

ASTER YUKONENSIS SURVEY
MIDDLE FORK KOYUKUK RIVER

Gates of the Arctic National Park and Preserve

GAAR-95-001
March 1995

Donna L. DiFolco, Biological Technician
U.S. National Park Service, P.O. Box 74680, Fairbanks, Alaska 99707

ACKNOWLEDGMENTS

Special thanks should be given to the happy aster hunters who scoured every single gravel bar along our survey route--and there are many! The team members included Susan Holly, our Aster yukonensis expert, Ann Corson, the logistics coordinator and jokester, Sherie Maddox, the first person to spot the rare aster on this survey, and Laurene Kovalinki, a Volunteer who brought sharp eyes and delicious cookies. We learned how to spot A. yukonensis from Susan, laughed at Annie's corny jokes, teamed with Sherie on wild aster hunting forays, and ate far too many of Laurene's cookies. The survey could have been very tedious without the high spirits yet serious dedication of this crew.

INTRODUCTION

Gates of the Arctic National Park and Preserve holds a vast amount of natural resources in its 8.4 million acres, some of which have yet to be discovered. The National Park Service is mandated by the Endangered Species Act (1973) to protect threatened, endangered or candidate species of plants and animals within the park and preserve. Before a program can be developed, however, knowledge of presence, status, and location of these species must be obtained.

Included in the park's objective to manage threatened and endangered species is an inventory of rare plant communities. Until recently, Aster yukonensis Cronquist (Fig. 1) has been documented in Alaska as occurring only in one location on the Middle Fork Koyukuk River near Bettles (Murray 1987). The only other documented location for A. yukonensis is in southwestern Yukon, Canada (Murray 1987).

In 1993, another population of A. yukonensis was discovered along the Middle Fork Koyukuk down river of the park boundary (S. Holly, Nat'l Park Serv., pers. commun.). A specimen collected at that site is now stored in the University of Alaska Museum herbarium in Fairbanks. This discovery spurred interest in searching for more populations of the plant along the southern park boundary. The objective of the search was to document any populations of the plant found in and neighboring the park, map their locations and numbers, and, if the search proved successful, to publish a range extension for the species.

STUDY AREA

Gates of the Arctic National Park and Preserve lies north of the Arctic Circle in the central Brooks Range, Alaska (Fig. 2). The survey area included the gravel bars and river banks of the Middle Fork Koyukuk River from Cathedral Mountain south of Coldfoot and down river along the park boundary (Fig. 3). The southeastern tip of the park is characterized by boreal forests blanketing the rounded foothills of the Brooks Range. The river corridor is lined with gravel bars interspersed with vertical cliffs rising 200 ft (61 m) above the river. Vegetation on the gravel bars is predominantly willows (mainly Salix alaxensis) and Balsam poplars (Populus balsamifera). Appendix II contains a list of the riverbar flora of the Middle Fork Koyukuk River. The list is a compilation of all species identified on all gravel bars surveyed.



Fig. 1. Aster yukonensis blossom, Gates of the Arctic National Park and Preserve, Alaska. This aster is a Candidate species, Category 2, for the Endangered and Threatened Species List. Prior to this survey, a small population near Bettles on the Middle Fork Koyukuk River was the only documented population of the species in Alaska (Murray 1987).

