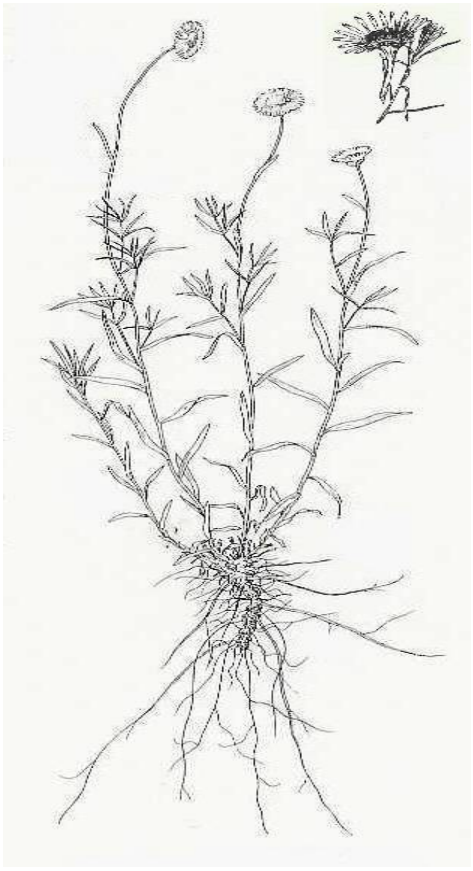
Conservation Assessment
for
Hyssop-Leaved Fleabane (Erigeron Hyssopifolius) Michx.



USDA Forest Service, Eastern Region

April 2003

This document is undergoing peer review, comments welcome

This Conservation Assessment was prepared to compile the published and unpublished information on Erigeron hyssopifolius Michx. This report provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It is an administrative study only and does not represent a management decision by the U.S. Forest Service. Although 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 this species, 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 – We thank Jan Schultz, of the Hiawatha National Forest, and Beverly Braden, contract botanist for their suggestions and patience through numerous revisions.

Literature Search

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- We thank Beverly Braden, a contract botanist, for additional literature searches at Northern Michigan University in Marquette and Michigan State University in East Lansing and the University of Michigan in Ann Arbor.

EXECUTIVE SUMMARY

Erigeron hyssopifolius Michx.(Hyssop-leaved Fleabane) is designated as a Regional Forester Sensitive Species on the Hiawatha National Forest in Michigan's Upper Peninsula, Eastern Region of the Forest Service. The species is currently not known from other National Forests. The purpose of this document is to provide the background information necessary to prepare a Conservation Approach which will include management actions to conserve the species.

This Conservation Assessment provides available information regarding *Erigeron hyssopifolius* Michx. and its distribution, abundance, habitat and range, status, and ecology. *Erigeron hyssopifolius* can be found along rocky shores, outcrops, and ledges (Chadde, 1998), especially along the north shoreline of Lake Superior in Ontario where it is locally frequent in rock crevices (Voss 1996). It is also known from calcium-rich fens and northern

white cedar swamps in the Upper Peninsula of Michigan in moist sites in full sun or partial shade (Streusand 1982, Weitzman 1983). *Erigeron hyssopifolius* is a boreal species of North America and is found in north-central Yukon, northern British Columbia, and northern Alberta, Saskatchewan, the central provinces of Ontario and Quebec east to Newfoundland, New Brunswick and Nova Scotia. In the United States it is known from Maine, New Hampshire, Vermont, New York and the Upper Peninsula of Michigan (NatureServe 2002). *Erigeron hyssopifolius* is currently listed as Threatened in the state of Michigan (MNFI 2002).

INTRODUCTION/OBJECTIVES

The National Forest Management Act and U.S. Forest Service policy require that Forest Service land 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 these species listed as endangered or threatened under the Endangered Species Act (ESA), or Species of Concern by U.S. Fish and Wildlife Service, the Forest Service lists species that are sensitive within each region (Regional Forester Sensitive Species or RFSS). A designation of "Sensitive" within National Forests affords some additional regulatory protection.

