrose), *Comandra umbellata* (bastard toadflax), *Antennaria neglecta* (pussy-toes), and *Hypericum kalmianum* (shrubby St. John's wort) (Crispin *et al.* 1985). Chadde (1998, 1999) has observed Vasey's rush growing in full sun on glacial outwash plain, on sandy shores and streambanks, and near springs and ditches. He has also documented this species in disturbance habitats, colonizing wet sandy areas of abandoned excavations. Other typically observed associates include such species as *Pinus resinosa* (red pine), *Populus tremuloides* (quaking aspen), *Potentilla fruticosa* (shrubby cinquefoil), *Cornus stolonifera* (red-osier dogwood), *Spiraea alba* (meadowsweet), *Chamaedaphne calyculata* (leatherleaf), *Gaultheria procumbens* (wintergreen), *Vaccinium angustifolium* (lowbush blueberry), *Calamagrostis canadensis* (bluejoint), *Lycopus* sp. (water-horehound), and *Aster longifolius* (New York aster) (Chadde 1999).

Minnesota habitat varies from old field, meadow, wet meadow, mesic prairie, roadside ditch, rock crevices and rock barrens. All habitats are relatively open. A shrub cover of 30% and up to 1.5 m high was mentioned for one occurrence at a wet-mesic brush-prairie. Shrubs at this site included *Salix bebbiana*, *S. discolor*, *Betula glandulifera*, and *Corylus americana* (Dana 92026 Univ. of Minnesota Herbarium 2003). At an old gravel pit dug just below the water table associated species were *Juncus nodosus*, *J. brevicaudatus*, *J. greenii*, and *Eleocharis nitida*. On the edge of a *Carex stricta* meadow forbes included *Potentilla simplex*, *Fragaria virginiana*, *Lobelia spicata*, and *Krigia biflora* (Delaney 89253 Univ. of Minnesota Herbarium). At a moist grassy meadow it was associated with *Andropogon gerardii* and *Spartina pectinatus*. At one mesic prairie strip it was associated with *Carex lanuginosa*, *Lythrum alatum*, and *Calamagrostis canadensis*. At another mesic prairie site it was associated with *Scirpus cyperinus*, *Epilobium ciliatum*, and *Eupatorium perfoliatum* (The grassy meadow and mesic prairie sites were collected by Welby Smith, University of Minnesota Herbarium 2003). On the Superior National Forest, *Juncus vaseyi* seems to colonize disturbed wetlands and then persist for several years (J. Greenlee pers. comm. 2004).

In Wisconsin, Vasey's rush occurs in wet mesic openings in alder thickets, wet meadows, open sandy lake shores, edges of clearings within northern hardwoods, and in the dry soil of a railroad right-of-way (Wisconsin State Herbarium 2003, R. Brooks pers. comm. 2004). In NW Wisconsin, there are areas in which *J. vaseyi* is thriving in dense prairie vegetation, which is contrast to beach and outcrop situations more often encountered (R. Brooks pers. comm. 2004). *Juncus vaseyi* has been associated with such typical prairie species as *Phlox pilosa* (hairy wild phlox), and *Asclepias hirtella* (tall green milkweed), as well as a number of bluegrass and sedge species (Penskar 1993).

New England

Vasey's rush is known to occur in Maine in a variety of habitats, from the rim of gorges to dry soil (MDOC 2003). Habitats compiled from herbarium specimens and literature for Maine include: sparsely vegetated folists on coastal headlands (folists are organic soils where decomposition is slowed by cool climate rather than saturation), wet ditches within peaty meadows, sandy edges of infrequently used roads, graminoid marshes, hydric meadows, shrub swamps, dry-mesic mixed conifer-hardwood forests, and circumneutral river shore outcrops (Haines 2003).

The following species have been found to occur with *Juncus vaseyi* at two or more sites in Maine: *Juncus dudleyi*, *Juncus x oronensis*, *Anemone multifida*, *Carex conoidea*, and *Viola novae-angliae* (Haines 2003). *Juncus vaseyi* appears to be an opportunist species that utilizes recently disturbed sites for a period of time until eliminated by succession in north-temperate and boreal climates. Seeds largely fall near the parent and may be banked in the soils until a later disturbance. However, the longevity of these seeds is not known (Haines 2003).

The recently discovered population of *Juncus vaseyi* in Vermont is located at an elevation of 110 feet on a bluff overlooking Button Bay, Lake Champlain. Bordering an intermittent watercourse, the habitat is dominated by a diversity of native monocots with a scattering of weedy forms and invading shrubs. The poorly drained soil of the damp meadow where the species occurs conceals bedrock suspected of being either Ordovician calcareous shale (Stony Point formation) or limestone (Hortonville formation).

