

Bear Lake

Planning Grant Project

December 1994

Aron & Associates
26111 W. Loomis Rd.
Wind Lake, WI 53185

BEAR LAKE PLANNING GRANT
TABLE OF CONTENTS

Background	1
Water Quality Monitoring	1
Aquatic Plant Survey	1
Methodology	2
Results	6
Watershed	15
Community Survey	19
Management Recommendations	20
Aquatic Plants	20
Water Quality	21
Other Recommendations	21
Final Report	23
Glossary	24
References	25

LIST OF MAPS

Map 1 - Hydrographic Map-Bear Lake	3
Map 2 - Transect Locations	5
Map 3 - Area Available for Plant Growth	9
Map 4 - General Aquatic Plant Communities	12
Map 5 - Bear Lake Watershed	17
Map 6 - Land Use	18
Map 7 - Recommended Management Plan	22

APPENDIXES

Community Survey
Reminder Letter and Summary
Summary Results
Community Survey Results
1992 Aquatic Plant Survey Data
1992 USGS Report on Water Quality Data
1993 USGS Report on Water Quality Data
Historical Water Quality Data
Press Releases

BEAR LAKE PLANNING GRANT

Background

In August of 1991, the Bear Lake Association of Barron County applied for a Lake Management Planning Grant from the Wisconsin Department of Natural Resources. The Planning Grant program was established in 1989 to help local communities manage and improve their lakes. In October of 1991, Bear Lake received a commitment for a \$10,000 planning grant.

The Bear Lake planning grant addresses three primary concerns:

- water quality--how clean is the water and is it changing
- plants in the lake--changes were being seen by residents as a sign of possible problems
- the opinions of the residents and landowners--what they see, and what they would like to see

Water Quality Monitoring

The U.S. Geological Survey (USGS) was contracted by the Town of Bear Lake to conduct water quality monitoring on behalf of the Bear Lake Association. Monitoring was conducted from October 1991 through September 1993. The annual reports from USGS are included in the Appendix. The results were presented by Steve Field, USGS, to the local residents at the annual meeting June 25, 1994.

The USGS monitoring was complemented by volunteer efforts. A local resident sampled clarity on Bear Lake weekly. Another volunteer recorded the lake elevation weekly during ice-free periods.

Aquatic Plant Survey

Bear Lake is a large, quiet lake with tea-stained waters. Approximately 75 homes surround the lake. Expansive areas of wetlands, bogs and conservancy areas protect the quiet nature and water quality of Bear Lake. Bald Eagles are frequently seen soaring overhead. Wild Rice is common in two areas on Bear Lake. The aquatic plant community is very diverse, with 42 species present during the planning grant project period. A wide variety of Pondweeds can be found throughout the lake's littoral zone. A healthy fishery attracts anglers looking for Largemouth Bass, Panfish and Northern Pike.

The information obtained by conducting aquatic plant surveys maybe used by future investigators to further document changes in the aquatic plant community and evaluate the impact of plant management, lake management, and watershed activities upon the plant communities. This information can be used to guide future lake management decisions on Bear Lake.

In late July of 1992 Aron & Associates (A&A) conducted a detailed aquatic plant survey on Bear Lake. The diversity, the density and frequency of the plants in Bear Lake were determined. Plant specimens were collected, analyzed, pressed, and mounted. The Bear

Lake Association has been given a collection of the plants found in the lake, for their permanent record.

In 1992 Bear Lake had excellent plant diversity--a total of 42 different species were found, including wild rice and a wide variety of pondweeds. Filamentous algae was found frequently throughout much of Bear Lake. The algae was most concentrated near the inlet from Kegema Lake. There was no evidence that there was any Eurasian Water Milfoil, a nuisance exotic plant, in Bear Lake. The public boat launch areas should be watched closely for any signs of the plant.

Bear Lake is located in Washburn and Barron County, Wisconsin. Hydrographic and morphological information are presented in Table 1 and Map 1.

Table 1. Hydrographic and Morphologic Data of Bear Lake.

Surface Area	1358 acres
Total Drainage Area	47.6 sq. miles
Volume	27253.8 acre feet
Length	3.9 miles
Width	1.0 mile
Shoreline Length	14.9 miles
Maximum Depth	87 feet
Mean Depth	20 feet