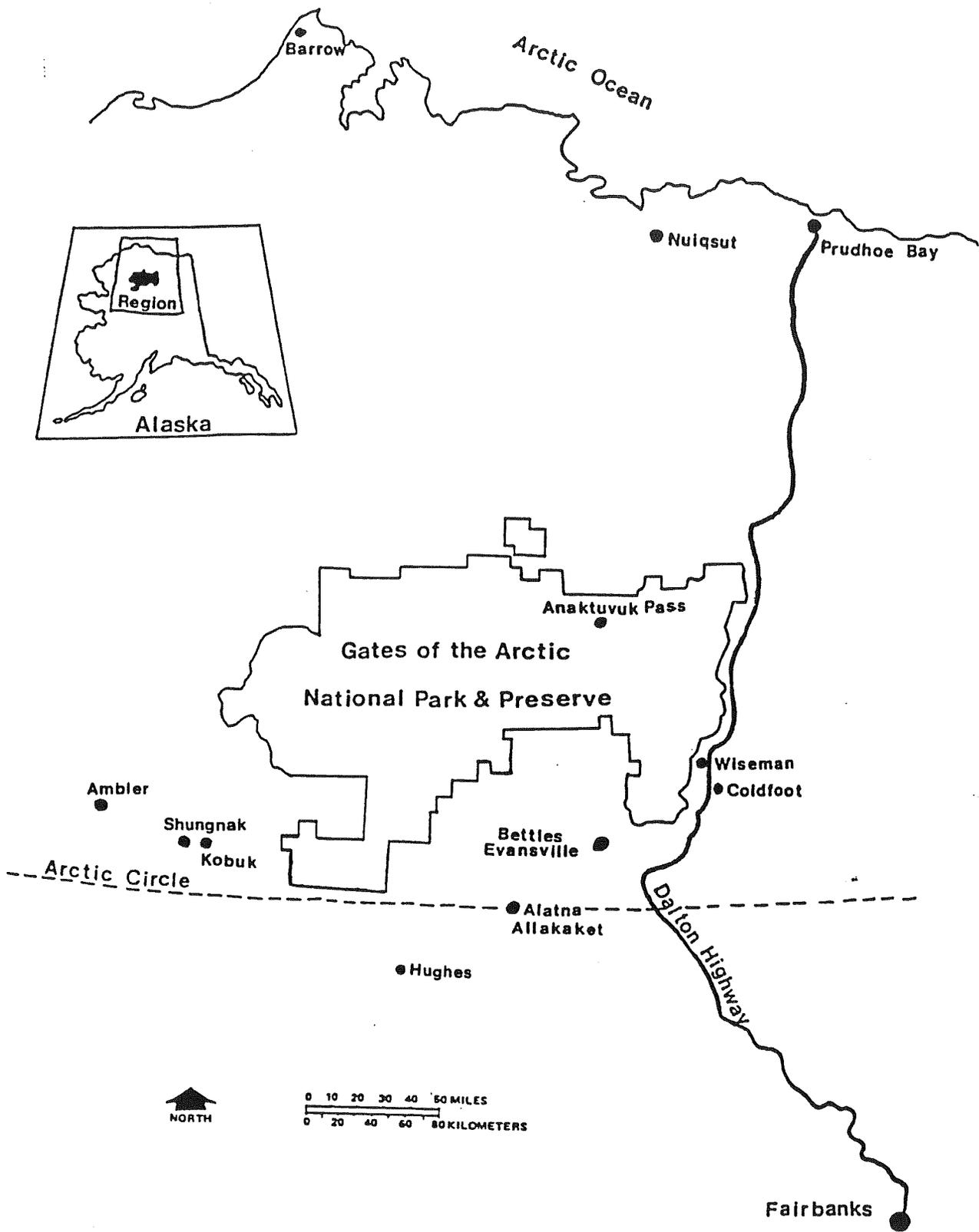


Fig. 2. Location of Gates of the Arctic National Park and Preserve, Brooks Range, Alaska.