Associates at the Vermont site include the rushes *Juncus dudleyi* and *J. effusus*; and the sedges *Carex annectens*, *C. buxbaumii*, *C. conoidea*, *C. lanuginosa*, *C. scoparia*, and *C. tenera*. Other associated species include *Chrysanthemum leucanthemum* (ox-eye daisy), *Cornus foemina* ssp. *racemosa* (gray dogwood), *Fragaria virginiana* (strawberry), *Galium* sp. (bedstraw), *Ranunculus acris* (common buttercup), and *Stellaria graminea* (common stitchwort); the grasses *Calamagrostis canadensis* (bluejoint), *Panicum boreale* (panic-grass), and *Poa pratensis* (Kentucky bluegrass) (Zika 1991). Zika reasoned that this former agricultural land is a fragmented remnant of a much more extensive seasonal wetland dominated by native monocot species and he considers *J. vaseyi* to be an early-succession species.

Other States

In Iowa, *Juncus vaseyi* occurs in moist to mesic prairie (Penskar 1993). In Illinois, Mohlenbrock (1970) described the habitat for this species as wet meadows, bogs, and shores or stream banks.

Colorado populations occur on sandy slopes, in loose, sandy, glacial alluvium along streams, in areas of pre-cambrian granite and gneiss bedrock. Associates include *Phleum pratense* (timothy), *Carex* spp. (sedge), *Salix* spp. (willow), *Poa palustris* (bluegrass), *Deschampsia* sp. (hair grass), *Prenanthes* sp. (rattlesnake root), and *J. tenuis* (rush)

(Penskar 1993). In Montana and Wyoming (Dorn 1992) noted that *J. vaseyi* occurs in moist areas.

DISTRIBUTION AND ABUNDANCE

Range-wide Distribution

(NatureServe 2003; Churchill 1986; Hinds 1986; Brooks and Clemants 2000; Crispin *et al.* 1985; Chadde 1998; Gleason and Cronquist 1991; MDOC 2003)

Juncus vaseyi has a broad North American range and is relatively common within its predominantly northern distribution, although it occurs as a rare disjunct in several areas in the southern portion of its range. This species is distributed across Canada from Newfoundland and Labrador 's in the east across the prairie provinces to the Northwest Territories and British Columbia. In the eastern United States it is known from Maine, Vermont, and New York. In the Midwest it occurs in Michigan, Illinois, Wisconsin, Minnesota, and Iowa. In the western United States it extends south from Canada to the Rocky Mountain states of Idaho, Montana, Wyoming, and Colorado and the Black Hills of South Dakota (Brooks & Clemants 2000). It has been reported from New York from two counties, but these were unvouchered specimens (Penskar 1993). It has also been documented from one collection in Bottineau County, North Dakota, an area adjacent to Canada more characteristic in habitat to the Canadian Province (USGS 2002, R. Brooks pers. comm. 2004). *Juncus vaseyi* is considered rare in Ontario, New York, and Nova Scotia, and is endangered in Illinois (Crispin *et al.* 1985).

In Canada, *J. vaseyi* is clearly less common in the prairie region than in the more northerly boreal forest region, present as scattered occurrences in southeastern and central Manitoba, more extensively in central and northern Saskatchewan, and throughout much of Alberta (Catling & Spicer 1987). It is also known from Quebec, Nova Scotia, British Columbia, Labrador, Newfoundland, the Northwest Territories, and is uncommon across eastern New Brunswick.

Abundance is difficult to estimate, individual plants forms cespitose clumps, and each plant may consist of several shoots arising from a compact or short rhizome. Element occurrences are presumably tracked as separate colonies of plants, which may constitute metapopulations or clusters of colonies (Penskar, 1993). In an exemplary site in Upper Michigan, hundreds of individual clumps have been observed. More commonly this species is encountered as a few widely scattered clumps occurring in a relatively restricted habitat (A. Reznicek pers. comm. 2003).

Northern Midwest Distribution

In Michigan, 15 occurrences of Vasey's rush are currently known, and several are derived from recently documented records. One such station in Schoolcraft County encompasses several acres. A recently discovered population of moderate size was found within the Camp Grayling Military Reservation (Penskar 1993). *Juncus vaseyi* was found at four localities prior to 1960 in the Mackinac Straits region and central Upper

Peninsula (Crispin *et al.* 1985). Several recent occurrences found on public land include two sites on the Manistee National Forest in the Lower Peninsula and another on the Hiawatha National Forest in Delta County in the Upper Peninsula. Other recent occurrences have been found in Schoolcraft County on Lake Superior State Forest, and the Escanaba River State Forest in Menominee County (MNFI 2003).