The objectives of this document are to:

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

DESCRIPTION OF SPECIES

Material for this section are from Maine Dept of Conservation 1999, Welsh 1974, Chadde 1998, Hultén 1968, Chadde 1999, Gleason and Cronquist 1991, Voss 1996, and Moss & Packer 1983.

Erigeron hyssopifolius is a low growing (up to 20 cm) herbaceous tufted perennial. Leaves are narrow and alternate on the stem. Stems are numerous and smooth to sparsely hairy (Maine Dept. of Conservation 1999, W-2). Daisy-like flower heads are usually solitary (or 1-5) per stem, with narrow white or pink-purplish rays (Chadde 1999). Flowering occurs in late spring to mid-summer; fruits in July-August (Chadde 1998).

Roots: Fibrous
Stem: Numerous from short underground caudex, slender, mostly 10-40cm long, smooth or sparsely hairy.

Leaves: Thin, lax, mostly linear, margins entire, about 1-3cm long, less than 5mm wide, alternate, numerous and overlapping on the lower stem, lowest leaves reduced and scale-like, often with short axillary shoots,

Flower heads: Disks and rays both present, rays 20-50, white or sometimes pink-purplish, 4-8mm long, disks 6-12mm wide, flower heads often solitary or 2-5 at the ends of long, nearly leafless stalks.

Fruit: Achenes, 2 nerved

Pappus: Of long bristles, may have a ring of very short bristles, white or yellowish.

NOMENCLATURE AND TAXONOMY

Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Scientific Name: *Erigeron hyssopifolius* Michx.
Common Name: Hyssop-leaved fleabane
Synonyms: none
Varieties: *Erigeron hyssopifolius* Michx.
var. *hyssopifolius*
var. *villicaulis* Fern
Plant Code: ERHY5 (USDA NRCS Plant profile, W-4)
Origin: Native

Taxonomy notes

Within the family *Asteraceae* the genus *Erigeron* is quite distinctive, but it is sometimes confused with the genus *Aster*. *Erigeron* usually flowers earlier than *Aster*, in spring and early summer; whereas, *Aster* flowers mostly in late summer and fall (Smith, 1996). "The name *Erigeron* is from the Greek *Eri*, early, and *geron*, old man, probably referring to the early flowering and fruiting of most species" (Smith, 1996).

Initially *Erigeron hyssopifolius* was included within the *E. foliosus* group (sect. *Pycnophyllum*) (Cronquist 1947 *cf.* Nesom & Noyes 1999); with added perspective *Erigeron* sect. *Linearifolii* was narrowed to a monotypic taxon, comprising only *Erigeron hyssopifolius* of northern North America (Nesom & Noyes 1999). Sect. *Pycnophyllum* (*E. foliosus* group) is restricted to areas along the Pacific coast of North America, while *E. hyssopifolius* occurs across North America (mostly in Canada and northern New England). *E. hyssopifolus* differs from *E. foliosus* in several features: cauline leaves abruptly reduced in size below the peduncles, and heads solitary on bracteate peduncles (Nesom & Noyes 1999).

PROTECTION STATUS

Currently, the official status for *Erigeron hyssopifolius* Michx. with respect to federal, state, and private agencies is:

U.S Fish and Wildlife Service: Not listed (None)
Global Heritage Status Rank: G5
U.S National Heritage Status Rank: N2N4 (02Oct2000)
Canada Heritage Status Rank: N5 (02Oct2000)

With a global rank of 5 an a U.S National rank of 2 and 4, The Nature Conservancy lists these rankings as:

N2: Nationally imperiled because of rarity (few remaining individuals or acres)
N4: Nationally widespread or secure, but with cause for long-term concern.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery

U.S. State Heritage Ranks (NatureServe, W-3)

Maine	S2 – Special Concern
Michigan	S1 – Threatened
New Hampshire	SR
New York	S1 – Endangered
Vermont	S2