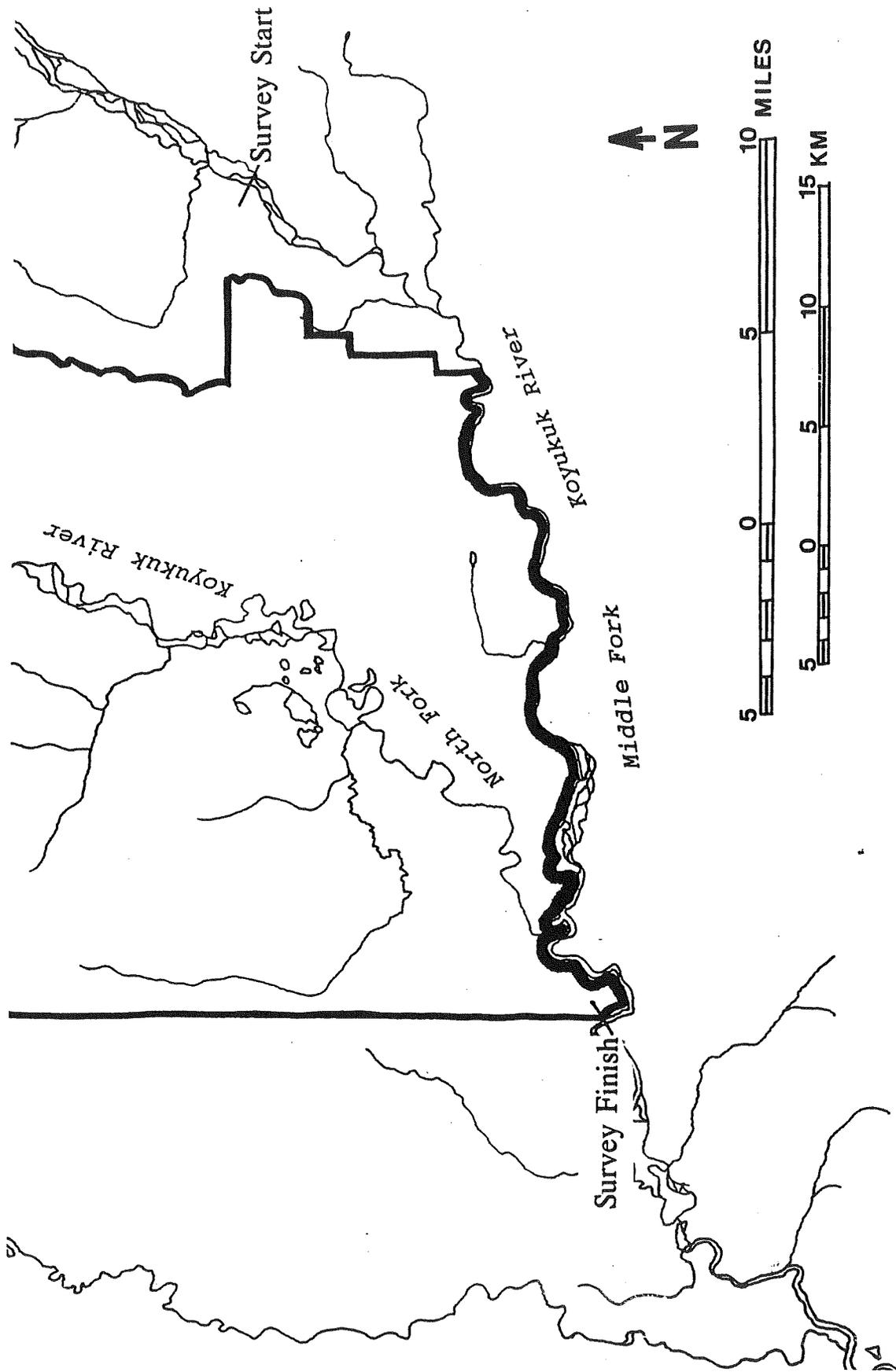


Fig. 3. Route for *Aster yukonensis* survey on the Middle Fork Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, July 1994.

METHODS

The survey began July 25, 1994, and was completed July 29, 1994. A five-person crew floated from Coldfoot to Bettles, using an inflatable raft and a collapsible canoe. The majority of the first two days was spent studying aster specimens and memorizing our target species' field characteristics (Hulten 1968 and Murray 1987). We searched every gravel bar on the park side of the river (generally the north bank) and each island that was mostly on the park side. Approximately 36 mi (58 km) of the river were surveyed.

Once the first specimens were located, the crew started at one end of the gravel bar and walked parallel transects. Each A. yukonensis on the gravel bar, from the thick organic mat of the forest edge to the sparsely vegetated strip nearest the river, was counted. An individual plant was defined as one with all the stems originating from the same point. Thus a single stem would be one plant and 5 stems growing from the same point would also be one plant. The first specimens located were examined carefully by looking for the densely glandular phyllaries to confirm identification. After this, macroscopic features were used to identify the species more quickly. The long, narrow clasping leaves were especially distinctive.

On river bars where the density of A. yukonensis was very high, a separate sampling technique was utilized to reduce the amount of time spent at each site. This technique involved having the crew disperse across the site. Each person would search a different section and count groups of 50 asters. The crew's individual counts would then be combined into the total site count.

Specimens were collected (from local populations of >50), pressed for verification and labelled as herbarium specimens for the National Park Service herbarium in Bettles, Alaska. Other vascular plants associated with A. yukonensis were documented concurrently.

RESULTS

Maps showing the survey route, population counts and estimates of the rare asters can be found in Appendix I. Population totals reported should be considered minimum estimates. Of 43 sites investigated during the survey, 27 were found with A. yukonensis (Table 1). Four asters, field identified as A. yukonensis, were collected. Species identification was verified by Carolyn Parker of the University of Alaska Museum.

Table 1. Distribution of A. yukonensis plants on gravel bars during a survey of the Middle Fork Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, July 1994.

No. <u>Aster yukonensis</u>	No. gravel bars
1-50	7
51-100	6
101-300	8
301-1000+	6

The first specimens of A. yukonensis were discovered just above Tramway Bar (Fig. 4) and were found on nearly every gravel bar thereafter. Two specimens were collected at the first site (of 125 plants counted) and pressed for future verification. Also, 13 other plant species found in association with A. yukonensis were documented (Table 2). These were all located within a 50 m stretch of gravel bar from the river's edge to the high water line. The substrate was mainly fist-size cobblestone, underlain by silt (Fig. 5).

A second plant list was compiled (Table 3) at an A. yukonensis site representing a different soil type, which was mostly silt and sand (Fig. 6). The aster population was growing in a wooded part of the gravel bar farther from the river than the more rocky sites. Species observed within an approximately 20 m radius of a representative group of A. yukonensis were listed.

Most sites before the confluence with the North Fork Koyukuk River had from 50 to 400+ plants on the gravel bars. Two sites supported over 1,000 plants each on wide sandbars about half-way between Tramway Bar and the North Fork confluence (approximately 67°2.5'N, 150°48'W). The numbers of A. yukonensis dwindled sharply after the North Fork confluence; only 22 scattered specimens were found on the large sandbar directly down river from where the North Fork enters the main channel. Down river from the confluence, numbers increased moderately.

After completion of the official survey, a check was made on "Susan's Island" where A. yukonensis had been found the previous summer. Fifty (minimum) were found on the island.