The only known occurrence of *J. vaseyi* on the Hiawatha National Forest is in Delta County, it occurs in a wet pocket within jack pine barrens of an outwash plain. Three cespitose clumps were first observed in 1995 along Forest Road 2814B, in a wet spot of nearly level pine savanna with an overstory of *Pinus banksiana* (jack pine) and *P. resinosa* (red pine). Six plants were observed in a 1996 survey, in very wet sand dominated by *Spirea alba* (meadowsweet), *Chamaedaphne calyculata* (leatherleaf), and mosses (MNFI 2003). In Schoolcraft County, a substantial population of this species occurs just five miles east of the Hiawatha National Forest boundary so there is possibility that this inconspicuous plant might also be found on the National Forest in Schoolcraft County (Crispin *et al.* 1985). On the Huron-Manistee National Forest there are two element occurrences. One population of over 200 plants is in excellent health, the other was originally just a few individuals and it was not relocated in 2002 (Alix Cleveland pers. comm. 2004)

In Minnesota this species is not tracked by the Natural Heritage Division, but there are approximately 30 specimens at the University of Minnesota Herbarium (2003). The Superior National Forest has an additional 10 records from recent surveys done by Gary Walton (J. Greenlee pers. comm. 2004). It is known from 13 counties in the northern 1/3 of the state and along the entire eastern section of the state bordering Wisconsin (Ownbey & Morley 1991).

In Wisconsin, prior to 1993 *J. vaseyi* was known from only seven occurrences, most were considered historical records. In 1993, Emmet Judziewicz found an occurrence in Bayfield County, the following year Ann Thering collected a specimen in Douglas County. The next year over 20 occurrences were found by Emmet Judziewicz in Douglas County (Wisconsin State Herbarium at Madison 2003).

New England Distribution

New England has a total of 14 occurrences of *Juncus vaseyi*, 13 in Maine (5 extant) and 1 in Vermont. The Natural Heritage Programs have ranked these occurrences as a B, a B/C, two C, and two unranked due to inadequate information (Haines 2003). Element occurrences are evaluated on quality (size and productivity), condition, viability and defensibility. Ranks range from A (excellent) to D (poor) (The Nature Conservancy 2003).

Vasey's rush was added to the native flora of Vermont relatively recently when a small population was discovered on a bluff overlooking Lake Champlain, in Button Bay State Park. This new station for *J. vaseyi* in Vermont fills a gap in the southeastern limit of its range between Maine, New York (reported but no specimen), and Michigan (Zika 1991).

Other States

In Illinois three sites have been documented from northern Illinois, two are historic occurrences from Cook County and McHenry County. The McHenry collection was made by Vasey himself on the banks of the Fox River near Ringwood in the mid 1800's and this is the type specimen (Swink & Wilhelm 1994). The only known extant occurrence is from a sedge meadow in Winnebago County that was located in 1987. This site is now contained within a state nature preserve (Penskar 1993).

In Colorado, eight occurrences have been documented, five are relatively recent observations. One large occurrence with locally abundant plants occurs within U.S. Forest Service land, and four other extant occurrences are contained within the Rocky Mountain National Park (Penskar 1993). In Wyoming it is known from the Teton area, not far east of Laramie (R. Brooks pers. comm. 2004).

RANGE WIDE PROTECTION STATUS

Currently, the official status for *Juncus vaseyi* with respect to federal, state, and private agencies is: (NatureServe 2002),

U.S. Fish and Wildlife Service:

Global Heritage Status Rank: G5? (09Sep2002)

Rounded Global Heritage Status Rank: G5

Global Heritage Status Rank Reasons:

Demonstrably secure in its primary range in Canada, but rare in the vast southern portion of its range. Additional locations are likely to be found. *Juncus vaseyi* is difficult to identify and may grow with and be confused with *Juncus greenei* in the midwest and northeast (NatureServe 2003).

U.S. National Heritage Status Rank: N3N4 (26Feb1997)

Canada National Heritage Status Rank: N5? (26Feb1997)

The Nature Conservancy lists these rankings as:

N3 = species rare or uncommon

N4 = species is nationally widespread, abundant, or apparently secure, but with cause for long-term concern.

N5? = Very common, demonstrably secure under present conditions, though tentatively assigned

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery. (G5? = rank tentatively assigned)

U.S. Forest Service: *Juncus vaseyi* is listed as a Regional Forester Sensitive Species in three of the Region 9 National Forests: Hiawatha National Forest (HNF) (MI), Huron-Manistee (MI), and Superior National Forest (MN).