Source: USGS, DNR

METHODOLOGY

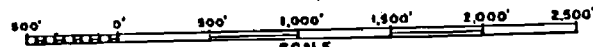
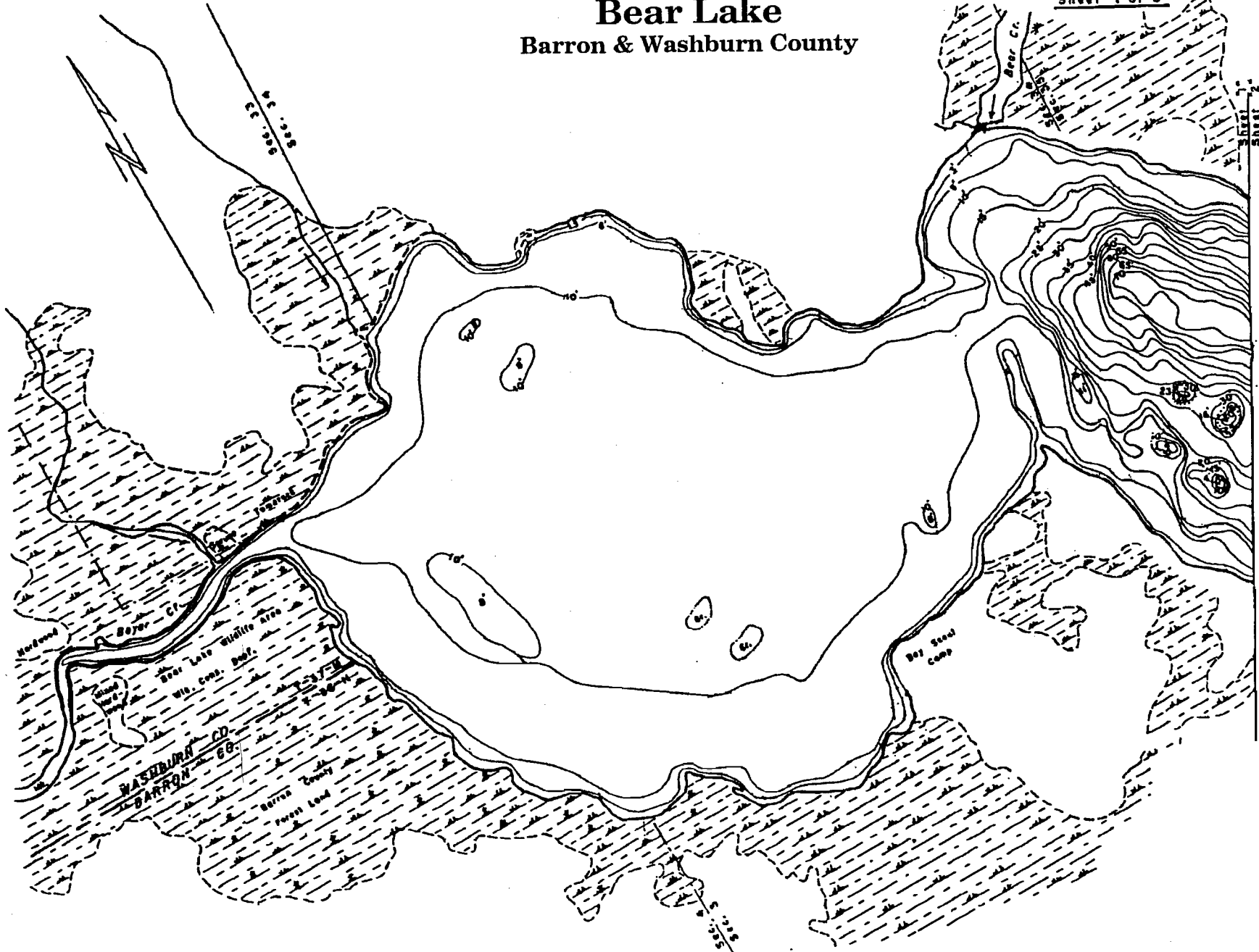
General Survey

A preliminary survey of the lake was made by boat. An attempt was made to locate all plant communities in the lake by region. All plant species found were collected and identified. Specimens were pressed, dried, and mounted for a permanent record. Nomenclature follows Fassett (1956) and Helquist and Crow (1980). Additional species located during the transect survey were also pressed, dried, and mounted. The 1992 maximum rooting depth in Bear Lake was determined to be eleven feet.