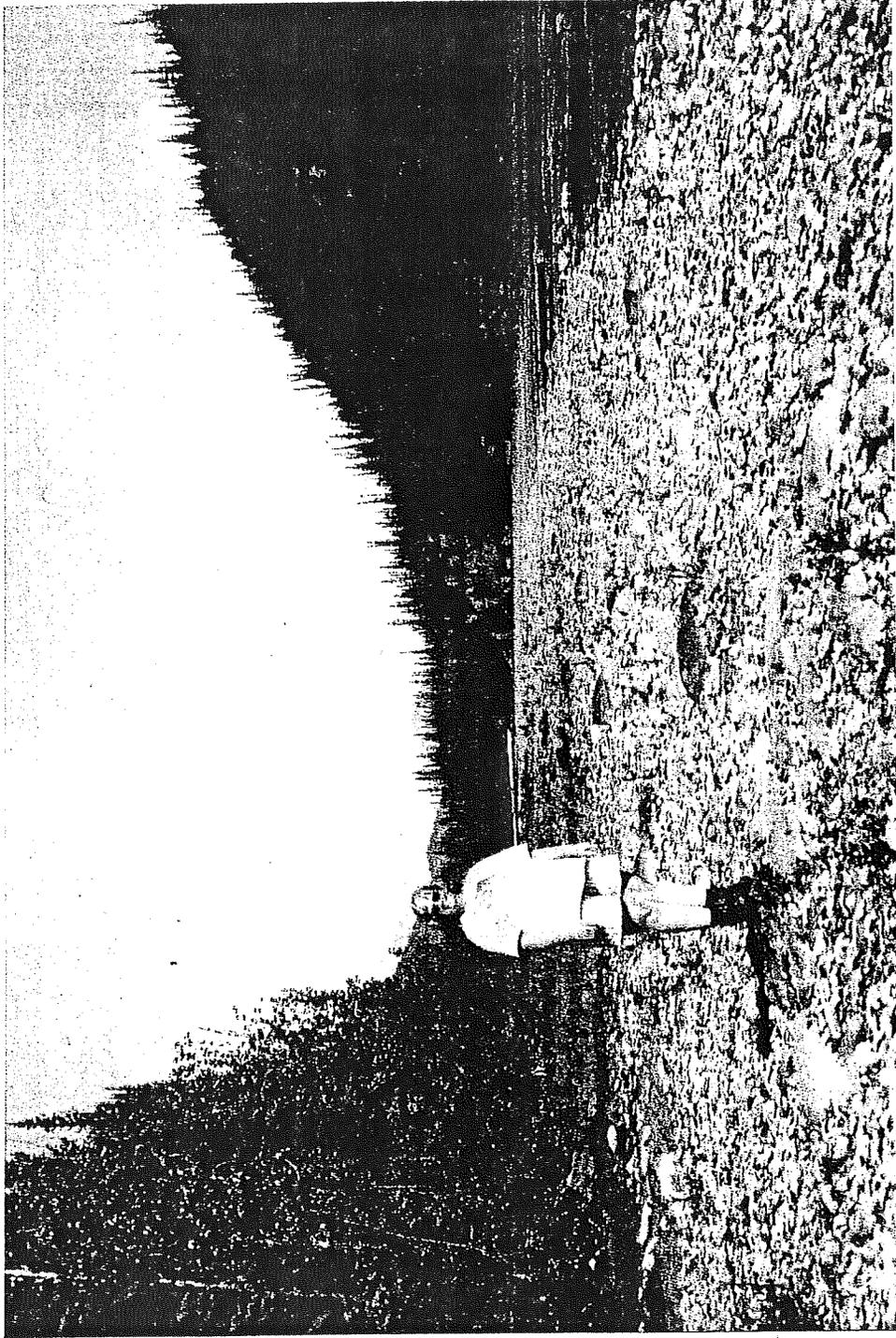


Fig. 4. Gravel bar where first specimens of *Aster yukonensis* were located during survey of Middle Fork Koyukuk River, Brooks Range, Alaska, July 1994.

Table 2. Plants associated with Aster yukonensis, near Tramway Bar, Middle Fork Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, July 27, 1994.

BETULACEAE (Birch Family)

Alnus crispera (Ait.) Pursh subsp. crispera

Alnus incana (L.) Moench subsp. tenuifolia (Nutt.) Breitung

CARYOPHYLLACEAE (Pink Family)

Wilhelmsia physodes (Fisch.) McNeill

COMPOSITAE (Composite Family)

Artemisia Tilesii Ledeb.

Aster sibiricus L.

Aster yukonensis Cronq.

CYPERACEAE (Sedge Family)

Carex spp.

GRAMINEAE (Grass Family)

Agropyron sp.

LEGUMINOSAE (Pea Family)

Hedysarum alpinum L. subsp. americanum (Michx.) Fedtsch.

ONAGRACEAE (Evening Primrose Family)

Epilobium latifolium L.

ROSACEAE (Rose Family)

Potentilla fruticosa L.

SALICACEAE (Willow Family)

Populus balsamifera L. subsp. balsamifera

Salix alaxensis (Anderss.) Cov.

SAXIFRAGACEAE (Saxifrage Family)

Parnassia palustris L. subsp. neogaea (Fern.) Hult.



Fig. 5. Aster yukonensis on rocky gravel bar, close to the river, Middle Fork Koyukuk River, Brooks Range, Alaska, July 1994. Aster sibiricus is in the background.

Table 3. Plants associated with Aster yukonensis, on the river island of Camp #3, Middle Fork Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, July 28, 1994.

BETULACEAE (Birch Family)

Alnus crispa (Ait.) Pursh subsp. crispa

COMPOSITAE (Composite Family)

Antennaria pulcherrima (Hook.) Greene

Artemisia Tilesii Ledeb.