The Regional Forester has identified it as a species for which viability is a concern on Hiawatha National Forest as evidenced by: **a)** a medium threat due to habitat loss and fragmentation, and suppression of regular fires **b)** a high threat due to human interactions such as ATVs (Hiawatha SVE Database 2003). It is also noted that *J. vaseyi* is somewhat vulnerable within Michigan since it is at the southern portion of its range (Hiawatha SVE Database 2003).

U.S. State Heritage Ranks:

Colorado	S1	Montana	SU
Idaho	SH	New Jersey	SR
Illinois	S1	North Dakota	SH
Indiana	SR	Ohio	SR
Iowa	SU	Utah	SR
Maine	S1	Vermont	S1
Michigan	S1S2	Wisconsin	S3
Minnesota	SR	Wyoming	S1

Canadian Province Heritage Ranks:

Alberta	S3	Northwest Territories	SR
British Columbia	S3S4	Nova Scotia	S1
Labrador (Newfoundland)	S1	Ontario	S3
Manitoba	S4?	Quebec	SR
New Brunswick	S2	Saskatchewan	S?

Definition of Ranks:

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

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

S3 = Rare to uncommon; 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 = Common, apparently secure under present conditions; typically 51 or more known occurrences, but may be fewer with many large populations; usually not susceptible to immediate threats.

SU = Status uncertain, 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.

SH = Historically known from the state but not verified for an extended period (usually 15 year); there are expectations that the species may be rediscovered.

SE = Believed to be extirpated from former region.

S? = Species has not yet been ranked; or, if following a ranking, rank tentatively assigned (e.g. S4?)

POPULATION BIOLOGY AND VIABILITY

The habitat of the wetland species *Juncus vaseyi* is characterized by seasonally fluctuating water tables, occurring in a variety of wetland and intermittently wet habitats. These sites are often sandy or rocky, and usually acidic. Hydrological regime appears to be the most critical factor determining suitable habitat. The shores and former shores where *J. vaseyi* predominantly occurs are kept open by wave and ice action, or by spring flooding and occasional fire. Uninhibited by human disturbance, these natural forces should suffice to maintain this species habitat at most Michigan stations (Crispin *et al.* 1985). Overall this species seems to be secure within an extensive primary range, though it may be declining in vulnerable disjunct localities in its peripheral range where habitat can be very restricted (Penskar 1993). However in 1989, Ralph Brooks noted that this rush had been collected from a mere half-dozen sites since 1950 in the United States. Further most populations of *J. vaseyi* consisted of 25 or fewer individuals contributing to the rarity of this species (Haines 2003). In the last 15 years renewed search time has yielded a few more occurrences. In the 1990s three additional occurrences have been located in Maine (MDOC 2003), and an additional eight sites have been located in Michigan (MNFI 2003).

In Vermont, *J. vaseyi* is very rare, although one site has been found recently. This rarity can be attributed to the alteration of the majority of suitable habitat by farming and construction of Button Bay State Park facilities. Its rarity in the region is most likely due to the nature of *J. vaseyi* as an early succession species, which was likely rare in forested areas such as the Champlain Valley. Even prior to European settlement, Vasey's rush would have been restricted to damp natural openings, perhaps abandoned beaver meadows or wetlands in recently burned pine stands. The absence of prior records implies it was always rare, probably due to dispersal and recruitment difficulties at the southern limit of the species range. In addition, increased competition from introduced grasses grown for hay, and agricultural drainage practices have limited *J. vaseyi* distribution even more (Zika 1991).

Since *Juncus vaseyi* is known primarily from historical records in Maine (Penskar 1993), it has a proposed endangered status in that state. There are five extant populations in Maine, two are from 1932 and 1936 and are unranked, one has a rank of B/C, the other two have a C rank (A=excellent, D=poor) (Haines 2003). Populations have few individuals and are continuing to decline. This species is particularly vulnerable to human activity since it is located at the southern limit of this species' range. For example, one known population in Maine has succumbed to conversion of its habitat to

residential or commercial use, and other populations are considered vulnerable (MDOC 2003).

Based on the resurvey of two populations, Vasey's rush is considered stable in Wyoming (Fertig 2000).