Bear Lake

Barron & Washburn County

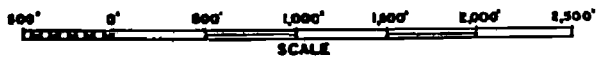
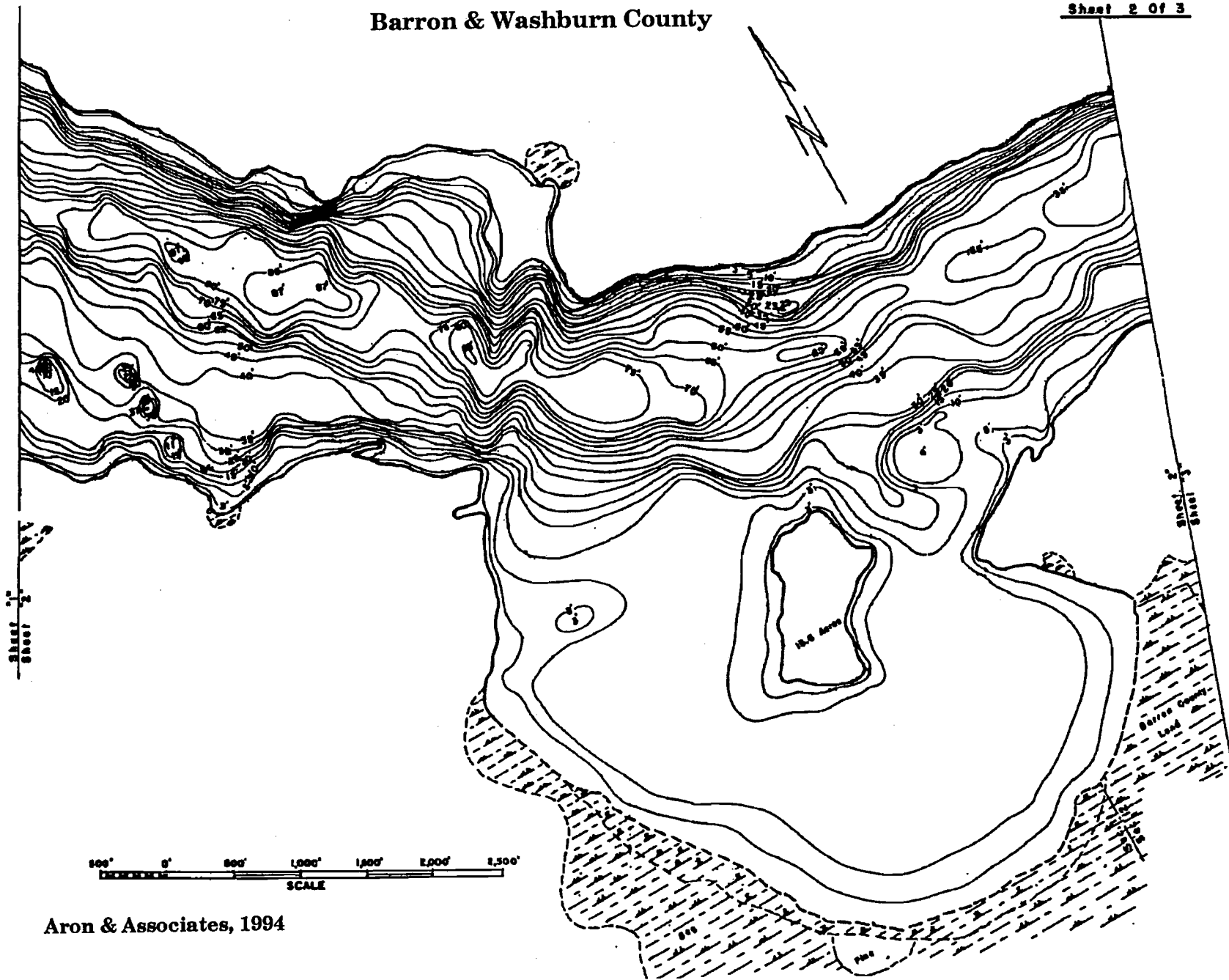
Sheet 1 of 3