Aster sibiricus L.

Aster yukonensis Cronq.

CUPRESSACEAE (Cypress Family)

Juniperus communis L.

ELAEAGNACEAE (Oleaster Family)

Shepherdia canadensis (L.) Nutt.

EQUISETACEAE (Horsetail Family)

Equisetum spp.

ERICACEAE (Heath Family)

Arctostaphylos rubra (Rehd. & Wilson) Fern.

GRAMINEAE (Grass Family)

Agropyron sp.

Calamagrostis sp.

JUNCACEAE (Rush Family)

Juncus sp.

LEGUMINOSAE (Pea Family)

Hedysarum alpinum L. subsp. americanum (Michx.) Fedtsch.

ONAGRACEAE (Evening Primrose Family)

Epilobium angustifolium L. subsp. angustifolium

ORCHIDACEAE (Orchis Family)

Platanthera hyperborea (L.) Lindl.

PINACEAE (Pine Family)

Picea glauca (Moench) Voss

ROSACEAE (Rose Family)

Dryas Drummondii Richards.

Rubus arcticus L.

Table 3, cont'd

SALICACEAE (Willow Family)

Populus balsamifera L. subsp. balsamifera

Salix alaxensis (Anderss.) Cov.

Salix glauca L.

SAXIFRAGACEAE (Saxifrage Family)

Parnassia palustris L. subsp. neogaea (Fern.) Hult.

SCROPHULARIACEAE (Figwort Family)

Castilleja caudata (Pennell) Rebr.



Fig. 6. *Aster yukonensis* growing in silty sand, Middle Fork Koyukuk River, Brooks Range, Alaska, July 1994. Such substrate was usually found on high gravel bars and supported more vegetation than the low, rocky gravel bars.

DISCUSSION

The search for Aster yukonensis proved to be more successful than we had expected. Once the team was able to easily recognize the aster and distinguish it from other species (mainly A. sibiricus) the search became more efficient. A. yukonensis appears to grow mainly where river silt has accumulated at the upper and lower ends of gravel bars and along sloughs.

The sudden decline in numbers of A. yukonensis immediately after the confluence with the North Fork of the Koyukuk River is noteworthy. A change in soil type could be one reason for the decline. With regular flooding, silt accumulates less at the confluence than along other parts of the river where flooding is less frequent and where silt can build up over time. Down river from the confluence, populations seemed to build again, with counts in the 50-150+ range. These populations were made up of scattered individuals, much like the populations where the first flower was discovered near Tramway Bar. This type of distribution suggests that either the species is becoming established on the gravel bar or the substrate is not optimal.

If heavy flooding can influence the eventual status of a population of A. yukonensis on a gravel bar, then the flood of 1994 may have affected the population surveyed earlier that year. If major floods tend to have deleterious effects on populations of these rare plants, this may explain, at least partially, why the plant is uncommon.

MANAGEMENT IMPLICATIONS

A follow-up survey should be conducted on the same stretch of river to determine how (and if) the 1994 flood affected the status of A. yukonensis. The North Fork Koyukuk River, from the confluence with the Middle Fork and extending north, should also be investigated, as the plant may have established itself there.

In addition to population surveys, analysis of the gravel bar soils where A. yukonensis thrives and where it is scarce may answer some questions about the plant's habitat preference.

A report of the 1994 findings should be submitted to the Alaska Rare Plant Working Group and the Endangered Species Listing Coordinator. The Rare Plants Working Group is collecting information on range extensions for a publication on rare Alaskan plants. The information obtained in this survey of Aster yukonensis should be included, as well as information that may be learned in future surveys.

LITERATURE CITED

- Endangered Species Act of 1973. As ammended by P.L. 94-325, June 30, 1976; P.L. 94-359, July 12, 1976; P.L. 95-212, December 19, 1977; P.L. 95-632, November 10, 1978; P.L. 96-159, December 28, 1979; P.L. 97-304, October 13, 1982; P.L. 98-327. June 25, 1984; and P.L. 100-478, October 7, 1988. U.S. Department of Interior, Washington, D.C. 45 p.
- Hulten, E. 1968. Flora of Alaska and neighboring territories; a manual of the vascular plants. Stanford Univ. Press, Stanford, Calif. 1008 p.
- Murray, D. F., and R. Lipkin. 1987. Candidate threatened and endangered plants of Alaska with comments on other rare plants. Univ. of Alaska Museum, Fairbanks, Alaska. 76 p.