Canada Province Heritage Status Ranks (NatureServe, W-3)

Alberta	S1
Manitoba	S4
New Brunswick	SR
Newfoundland	SR
Northwest Territories	SR
Nova Scotia	S2S3
Nunavut	SR
Ontario	S5
Quebec[1]	S?
Saskatchewan	S2
Yukon Territory	SR

1. Likely to be designated as threatened or vulnerable species (Ministerial Order – CanLII 2002)

Definitions (NatureServe, W-3)

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.
S5: Very common; demonstrably secure under present conditions.
S?: The species is either unranked or has a questionable ranking.

HABITAT AND ECOLOGY

Habitats for *Erigeron hyssopifolius* in Canada include calcareous ledges, talus, and gravelly shores (Scoggan 1979). Packer and Bradley (1984) list gravelly shores and meadows as typical habitat in Alberta. It is locally frequent in rock crevices along the north shore of Lake Superior shores in Ontario (Voss 1996). In Ontario (Reznicek 9491 MICH) noted "limestone cliffs and ledges along the Maitland River; frequent but very local in stretches of low cliffs in sun or partial shade" (University of Michigan herbarium 2001). This location is along the southern shore of Lake Huron, it extends the range for this species more than 200 miles south of Summerby Swamp in Mackinac County, Michigan (Ed Voss pers. comm. 2002). In New Brunswick on the Aroostook River, *E. hyssopifolius* was found (Reznicek 1978, specimen) in a seepy rock outcrop amongst large boulders (University of Michigan herbarium 2001). Sea level alpines, such as *Erigeron hyssopifolius*, are found along the western and northern shores of Newfoundland occurring among the scree of limestone gravel (Boland 1996). Associates in the limestone scree gravels of Newfoundland's coast include *Arenaria rubella*, *Antennaria parviflora*, and *Cerastium alpinum*. Also at the University of Michigan (MICH) are three specimens from north of Manitouwadge and in the Cochrane district, considerably north of Lake Superior (Ed Voss, pers. comm. 2001).

Another relict area includes the well-known calcareous regions around the shores of the Gulf of St. Lawrence. The map of the St. Lawrence River by Environment Canada shows nearly 20 sites for *Erigeron hyssopifolius* with the greatest number along the bay north of the Gaspe′ Peninsula (Environment Canada 2001). In geological time, not all the highly soil-specialized species may have had the opportunity to reach all suitable habitats (Wynne-Edwards 1937) so it is possible that *E. hyssopifolius* presence might increase further in this area.

In Maine *Erigeron hyssopifolius* prefers non-forested, seasonally wet areas, also non-forested, upland rocky outcrops and often grows out of rock crevices along northern rivers (Maine Dept. of Conservation 1999, W-2). Associates at these sites are *Carex hassei, Hedyotis longifolia, Primula mistassinica, Viola novae-angliae,* and *Potentilla fruticosa* (Ballard & Gawler 1994). In Maine "competition from other plants appears to be limited,

possibly because of the severity of the habitat, which is subjected to annual ice scouring and flooding". In Maine *E. hyssopifolius* seems to be limited by the scarcity of calcareous substrate (Maine Dept. of Conservation 1999, W-2).

Historically *Erigeron hyssopifolius* was reported in New York at the turn of the century on moist cliffs along the Ausable River (Peck NYS) in northern Essex County (Zika and Jenkins 1992). Recently two extant populations were located in 1990 in the Hudson River Gorge. The larger colony of 500+ plants is in the town of Indian Lake, Hamilton County on north-facing ledges at 425m (Zika & Jenkins 10918 NYS). Cliffs here are mostly calcite with some harder rock weathering to course calcareous sand (S. Young pers. comm. 2002). Associated species at that site are *Allium schoenoprasum* var. *sibiricum, Calamagrostis stricta* ssp. *inexpansa, Campanula rotundifolia, Carex capillaris, C. eburnea, Cryptogramma stelleri, Cystopteris bulbifera, Muhlenbergia mexicana, Potentilla fruticosa, Saxifraga oppositifolia, Solidago simplex* ssp. *randii,* and *Woodsia glabella* (Zika & Jenkins 1992).