POTENTIAL THREATS

Though *Juncus vaseyi* is fairly stable overall, it is still somewhat vulnerable and at least slightly threatened in the vast southern portion of its range, especially in some localities in the Midwest and Northeast. It may not be able to persist in sites with significant habitat fragmentation, so disjunct populations are much more at risk (Reznicek pers. comm. 2003). The primary threat to this species appears to be alterations of its wetland habitat through drainage, direct habitat destruction for use in agriculture and forestry, and to some extent the suppression of natural disturbances, such as fire and water table fluctuations, which maintain suitable conditions in certain habitat types. The occurrence of *J. vaseyi* in a number of prairie habitats suggests that fire is an important factor in its natural history. The suppression of fire may comprise a significant threat to this species (Penskar 1993).

The coastal plain marsh, an inland wetland community that is a remnant of ancient Great Lakes shorelines, is highly vulnerable to changes in hydrology. Stable water levels allow perennial and woody wetland species to become established and displace less competitive herbs, which tend to dominate in fluctuating water levels (Kost 2000).

In Michigan, *J. vaseyi* is threatened in some sites by off-road vehicle use. Alix Cleveland (pers. comm. 2004) the Forest Plant Ecologist at the Huron-Manistee National Forest mentioned off-road vehicles as a threat to this species. It is also threatened to some extent, by forestry practices in situations that utilize roller-chopping and plowing as site preparation techniques. Road building may also constitute a threat to populations. Some populations are able to persist at sites in which natural water table fluctuations maintain suitable conditions. The lack of fire also constitutes a threat, particularly in prairie habitats where fire is necessary to control woody plant competition and maintain community structure (Penskar 1993). Alix Cleveland (pers. comm. 2004) mentioned fire suppression as a threat to this species.

In Wisconsin two populations occur within a pipeline corridor and thus may be somewhat vulnerable, or possibly impacted by pipeline construction (Dobberpuhl pers. comm. with Penskar 1993). In Minnesota, road and trail construction as well as activities that affect the hydrology of an area are known threats on the Superior National Forest (J. Greenlee pers. comm. 2004).

Important threats to *Juncus vaseyi* in New England are changes to watershed dynamics such as damming and alteration of flows. Watershed protection is increasingly difficult due to the number of parties and the multitude of issues involved. This is especially

important as three out of six extant occurrences are found along the St. John River (Haines 2003). These sites have been created by severe ice scour, and they could become extirpated by the same phenomenon (Haines 2003).

Other New England sites have been impacted by human construction such as road building, a natural gas pipeline, and a livestock barn. One Maine site is along a hiking trail that receives intense recreational pressure (Haines 2003).

In Vermont, the Champlain Valley wetlands continue to be altered by agriculture and development. The degradation of this wetland complex has made it vulnerable to natural succession and encroachment by shrubs. Though Button Bay State Park is within the Champlain-Adirondack Biosphere Reserve, possible expansion of facilities in the park is still a threat to *J. vaseyi* populations (Zika 1991).

In Colorado, many Vasey's rush sites are fairly well protected by their remoteness and general inaccessibility (Penskar 1993). However, one of the most healthy populations is on the northeast shore of Grand Lake. The area is not more than 100 feet from a parking lot (R. Brooks pers. comm. 2004). Presumably the inconspicuous habit of this rush has protected it from public harm. Overall in the Rocky Mountains, the species has probably declined due to conversion of mountain wetlands to hay meadows (Penskar 1993).

SUMMARY OF PUBLIC LAND OWNERSHIP

In Michigan two National Forests harbor element occurrences, the Hiawatha National Forest in the Upper Peninsula and the Huron-Manistee in the Lower Peninsula. In the Upper Peninsula there are element occurrences on the Lake Superior State Forest, the Escanaba River State Forest, and the State of Michigan property on Sugar Island. In the Lower Peninsula, it has been found at the Allegan State Game Area and Camp Grayling. Although these are public lands, their primary emphasis is not conservation. None of these sites are natural areas which afford stricter protection.

In Minnesota, 11 sites occur on the Superior National Forest (J. Greenlee pers. comm. 2004); two sites are state natural areas, another a natural history area, two occurrences are in state parks, two others are on Indian Reservations and another is on a military reservation (MN Bell Herbarium 2003). None of the St. Louis sites are on public lands. A survey of this area is likely needed as most of these occurrences are from 1937 to 1947. Overall there are more sites known in Minnesota, and several of the public lands have been set aside for conservation or natural areas.

SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

Though specific measures for protection of *Juncus vaseyi* are not likely required in its primary range in Canada, healthy populations in the northeastern and upper mid-western

states need to be protected (Penskar 1993, NatureServe 2003). The primary management requirement for this species is the maintenance of the natural hydrological regime within its habitats. Conservation objectives consist of protecting known sites, studying extant populations, and the location of additional populations. There are no known management or monitoring programs currently in place for this species.