Appendix I

ASTER YUKONENSIS ON THE MIDDLE FORK KOYUKUK RIVER
GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE, ALASKA

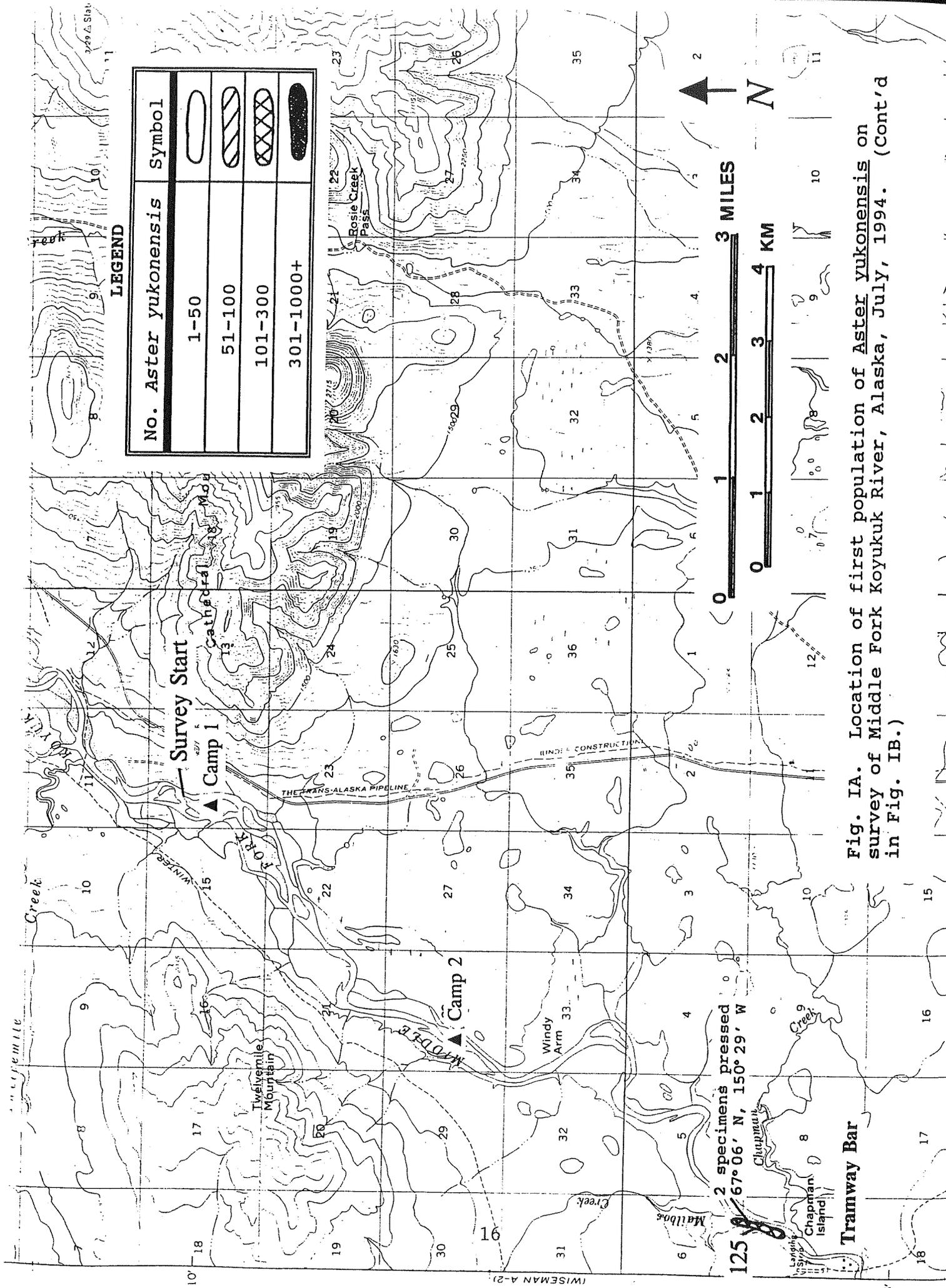
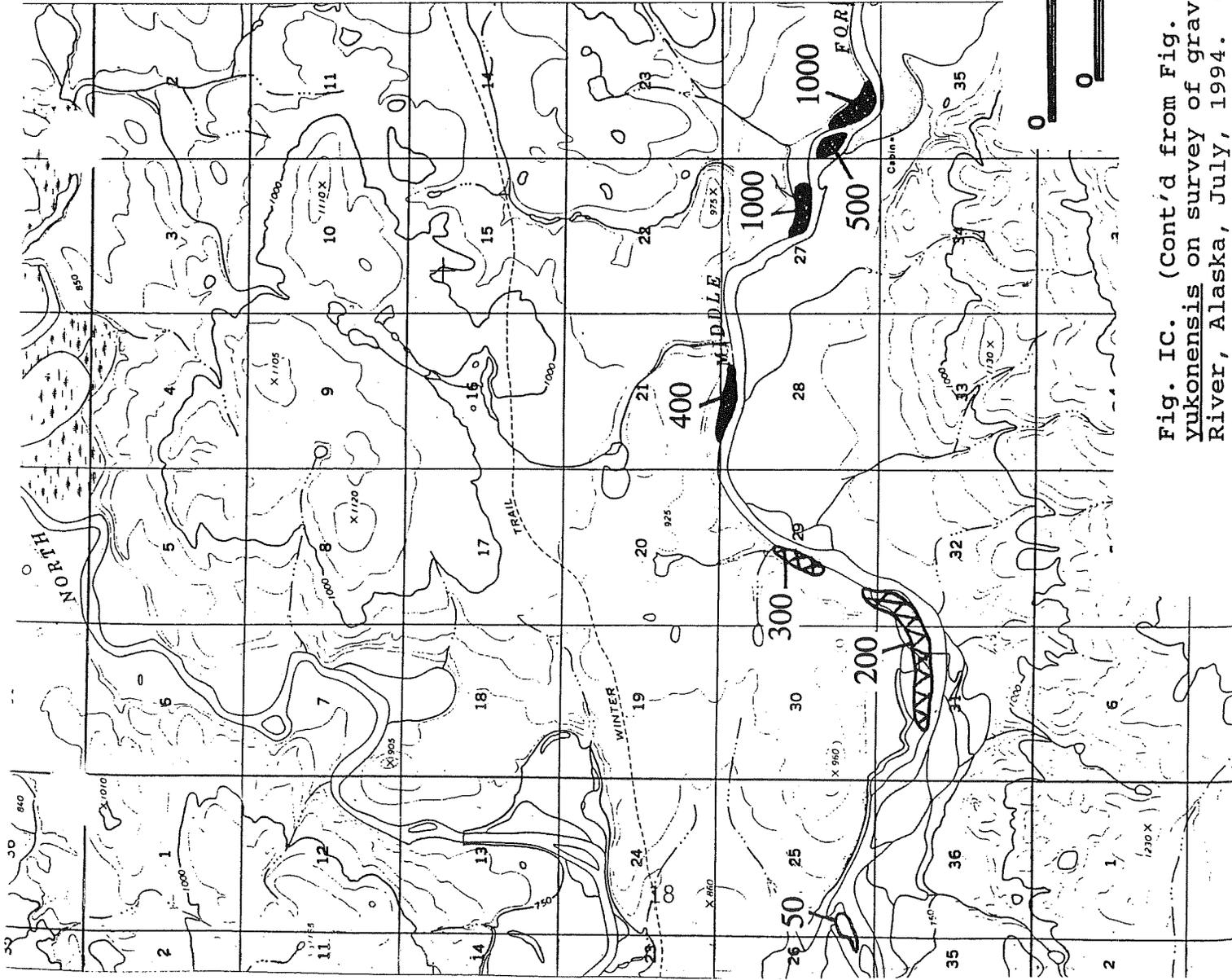