Magee and Ahles (1999) list *E. hyssopifolius* as found on rocky ledges, shores, banks, often calcareous. The White Mountains in New Hampshire contain pockets of calcareous soils rich in magnesium. These pockets harbor several sub-arctic species including: *Castilleja pallida* var. *septentrionalis, Erigeron hyssopifolius, Hedysarum alpinum* var. *americanum,* and *Solidago cutleri* as well as the more widespread holarctic types such as *Asplenium trichomanes-ramosum, Pinguicula vulgaris,* and *Saxifraga oppositifolia* (Wynne-Edwards 1937).

In Michigan, the known habitat is a calcium rich fen (pH 7.5 – 8.0) in a northern white cedar swamp within Mackinac County (Streusand 1982, Weitzman 1983). Associated species at this site include: *Thuja occidentalis, Picea mariana, Larix laricina, Chamaedaphne calyculata, Vaccinium oxycoccos, Potentilla fruiticosa, Kalmia polifolia, Scirpus cespitosus, Scirpus hudsonianus, Carex aquatilis, Carex capillaris, Drosera rotundifolia, Lobelia kalmii, Gentianopsis procera,* and *Tofieldia glutinosa.* Many of these plants are common in swamps and bogs throughout northern Michigan. A few of the more uncommon associates at this site include *Selaginella selaginoides, Pinguicula vulgaris, Carex crawei, Juniperus horizontalis,* and *Empetrum nigrum* (Weitzman 1983). Historically *E. hyssopifolius* was collected by Farwell and indicated as "rare" from Keweenaw County in 1890 (Voss 1996).

DISTRIBUTION AND ABUNDANCE

Erigeron hyssopifolius is mostly found in moist sites in the Yukon, northern British Columbia to Hudson Bay, Quebec to Newfoundland, south to Michigan, New York, Vermont (Packer & Bradley 1984), New Hampshire (NatureServe 2001). Canadian distribution includes Alberta (north in Wood Buffalo National Park), Manitoba (south to Cowan, NE of Duck Mt.), northern portion of New Brunswick (Hinds, 1986), Newfoundland, Northwest Territories, Nova Scotia, Nunavut, Ontario (south to Michipicoten, ca. 48°N on the east shore of Lake Superior), Quebec, Sackatchewan, and Yukon Territory (Scoggan 1979). Michaux based his species description from specimens near Lake Mistassini, Quebec (Voss 1996). A recent range extension (Reznicek 9491, MICH) extends the range to the southern shore of Lake Huron near Goderich (University of Michigan herbarium, 2001).

United States distribution of *Erigeron hyssopifolius* includes Maine, Michigan (Mackinac County and historically Keweenaw County, MNFI 2002), New Hampshire, New York (Hamilton County, Zika & Jenkins 1992), and Vermont (NatureServe, W-3). In Vermont this species is found in Orleans County, Smuggler's Notch, Chittenden County, Bradford, Windsor County, and Clarendon (when a county is listed there are at least two occurrences in different towns; when a town is listed there is just one occurrence) (Seymour 1997).

In the Upper Peninsula of Michigan, *Erigeron hyssopifolius* is found adjacent to an open northern white cedar-tamarack swamp in Mackinac County (Summerby Swamp) near Moran (Voss 1996). *Erigeron hyssopifolius* was first collected in Summerby Swamp (MSC) on June 16, 1965 by M.C. Nielsen (MI DNR). Ed Voss later (1977) visited the site, collected specimens that were distributed to six herbaria (Ed Voss pers. comm. 2002). In 1987-88 Hiawatha National Forest Service botanists documented this same site. At one site thousands of individuals were reported covering at least three acres; another site occurred near a creek over a 100 x 20m area (MNFI, 1998). In 2002 the Hiawatha National Forest listed four Element Occurrences of *Erigeron hyssopifolius*; MNFI lists two Element Occurrences (MNFI 2002); probably indicating that this species occurs on both sides of Highway M-123. In Michigan *Erigeron hyssopifolius* is State Threatened (MNFI 2002).