Bear Lake

Barron & Washburn County

Sheet 2 of 3

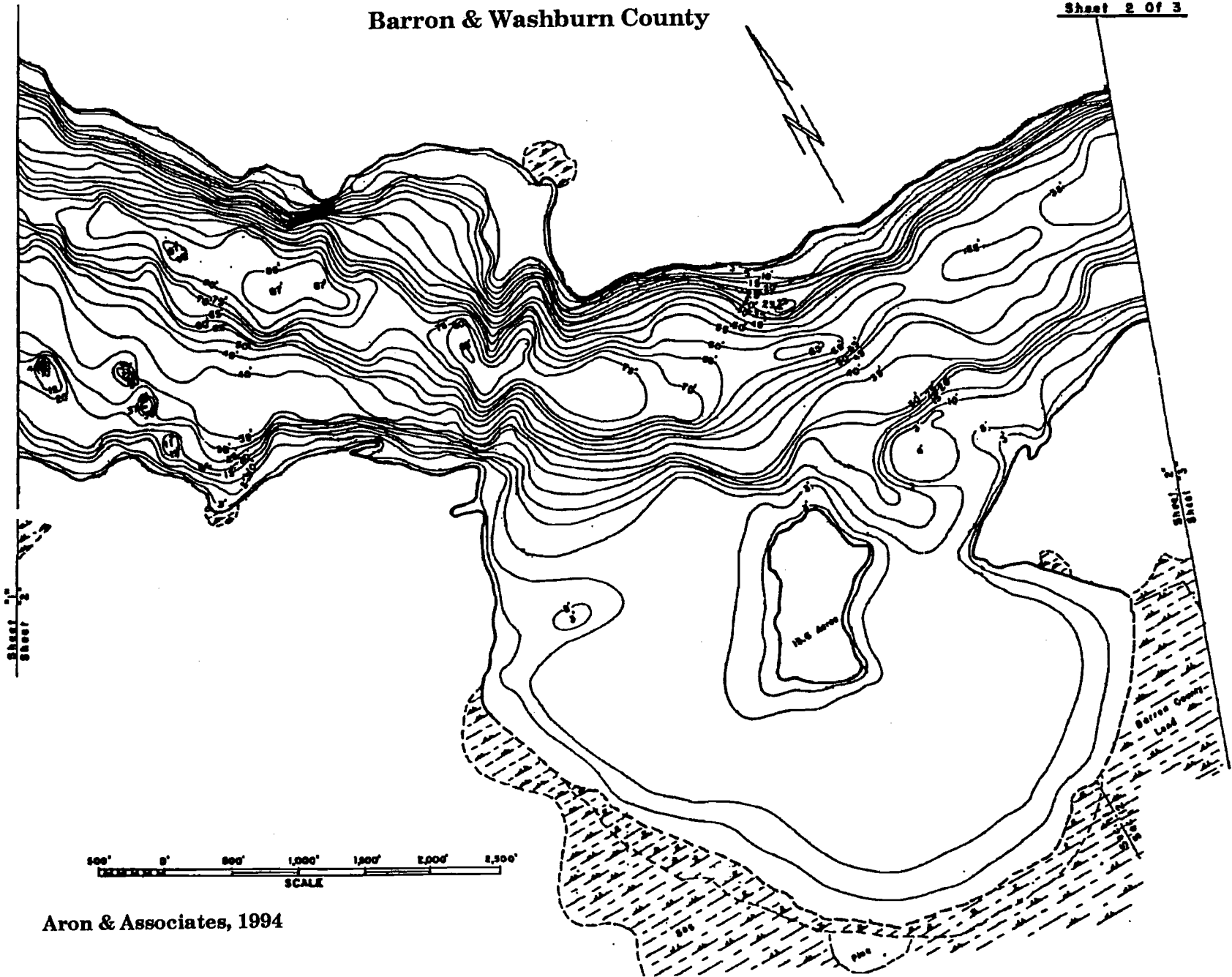


Aron & Associates, 1994

Bear Lake

Barron & Washburn County

Sheet 2 of 3

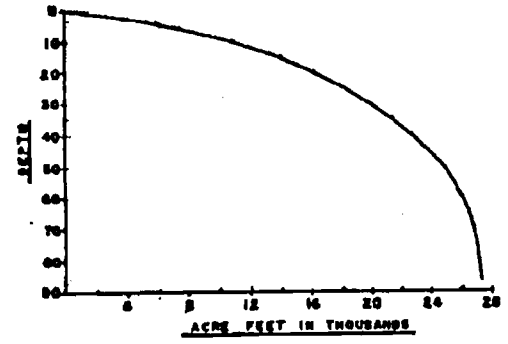
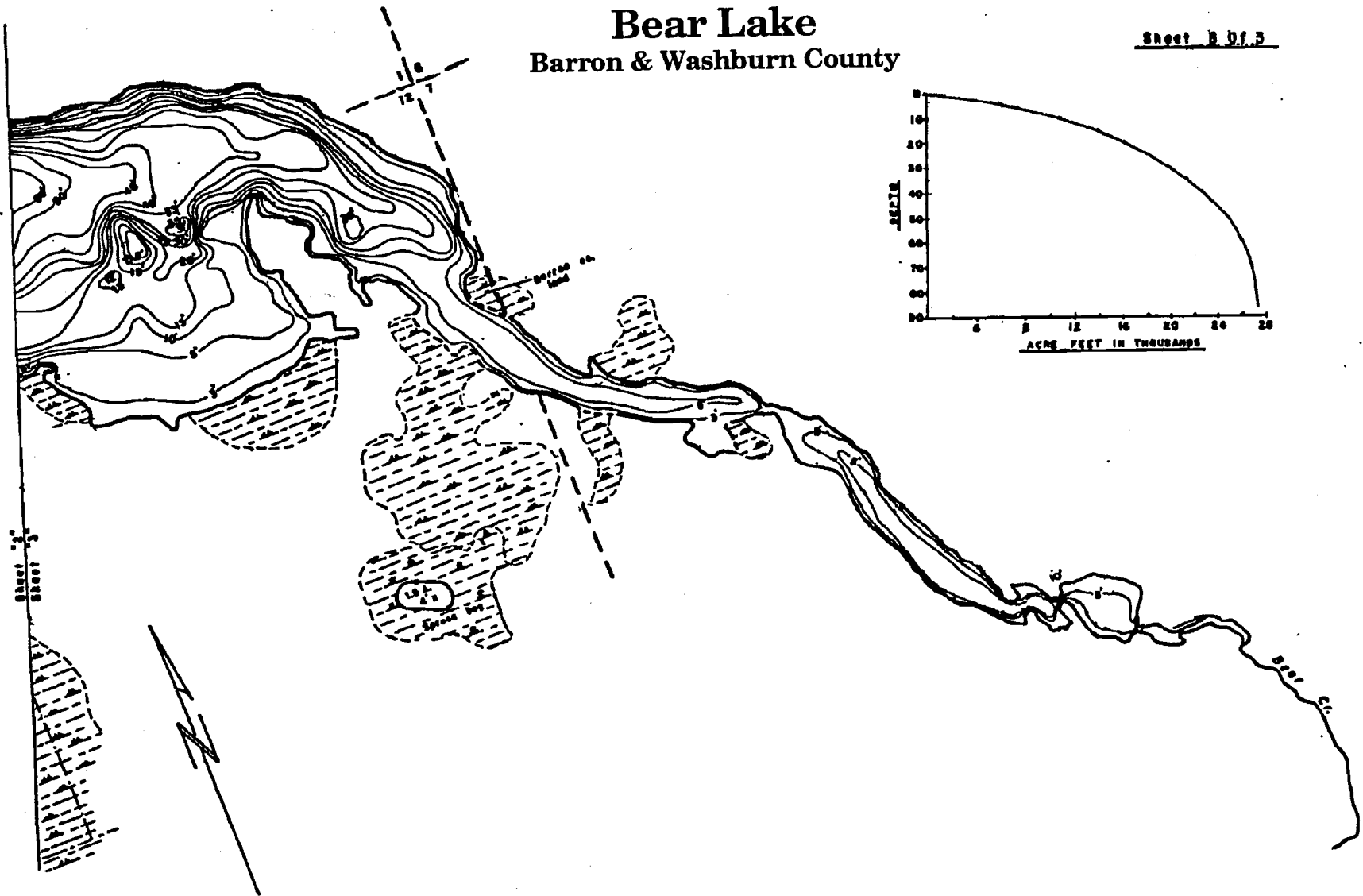