Fig. IA. Location of first population of *Aster yukonensis* on survey of Middle Fork Koyukuk River, Alaska, July, 1994. (Cont'd in Fig. IB.)



LEGEND

No. Aster yukonensis	Symbol
1-50	
51-100	
101-300	
301-1000+	

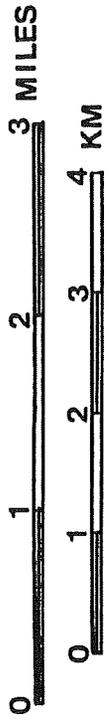


Fig. IC. (Cont'd from Fig. IB.) Population estimates of Aster yukonensis on survey of gravel bars along the Middle Fork Koyukuk River, Alaska, July, 1994. Gravel bars in this section supported

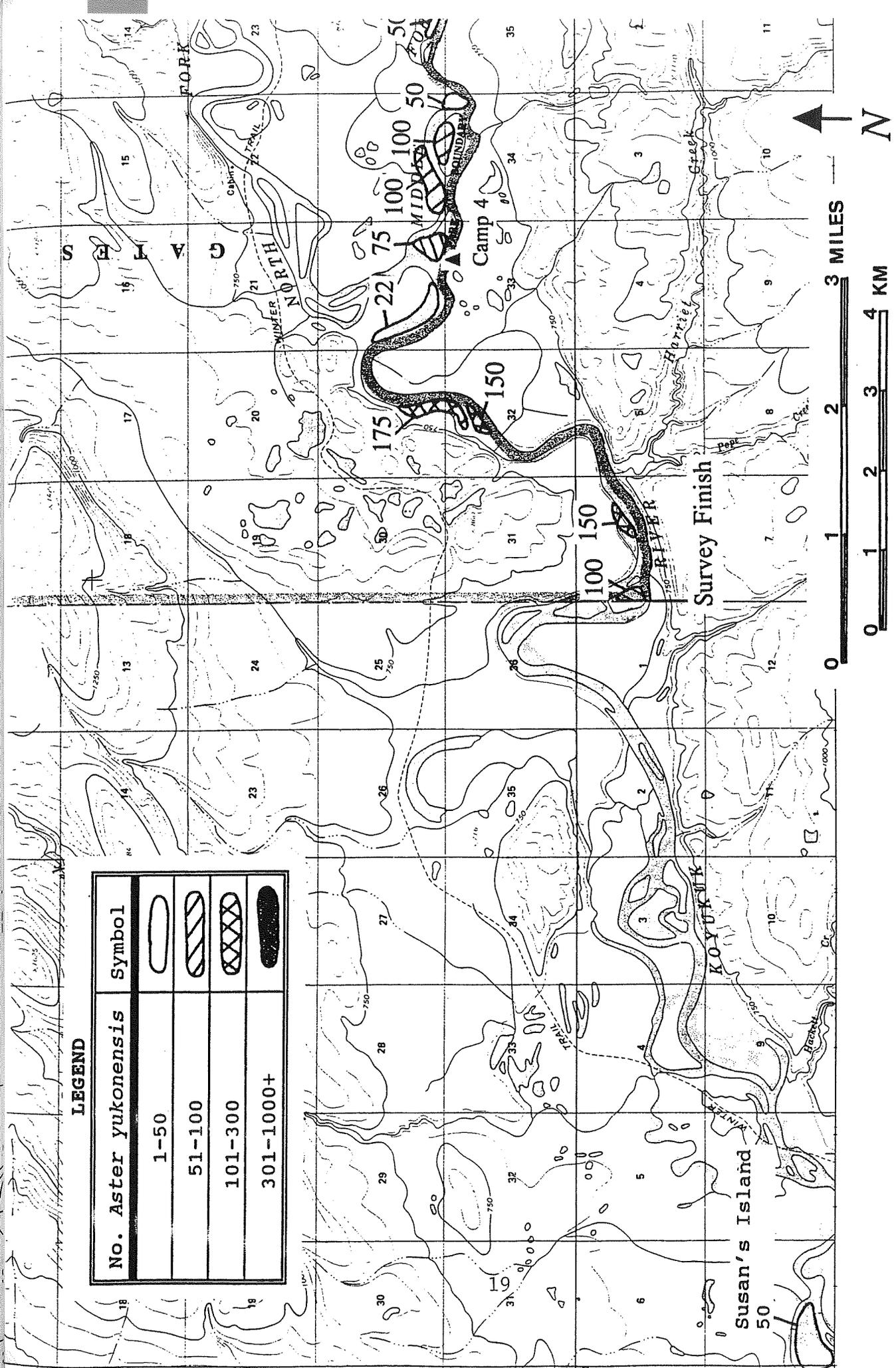


Fig. ID. (Cont'd from Fig. IC.) Population estimates of *Aster yukonensis* on survey of gravel bars along the Middle Fork Koyukuk River, Alaska, July, 1994. Populations of *A. yukonensis* declined markedly after the confluence of the North Fork Koyukuk River

Appendix II

RIVERBAR FLORA OF THE MIDDLE FORK KOYUKUK RIVER, GATES OF THE
ARCTIC NATIONAL PARK AND PRESERVE, ALASKA

BETULACEAE (Birch Family)

Alnus crispa (Ait.) Pursh subsp. crispa

Alnus incana (L.) Moench subsp. tenuifolia (Nutt.) Breitung

CAPRIFOLIACEAE (Honeysuckle Family)

Linnaea borealis L.

Viburnum edule (Michx.) Raf.

CARYOPHYLLACEAE (Pink Family)

Wilhelmsia physodes (Fisch.) McNeill

COMPOSITAE (Composite Family)

Antennaria pulcherrima (Hook.) Greene

Artemisia Tilesii Ledeb.

Aster sibiricus L.

Aster yukonensis Cronq.

Crepis elegans Hook.

Erigeron sp.

Solidago multiradiata Ait. var. multiradiata

CUPRESSACEAE (Cypress Family)

Juniperus communis L.

CYPERACEAE (Sedge Family)