Erigeron hyssopifolius occurrence in Summerby Swamp, a candidate Research Natural Area in Mackinac County, Michigan can be partially explained by the fact that the area was apparently a Lake Nipissing shoreline 4000 years ago (Dorr & Eschman 1970). "Because of its limestone substrate, it is quite calcareous and probably resembles the marly beach pools of the present Great Lakes"(Weitzman 1983). *Empetrum nigrum, Junipus horizontalis, Pinguicula vulgaris, Primula mistassinica, Carex crawei, Erigeron hyssopifolius, Aster ptarmicoides,* and *Selaginella selaginoides* thrive in this shoreline habitat. Because of the lack of disturbance, cold water, and cold air drainage these plants have persisted in Summerby Swamp at least from the Lake Nipissing lake stage (Weitzman 1983).

In Maine *Erigeron hyssopifolius* grows only along rivershores in the northern half of the state; it is ranked state Special Concern. Where habitat is suitable, the plants are often abundant. "Competition from other plants appears to be limited, possibly because of the severity of the habitat, which is subjected to annual ice scouring and flooding" (Maine Dept. of Conservation W-2). This species has been documented from a total of 17 town(s) in the following county(ies): Aroostook, Penobscot, Piscataquis, Somerset. The dates of documented observations are: 1906, 1917, 1939(2), 1940, 1970s, 1980, 1982, 1983 (2), 1984 (4), 1985, 1990 (2), and 1992. "Reasons for rarity are that it is at the southern limit of its range, and there is a natural scarcity of calcareous substrate in Maine. Its habitat appears subject to little threat except for recreational use, which in the past has not been heavy where it grows" (Maine Dept. of Conservation 1999, W-2).

In New York *Erigeron hyssopifolius* was found on moist cliffs along the Ausable River, northern Essex County at the turn of the century. Recently (1990) two extant populations were located in the Hudson River Gorge on north-facing ledges at approximately 425m. This population was estimated to be about 500 plants (Zika and Jenkins, 1992).

LIFE HISTORY

Life cycle information specific to *Erigeron hyssopifolius* was not found. Some generalizations may be possible from research done with other *Erigeron* species and other members of the Asteraceae. The inflorescence of all Asteraceae (Compositae) is a greatly condensed complex inflorescence, characterized by high floral density; it is called a capitulum (head). The capitulum in the Asteraceae functions as a single, simple blossom while it is in fact a consolidation of numerous simple solitary flowers on a swollen or expanded receptacle. The outermost whorl of the head (involucre) acts as if it was a calyx, while other peripheral whorl (ray florets) serve as petals and the inner florets (disc florets) behave as though they were the inner stamens and pistils of a single flower.

With *Erigeron* the head is differentiated into disc and ray florets. In general, ray florets attract more pollinators than non-rayed heads; Stuessy as cited in Mani and Saravanan (1999) demonstrated experimentally that the rayless heads of Asteraceae attracted fewer pollinators with a fall in seed set of over 64%. Dichromatism (disk flowers yellow), ray flowers differently colored are found in both *Aster* and *Erigeron.* Also in *Erigeron,* the peripheral ray florets are female and fertile and the inner tubular-companulate florets are bisexual and fertile (Mani and Saravanan 1999). *Erigeron* would logically be a species that attracts more pollinators due its differentiation between disk and ray flowers and the color contrast between the two types of flowers.