Aron & Associates, 1994

Bear Lake

Barron & Washburn County

Sheet B 01.3



Sheet 2
Sheet 3

Aron & Associates, 1994

0 500 1000 1500 2000 2500
SCALE

Transect Survey

The methodology for the transect survey follows the methods used by the Wisconsin Department of Natural Resources (WDNR) in their Long Term Trend Monitoring Program. Twenty-five transects were established along the lake perimeter (Map 2). Each transect was identified by a landmark, compass bearing, and way point. Transects extended from shore to the maximum rooting depth (eleven feet) or to a point approximately half way to the opposite shore (way point). Photographs were taken of each transect shore location to facilitate duplication in future surveys.

Four sampling locations along each transect were established at water depths of 1.5, 4.0, 6.0, and 9 feet. At each sampling point an imaginary six foot diameter circle was divided into four quadrants. Sampling of aquatic vegetation took place once within each quadrant producing a total of four samples for each sample point. A rake with a telescoping handle was used to collect plant samples. Samples were collected by casting the rake into each of the four quadrants and pulling the rake to the center of each sampling point. Each plant species retrieved was recorded and given a density rating in accordance with the following criteria:

<u>Rake Recovery of Aquatic Plant</u>	<u>Density Rating</u>	<u>Descriptive Term</u>
Rake teeth full, all 4 casts	5	Heavy
Teeth partly full, all 4 casts	4	Dense
Plants taken on 3 casts	3	Moderate
Plants taken on 2 casts	2	Scattered
Plants taken on 1 cast	1	sparse

The data collected were then used to calculate frequency of occurrence, and density ratings for each species along each transect at each sample depth.

The abundance of each species was determined using four estimates:

- 1) The **frequency** is an estimate of how often a species occurs in the sample points.
- 2) The **average density** rating, or the average density of a species in the sample point where it occurred.
- 3) The **relative density** rating, or the average density of a species averaged over all sample points whether or not any species were present.
- 4) The **relative density** rating averaged over all sample points in which any species occurred.

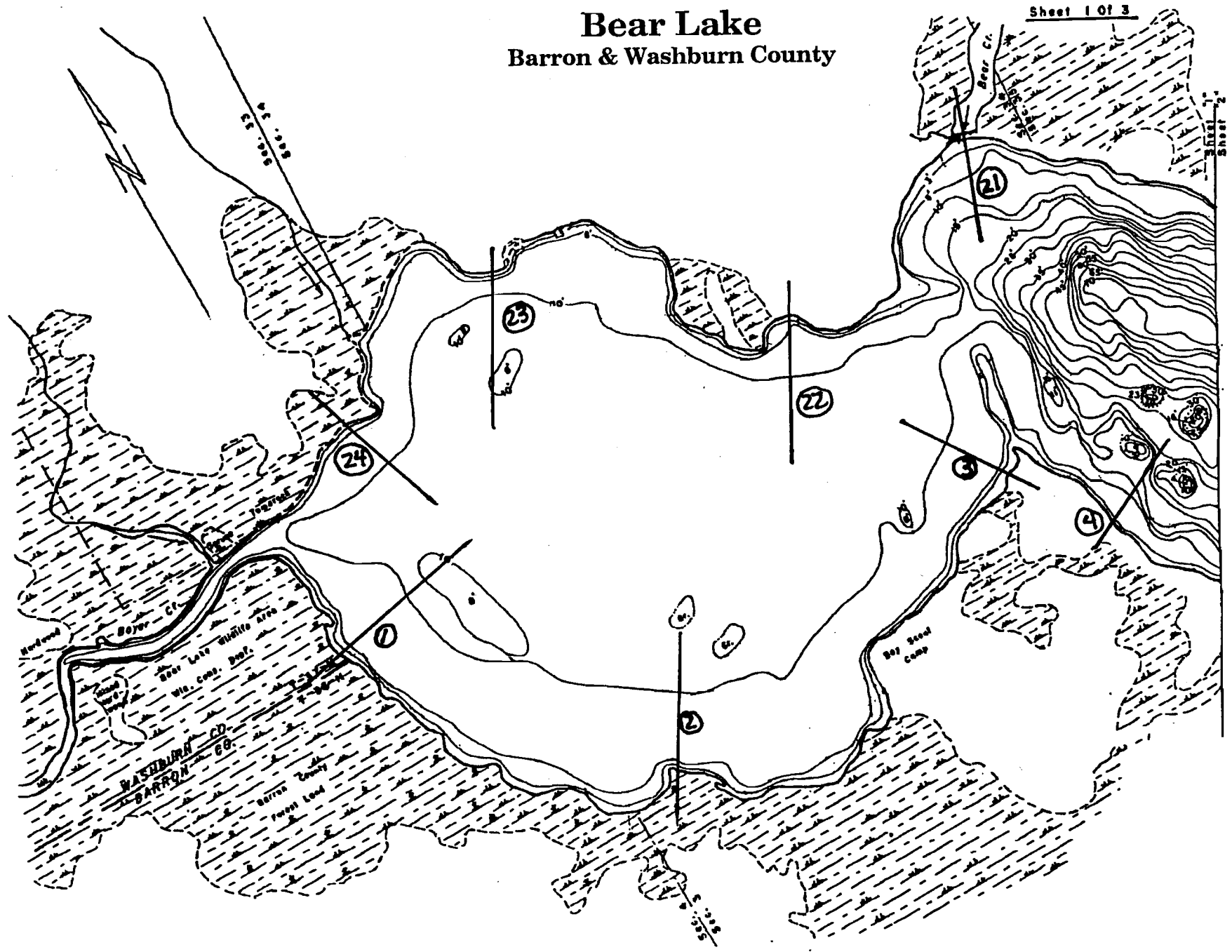
A Sitek strip chart recorder was used to obtain a permanent record of the depth profile and plant distribution along each transect.