Carex aquatilis Wahlenb. subsp. aquatilis

Carex spp.

Eriophorum sp.

ELAEAGNACEAE (Oleaster Family)

Shepherdia canadensis (L.) Nutt.

EQUISETACEAE (Horsetail Family)

Equisetum spp.

ERICACEAE (Heath Family)

Arctostaphylos rubra (Rehd. & Wilson) Fern.

Vaccinium uliginosum L. subsp. alpinum (Bigel.) Hult.

GRAMINEAE (Grass Family)

Agropyron sp.

Calamagrostis sp.

Poa sp.

JUNCACEAE (Rush Family)

Juncus sp.

Appendix II, cont'd

LEGUMINOSAE (Pea Family)

Hedysarum alpinum L. subsp. americanum (Michx.) Fedtsch.

Hedysarum Mackenzii Richards.

Lupinus arcticus S. Wats.

ONAGRACEAE (Evening Primrose Family)

Epilobium angustifolium L. subsp. angustifolium

Epilobium latifolium L.

ORCHIDACEAE (Orchis Family)

Platanthera hyperborea (L.) Lindl.

PINACEAE (Pine Family)

Picea glauca (Moench) Voss

PYROLACEAE (Wintergreen Family)

Pyrola asarifolia Michx.

ROSACEAE (Rose Family)

Dryas Drummondii Richards.

Potentilla fruticosa L.

Rosa acicularis Lindl.

Rubus arcticus L.

Sanguisorba officinalis L.

RUBIACEAE (Madder Family)

Galium boreale L.

SALICACEAE (Willow Family)

Populus balsamifera L. subsp. balsamifera

Salix alaxensis (Anderss.) Cov.

Salix glauca L.

SANTALACEAE (Sandalwood Family)

Geocaulon lividum (Richards.) Fern.

SAXIFRAGACEAE (Saxifrage Family)

Parnassia palustris L. subsp. neogaea (Fern.) Hult.

SCROPHULARIACEAE (Figwort Family)

Castilleja caudata (Pennell) Rebr.

Pedicularis verticillata L.