A controlled breeding experiment (Armbruster & McGuire 1991) involved *Erigeron glabellus* and *Aster sibiricus* in the interior of Alaska. These species have similar flowers, share pollinators, and normally bloom sequentially. For the purpose of this experiment, the flowering time of *Erigeron* was manipulated to force it to bloom simultaneously with *Aster*. Armbruster and McGuire were interested in the effects on female fecundity.

For the Armbruster and McGuire (1991) study, pollinators were observed for ½ hour intervals (17.5 hours total) over the flowering season in the interior of Alaska, with blooming manipulated for con-current blooming. *Erigeron glabellus* was visited most frequently by one species of fritillary butterfly, *Boloria titanica* (Esper.) or 42.1 % of 650 visits. Males of three species of halictid bees were observed for 36.0 % (pooled data) of the visits. Throughout the experiment, the general abundance of the male halictids increased and that of the fritillary decreased. The halictid male bees preferred the *Aster* and 92% of the moves from *Erigeron* were to *Aster*. The fritillary butterfly showed an almost equal number of moves between *Erigeron* and *Aster* and *Aster* to *Erigeron* in mixed plots. This evidence suggests that *Erigeron glabellus* and *Aster sibiricus* both bloom naturally when their most efficient pollinators are active.

Erigeron was found to be strongly self-incompatible. There was no seed set in the no-pollination and self-pollination treatments of the breeding experiment. Even though *Aster* and *Erigeron* shared pollinators there was no evidence in this study that the presence of simultaneously blooming *Aster* depressed pollination visitation or seed set in *Erigeron.* The

results of this study did not show negative effects on female fecundity Armbruster and McGuire (1991).

In many regions of the United States the difference in blooming periods of *Erigeron* and *Aster* is considerable so that the genera would not be likely to be found blooming at the same time. For example, in California 24 species of *Erigeron* were compared with 24 species of *Aster* and *Erigeron* was found to precede *Aster* by 1.45 months (two-sample *t*-test t=10.10, $P < 0.001$, df = 46) (Armbruster and McGuire 1991).

In Michigan, *Erigeron hyssopifolius* flowers in June and July (Chadde 1999) to early August on the north shore of Lake Superior (Ed Voss pers. comm 2002), and fruits in July and August (Chadde 1998). In some of the more northern or higher altitude element occurrences *Erigeron hyssopifolius* blooms with some *Aster* species. Even a minimal overlap in blooming times would allow for cross-visitation by pollinators (Ed Voss, pers. comm. 2002).

POPULATION VIABILITY AND PROTECTION

In the Upper Peninsula of Michigan, *Erigeron hyssopifolius* is south of its normal range, but persists here in a northern fen indicating its preference for calcareous substrate. The "Northern Rich Fen" habitat is located on marly substrates near the Straits of Mackinac (Albert 2001). The area where *E. hyssopifolius* is found was apparently a Lake Nipissing shoreline. Because of a lack of disturbance, cold water and air drainages, *Erigeron hyssopifolius* has been able to persist here at least since the Nipissing Lake stage (Weitzman 1983). At one site thousands of individuals were reported covering at least three acres; another site occurred in a borrow pit near a creek over a 100 x 20m area (MNFI, 1998). Summerby Swamp is a candidate Research Natural Area in the Hiawatha National Forest which would afford some additional protection.

POTENTIAL THREATS

In the Upper Peninsula, old logging roads have affected drainage patterns for large areas. At Summerby Swamp M-123 a paved road with wide shoulders runs through the site. At certain times of the year, when heavy rains fall in a short time, the road acts as a dam. The road has allowed other damaging activities; there is the remains of an old east-west logging road that likely affects drainage patterns as well. Weed introduction along the road, the logging road, or the utility line (north of the logging road) is a possible threat (J. Schultz pers. comm. 2002). Aggressive weeds of wetland areas include *Lythrum salicaria* (purple loosestrife), *Phragmites australis* (reed), and *Phalaris arundinacea* (reed canary grass) (Albert 2001). Ditching along the M-123 Highway could lead to the spread of cattails, especially if extra road salts wash into these ditches (Ed Voss pers. comm. 2002). In addition, the highway subjects the area to the possibility of an accident with an oil carrier, or carrier of other chemicals.