Map 2 - Transect Locations for 1992 Aquatic Plant Survey
Source: Aron & Associates

Bear Lake

Barron & Washburn County

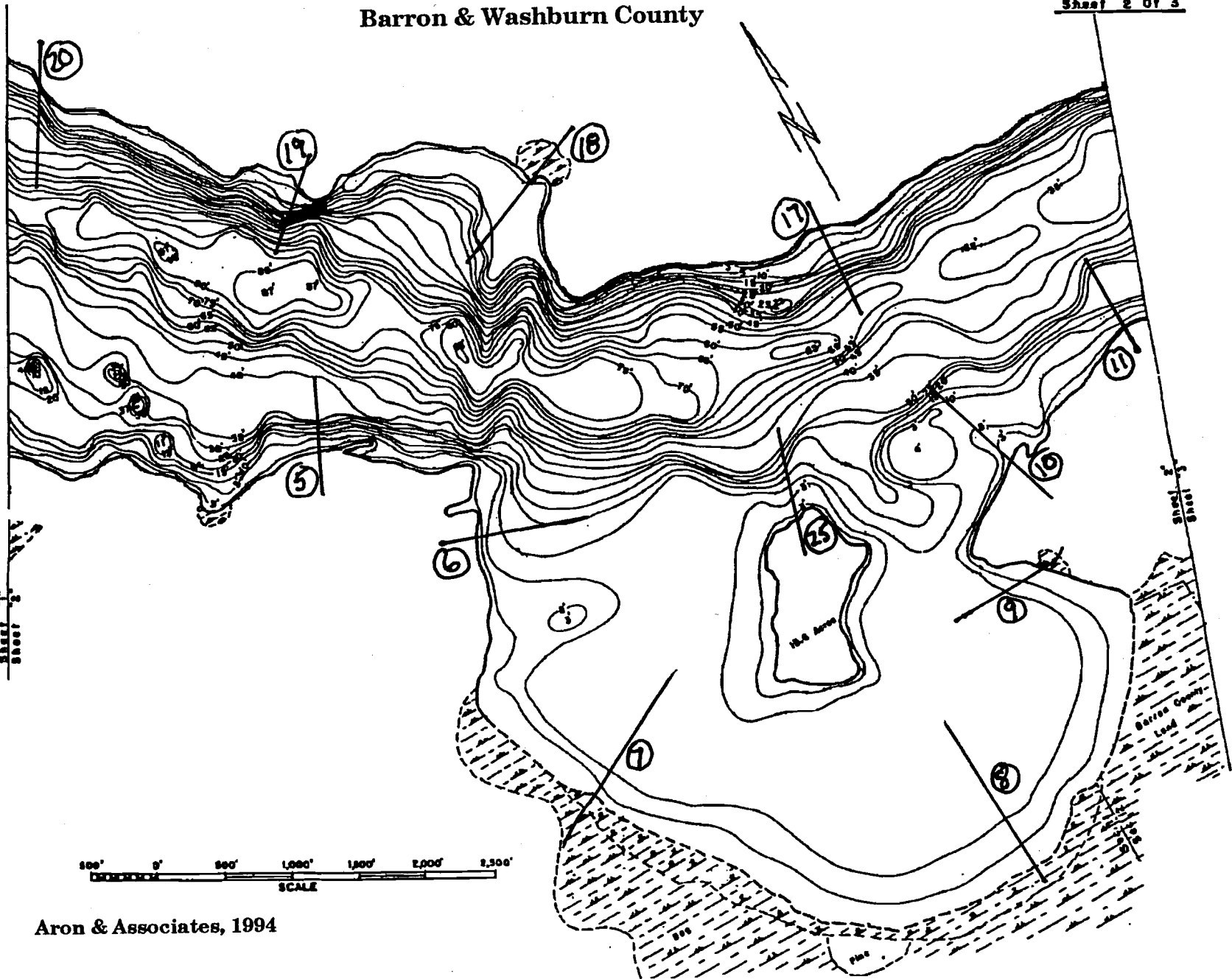
Sheet 1 of 3