Juncus vaseyi is a short stature graminoid with a limited number of individuals at most sites. This is a species that could be easily overlooked and under reported. Searches should be conducted in habitats that are naturally open and would appear to have the best long-term viability. Even ephemeral populations such as those that occur in fields and in roadside ditches provide additional sources of propagules (Haines 2003).

Since *Juncus vaseyi* sometimes occurs in prairie communities, there is good potential for restoration using prescribed burns to reduce woody plant competition and maintain open grassland habitat. Restoration potential can not be easily assessed since no attempts have been made to reintroduce *J. vaseyi* to previous sites (Penskar 1993).

The primary factor required to preserve this species is the protection and maintenance of its hydrological regime, since this species most often occurs in seasonally inundated communities. The role of fire and other natural disturbances in the perpetuation of suitable open grassland habitat are also important management considerations. Especially along rivers the use of conservative forestry practices and the limitation of water control structures will also be important factors. Haines (2003) recommends the collection of seeds for gene banking and germination studies.

RESEARCH AND MONITORING

Existing Surveys, Monitoring, and Research

There are no known monitoring programs for *Juncus vaseyi* and thus there are no data on trends for this species. Long-term monitoring may be desirable in portions of the range where this species occurs as a rare and an isolated disjunct. Monitoring should entail permanent plots or consensus of delineated areas. Data that might be useful to collect include substrate, soil pH, hydrology, soil profile, bedrock, site history, and local climate (Haines 2003). Later analysis of several years data could assist to determine population trends, viability, and responses to management practices (Penskar 1993). The characterization and classification of its preferred habitats in greater detail would allow more educated management recommendations to be made.

This species is fairly difficult to identify and its presence has often been overlooked by field botanists because of its frequent co-occurrence with the very similar *J. greenii*. It is very likely that ongoing inventory efforts would result in the identification of several new United States occurrences (Reznicek pers. comm. 2003).

Survey Protocol

To understand trends, fixed plots are recommended for this species so known locations can be relocated and monitored for several years.

Research Priorities

At present the primary research need is to conduct inventories to determine the status of most occurrences, particularly those classified as historical. Surveys should also be conducted in areas where new populations may be identified. A secondary research need is the determination of the habitat factors most relevant to the natural history and perpetuation of this species, such as the role of water table fluctuations, germination requirements, and the importance of fire in many habitats (Penskar 1993).

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APPENDIX for *Juncus vaseyi*

Michigan – Upper Peninsula (MNFI 2003)

Location/County	Date Last Observed	Remarks
Sugar Island, Chippewa County	August 15, 1957	Low, sandy pine barren
Chippewa County	September 2, 1960	Moist sand flat; not found in 1981, but habitat apparently intact; assoc: <i>Juncus brevicaudatus</i> , <i>J. torreyi</i> , <i>Lycopodium inundatum</i> , <i>Ophioglossum vulgatum</i>
Forest Road 2814B, Hiawatha National Forest, Delta County	September 4, 1996	Wet pocket in jack pine barrens on outwash plain; 3 cespitose clumps in wet spot in nearly level pine savanna in 1995; In 1996: 6 plants were observed in very wet sand.
Lake Mary West, Escanaba River State Forest, Menominee County	1986	
Shakey Lakes, Escanaba River State Forest, Menominee County	1986	South of oak barrens area, a few plants in seasonally wet swale, open to semi-open overstory
East Driggs, Schoolcraft County	July 28, 1936	Dry grassy, sandy plain; 4 adjacent EOs
Schoolcraft County, SE of Shingleton * Manistique River State Forest	July 23, 1983	Grows in low seasonally wet open areas among spruce
Section 19 Creek, Lake Superior State Forest, Schoolcraft County	July 25, 1985	Scattered in low, vernaly inundated channels, sandy openings among spruce and pine
Hartman Camp Road, Lake Superior State Forest, Schoolcraft County	August 23, 1990	Hundreds of individuals in low wet areas of recently logged and replanted jack pine forest; also occurring in wet ditch parallel to S side of M-28. Associated with <i>Muhlenbergia glomerata</i> , <i>Agrostis gigantea</i> , <i>Prenanthes racemosa</i> , and <i>Bromus ciliatus</i> .