RESEARCH AND MONITORING

Research and monitoring has been lacking for this species. As with many other boreal species, unless there is an economic reason for research as with *Rubus arcticus*, plants of the far North are usually neglected. In general, botanists are fewer in number, growing seasons are shorter, and occurrences are normally farther from civilization requiring more physical travel time and possible physical hardship at a location sites. On the Hiawatha National Forest, the site is easily accessed by M-123 so this would be a good site to set up a regular monitoring program.

SUMMARY

Information on *Erigeron hyssopifolius* is clearly limited. This species seems to be somewhat more abundant in Canada, but infrequent in northern New England. It is state Threatened in Michigan, and state Endangered in New York. Globally *E. hyssopifolius* is considered a secure species, which is shown by its G5 status. In Michigan it is known from the Upper Peninsula only in Mackinac County and historically in the Keweenaw Peninsula. *E. hyssopifolius* can sometimes be mistaken for similar looking *Aster* species, but *Erigeron* spp. blooms somewhat earlier in the season (mid-summer) than *Aster* spp. which bloom late summer to autumn. *E. hyssopifolius* can be recognized by a low growing tufted form with narrow linear leaves that are hairless or fairly hairless and up to 40 rays on its head (Maine Dept. of Conservation 1999, W-2). This species preferred habitat is rocky outcrops, shores, and ledges in Canada. In Maine and New York it often occurs in rock crevices along river banks. Often this species is found on calcium rich soils. In Michigan this species is near its southern limit in distribution, it occurs in a calcium-rich fen and northern white cedar swamp; it grows in either sun or partial shade (Chadde 1999). Recently one site was found on the southern shore of Lake Huron in Ontario which extends the southern range limit by 200 miles.

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APPENDIX

Location/ County	Date Observed	Remarks
Mackinac County	June 06, 1987	Thousands of individuals over at least three acres in all but the wettest areas of bog and sedge meadow openings.
Mackinac County	June 04, 1987	Marl substrate with sphagnum hummocks w thickets of stunted *Thuja*
Mackinac County	July 11, 1988	Northern fen –occurring in a borrow pit near creek, in marly gravelly sand, area appr. 100 x 20m. Associates: *Senecio pauperculus, Solidago houghtonii, Carex scirpoidea,Tofieldia glutinosa*
Mackinac County		Ref in old atlas

Hiawatha National Forest (Upper Peninsula of Michigan)

New York (Zika & Jenkins 1992)

Two populations were found in 1990 in the Hudson River Gorge, near the town of Indian Lake, Hamilton County. The larger population was estimated at approximately 500 plants.

Vermont (not tracked by state heritage)
Known from six counties (USDA NRCS 2001) Orleans County, Smuggler's Notch, Chittenden County, Bradford, Windsor County and Clarendon (Seymour 1997). Note data is from 1968 edition. Seymour lists counties if the taxon occurs in two or more towns within the county; otherwise he lists the town (D. Burbank pers. comm. 2002). Harvard herbarium has specimens from 9 townships in 6 different counties (R. Angelo pers. comm. 2002).

New Hampshire (not tracked by state heritage)
Habitat is rocky ledges, shores, banks, often calcareous (Magee and Ahles 1999). Seymour (1968) does not show any occurrences in New Hampshire (D. Burbank pers. comm. 2002).

Maine (Maine Dept. of Conservation 1999)
Known from the northern 2/3 of the state (USDA NRCS 2001)
Twelve occurrences were discovered between 1980 – 1992
in the counties of Aroostook, Penobscot, Piscataquis, and Somerset
Historic occurrences (1906-1979) number six primarily from northern Aroostock County
Habitat in Maine: Grows along rivershores on calcareous substrate in the northern half of the state.