Bear Lake

Barron & Washburn County

Sheet 2 of 3

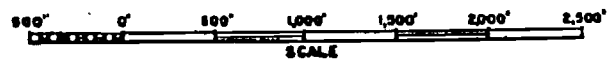
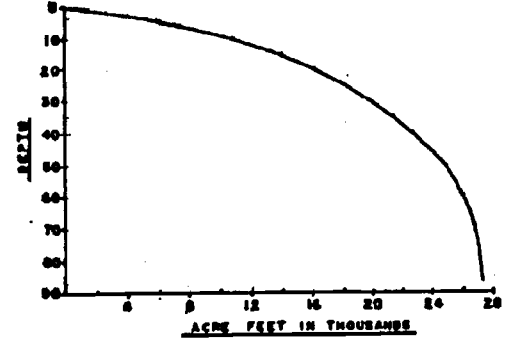
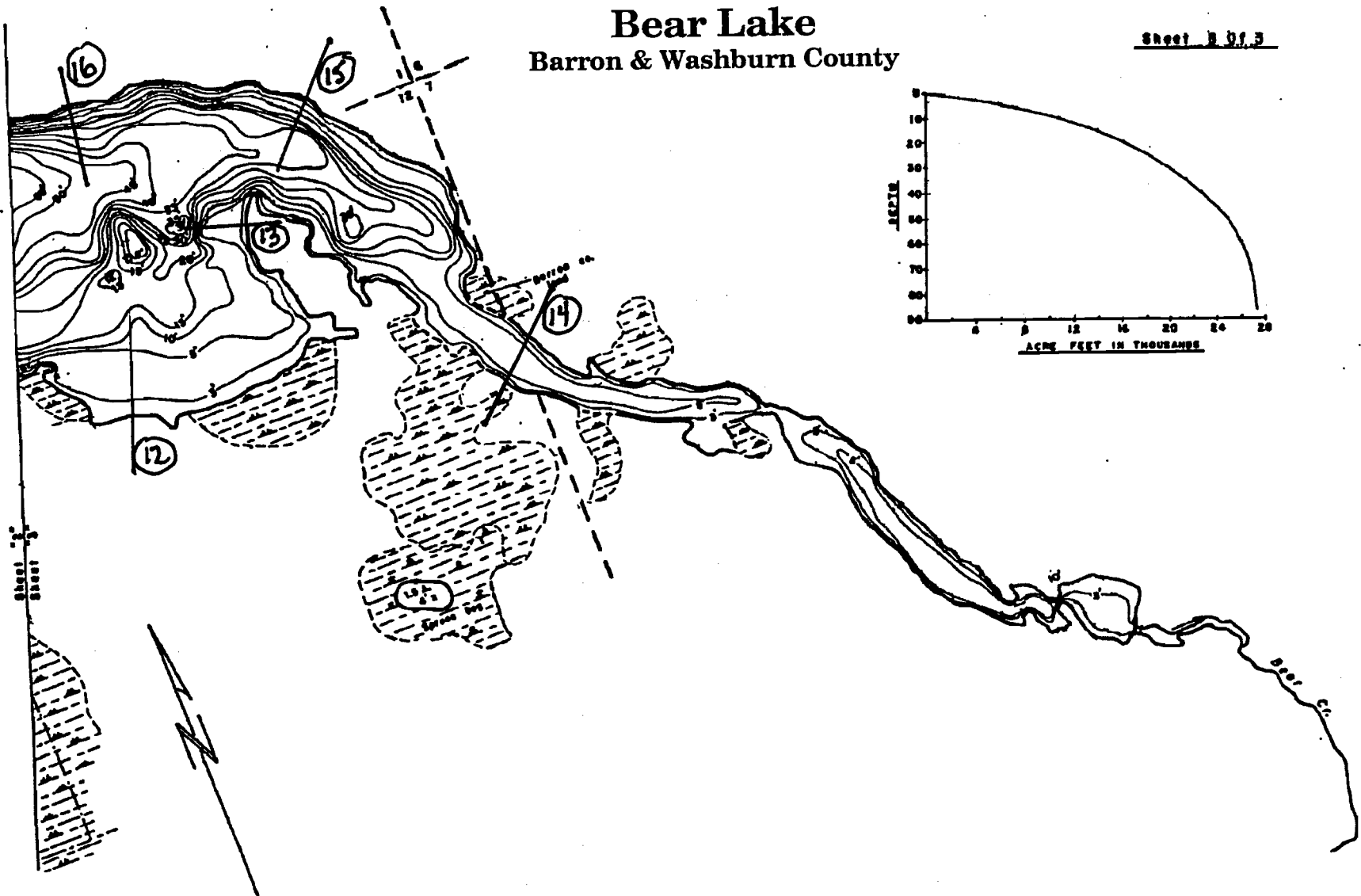