* University of Michigan Herbarium label

Michigan – Lower Peninsula (MNFI 2003)

Lidkey Swamp Prairie, Manistee National Forest, Oceana County	July 24, 1997	Northern wet-mesic prairie occupying a long, narrow depression on the outwash plain; 1993: single shoot identified in N end of prairie swale; 1997: 6-7 clumps observed along the NE edge of swale
Bear Swamp, Manistee National Forest, Mason County	August 20, 2001	1986: edge of swale in ecotone with thinly forested sand ridge; deep mulch over fine sand; 2001: 200+ plants observed, with scattered colonies occurring over N and E ends of meadow
Penny Lake, Cheboygan County	July 7, 1933	
36 th Street Prairie, Allegan State Game Area, Allegan County	September 26, 1989	Lakeplain wet-mesic prairie; several hundred plants covering ca. 5 sq. m. growing in moist depressions in shallow organic soil
Allegan State Game Area Allegan County*	Aug. 17, 1991	Open and moist sandy prairie swale between low foredune and dune ridges; scarce
Perry Prairie, Shiawassee County	June 8, 1990	Less than 25 plants growing in an apparent wet-mesic prairie remnant along RR tracks
Sibley Road Prairie, Wayne County	July 7, 1991	A few localized plants in lakeplain wet prairie, interspersed among relatively frequent <i>Juncus greenei</i>
5 miles east of Grayling, Crawford County*	Sept. 01, 1993	Occasional in mesic sand prairie, scattered in wetter areas of clear cut in full sun. Associated with <i>Carex cumulata</i> , <i>C. buxbaumii</i> , <i>Calamagrostis canadensis</i> , and <i>Hypericum kalmianum</i>
Portage Creek Prairie Complex, Howes Lake Camp Grayling, Crawford County	October 24, 1993	Small colonies scattered in mesic sand prairie/pine barrens, 50-100 plants

* Additional records at the University of Michigan Herbarium

Minnesota (Specimens from University of Minnesota Herbarium 2003)

County	Date	Special Area	Habitat
Anoka County	24 Aug 1927	Bunker Hills Regional Area	Prairie
Anoka County	8 July 1985	Cedar Creek Natural History Area	Old field, moist ground between depressions
Carlton County	18 Aug 1940		Edge of meadow
Carlton County	4 Sept 1944		Swampy roadside
Clearwater County	Sept. 1929	Itasca State Park	Sedge meadow, loam soil
Cook County	12 Sept 1947	Superior National Forest – North Shore	Crevices of basalt
Cook County	15 Sept 1929	Grand Portage Indian Reservation/ North Shore	Meadow
Isanti County	18 Aug 1989		Edge of <i>Carex stricta</i> sedge meadow bordering sand prairie
Kittson County	29 June 1992		Wet-mesic brush prairie with 30% shrub cover
Kittson County	30 Aug 1992		Dry-mesic brush-prairie
Lake County	31 Aug 1949	Superior National Forest	Scattered small clumps in crevices of basalt
Lake County	31 Aug 1949	Superior National Forest	In old gravel pit just below water table
Lake of the Woods County	19 July 1979		Roadside near old field
Lake of the Woods County	7 Aug 1979		Path through <i>Populus</i> sp.
Mille Lacs County	June 1892	Mille Lacs Indian Reservation	
Morrison County	1 Aug 1990	Camp Ripley Military Reservation	Moist grassy meadow, Sandy loam
Mower County	28 July 1982	Racine Prairie State Natural Area	Mesic prairie strip
Mower County	20 Aug 1982	Lake Louise State Park	Mesic prairie
Mower County	24 Jun 1994	Lake Louise State Park	Old field
Polk County	1 Aug 1900		Brookside meadow
St. Louis County	27 Aug 1937		Brookside meadow
St. Louis County	11 Aug 1937		Sedge meadow
St. Louis County	1 Aug 1941		Shore rocks of Lake Superior
St. Louis County	4 Aug 1944		Brookside meadow
St. Louis County	31 July 1940		Brookside meadow
St. Louis County	4 Aug 1953		Wet meadow
St. Louis County	18 Aug 1956		Peaty meadow
St. Louis County	27 July 1947		Moist meadow

Superior National Forest, Recent Element Occurrences (J. Greenlee email 2004)

Surveyor	Date	Notes
G. Walton	1996	1 plant on trail through wet balsam fir/black spruce forest
G. Walton	8 Aug. 1998	Shallow ditch between dirt road and black spruce stand; 3 clumps
G. Walton	1997	Shallow ditch in damp soil with sedges and grasses; 5 clumps
G. Walton	17 June 1998	Edge of jack pine/black spruce wetland; 3 clumps
G. Walton	2000	On trail through jack pine/black spruce forest; 4 clumps
G. Walton	24 Aug. 2000	2 clumps in disturbed vegetation on edge of ATV trail
G. Walton	15 Sept. 1999	1 clump in poorly drained depression in small field
G. Walton	1997	1 clump in low moist clearing; associated with <i>Calamagrostis canadensis</i> , <i>Trifolium hybridum</i> , <i>Aster cilioatus</i> , and <i>Salix gracilis</i>
G. Walton	23 Aug. 2002	5 clumps in moist soil on old tail in red pine, partial shade
G. Walton	5 Sept. 2002	Moist clearing; Associated with <i>Agrostis alba</i> , <i>Hieracium auranticum</i> , <i>Trifolium hybridum</i> , <i>Aster simplex</i> , <i>Aster puniceus</i> , and <i>Fragaria virginiana</i> .

Wisconsin (Wisconsin State Herbarium at Madison 2003)

The most extensive collections of *Juncus vaseyi* in Wisconsin have been made from Douglas County. The first collection was made by Rudy Koch in 1969, Ralph Brooks made collections from Douglas County in the mid 1980s from Amnicon Falls Park and Wisconsin Point, they are deposited at University of Kansas Herbarium (Brooks 1989), and later Emmet Judziewicz made numerous collections from Douglas County in August and September of 1995. Another fairly recent collection was in Bayfield County in 1993, also by Judziewicz. All other known occurrences are historic: Juneau County (7/12/1964), Green County (8/31/1956), Columbia County (8/7/1959), and Shawano County (7/22/1916).

Maine (recent occurrences) (Haines 2003)

Location	Date	Remarks
Piscataquis Co.	14 Aug 1994	Growing on the rim of slate gorge; 12 plants

Elliotsville		
Washington Co.	5 Aug 1997	Growing on dry (sandy loam) shoulder of logging road. Associates: <i>Betula papyrifera</i> , <i>Betula populifolia</i> , <i>Diervilla lonicera</i> , <i>Euthamia graminifolia</i> , <i>Anthoxanthum odoratum</i> and <i>Solidago</i> ssp.
Washington Co. Baileyville	5 Aug 1997	Dry sandy roadside
Washington Co. Centerville	5 Aug 1936	Grassy swamp
Washington Co, Steuben	22 Aug 1932	Peaty barren

Maine (historic occurrences) (Haines 2003)

Location	County/Town	Year	Remarks
Aroostook Co.		1897	Shore of St. John River
Aroostook Co.		1902	St. Francis River
Aroostook Co.	Fort Kent	1901	Roadside
Franklin Co.	Rangeley Lake	1882	
Penobscot Co.		1897	Dry thicket, alt. 700 ft.
Penobscot Co.	Orono	1890	Alder swamp
Penobscot Co.	Orono	1892	Alder swamp
Washington Co.		1909	Boggy meadow

Vermont/New York

The first record of *J. vaseyi* in Vermont was discovered in a damp meadow along an ephemeral watercourse at an elevation of 110 ft on a bluff overlooking Button Bay, Lake Champlain (Zika 1991). Associates at this site include *Carex tenera*, *C. lanuginosa*, *C. buxbaumii*, *Juncus effusus*, and *J. dudleyi* (Zika 1991). New York has a report of this species, but no herbarium specimen (Clemants 1990).

Illinois

J. vaseyi has been recorded in Cook, McHenry, and Winnebago counties in Illinois (IL PIN 2003).

Canada (Scoggan 1978)

J. vaseyi occurs from British Columbia as far north as Hudson Hope (ca. 56°N), to southwest District of MacKenzie, as far north as Fort Simpson (62°51'N), to Lake Athabasca in Alberta and Saskatchewan, and Reindeer Lake in Manitoba (57°48'N). In Ontario it is known from Lake Nipigon and the Albany River in James Bay (ca. 52°12'N), and from the James Bay watershed (ca. 53°50'N), Lake St. John, and the Cote-Nord in Quebec. *Vasey's* rush also occurs in the Hamilton River Basin in SE Labrador,

New Brunswick, and Nova Scotia, although it is not known from Prince Edward Island (Scoggan 1978).

Ontario (University of Michigan 2003)

Location	Date	Remarks
Thunder Bay – Port Arthur	11 Aug 1950	Moist rocky depression in moss and peat
Thunder Bay District	21 Aug. 1974	Loosely caespitose in lakeshore sand just above strand line
Thunder Bay District	28 July 1974	Caespitose in mossy and grassy fringe of roadside ditch in black spruce bog
Thunder Bay District	5 Aug 1981	Loosely caespitose in moist depressions
Thimble Creek Research near Beardmore	28 July 1980	Moist, exposed mineral soil
Rainy River	12 July 1989	Open grassy area
Kenora District	14 July 1997	Moist area on rock barrens

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