Aron & Associates, 1994

Bear Lake

Barron & Washburn County

Sheet 2 of 3



Aron & Associates, 1994

RESULTS

During the survey, a total of forty-two (42) aquatic plant species were observed. Thirteen (13) species were observed only during the general survey, and twenty-nine (29) species were observed in the transect survey (Table 2). Of the species observed only in the general survey, six (6) were emergent plant species and include Swamp Loosestrife (Decodon verticillatus), Water horsetail (Equisetum fluviatile), Reed grass (Phragmites maximus), Pickerel weed (Pontederia cordata), Common arrowhead (Sagittaria latifolia), and Common Bur-reed (Sparganium eurycarpum). These species were associated with wetland complexes located around the lake. Wild rice (Zizania aquatica) was found near the Boyer Creek inlet on the west end of the lake, and in a large bay south of the 15 acre island.

The distribution of plants by water depth is summarized in Table 3. Of those species found during the transect survey, fourteen (14) were found at all sample depths and include Coontail (Ceratophyllum demersum), Waterweed (Elodea canadensis), Whorled Water Milfoil (Myriophyllum verticillatum), Slender Naiad (Najas flexilis), Nitella (Nitella sp.), Large leaf Pondweed (Potamogeton amplifolius), Leafy Pondweed (P. foliosus), Variable-leaf Pondweed (P. gramineus), Illinois Pondweed (P. illinoensis), Claspingleaf Pondweed (P. richardsonii), Fern Pondweed (P. robbinsii), Flat-stem Pondweed (P. zosteriformis), Great Bladderwort (Utricularia vulgaris), Water Celery (Vallisneria americana), and Forked Duckweed (Lemna trisulca).

Two species were found at the 4, 6 and 9 foot depths: Fries Pondweed (P. friesii) and Small Pondweed (P. pusillus). Elodea (Elodea canadensis) and Yellow Water Lily (Nuphar variegatum) were found at the 1.5, 4 and 9 foot depths. Small Duckweed (Lemna minor) and Hard-stem Bulrush (Scirpus acutus) was found at the 1.5 and 4 foot depths. Grassy Arrowhead (Sagittaria graminea) and White Water Lily (Nymphaea tuberosa) was found at the 1.5, 4 and 6 foot depths. Wild Rice (Zizania aquatica) and Water Crowfoot (Ranunculus longirostris) was found at the 4 foot depth. Water Marigold (Megalodonta beckii) was found only at the 4 and 6 foot depths. Three plants, Water Stargrass (Heteranthera dubia), Floating-leaf Pondweed (P. natans) and Sago Pondweed (P. pectinatus) were found at the 1.5 foot depth. Curly-leaf Pondweed (P. crispus), an exotic plant that may grow to nuisance conditions, was found only on transect 14S at the 6 foot depth. Map 3 shows the area of Bear Lake that is available for aquatic plant growth.

Using the total mean density ratings for each species (Table 4 and Appendix), the most dominant species were Slender Naiad, Coontail, Whorled Milfoil and Wild Celery, respectively. Slender Naiad reached its maximum density at the one and a half foot depth. Coontail and Wild Celery reached their maximum densities at the four foot depth. Whorled Milfoil was dominant at the six foot depth. Filamentous algae was found in almost all transect locations. Aquatic plants were frequently covered with the algae especially in the Bear Creek inlet area.

Aquatic plants were found throughout the littoral zone of Bear Lake. Aquatic vegetation was sparse along the steeply sloped northern shoreline. Slender Naiad and a variety of pondweeds were found in this area. The large flat muddy bay south

of the island had a very diverse plant community, including Wild Rice, a variety of Pondweeds, Bladderwort, Lilies, Coontail, Whorled Milfoil, Wild Celery and Naiad. The inlet from Bear Creek was also diverse, with Wild Celery, Coontail, Duckweed and Pondweeds.

Table 2 -Aquatic Macrophytes - 1992
Bear Lake - Barron-Washburn County, Wisconsin

EMERGENTS

<u>Scientific Names</u>	<u>Common Names</u>
<u>Decodon verticillatus</u> ²	swamp loosestrife
<u>Equisetum fluviatile</u> ²	water horsetail
<u>Phragmites maximus</u> ¹	reed grass
<u>Pontederia cordata</u> ²	pickerel-weed
<u>Sagittaria graminea</u>	grassy arrowhead
<u>S. latifolia</u> ¹	common arrowhead
<u>Scirpus acutus</u> ³	hard-stem bulrush
<u>Sparganium eurycarpum</u> ²	common bur-reed
<u>Zizania aquatica</u> ³	wild rice

SUBMERGENTS

<u>Ceratophyllum demersum</u>	coontail
<u>Elodea canadensis</u>	common waterweed
<u>Heteranthera dubia</u>	water star grass
<u>H. limosa</u> ²	
<u>Megalodonta Beckii</u>	water marigold
<u>Myriophyllum verticillatum</u>	whorled water milfoil
<u>Najas flexilis</u>	slender naiad
<u>Nitella</u> sp.	nitella
<u>Potamogeton amplifolius</u>	large-leaf pondweed
<u>P. crispus</u>	curly-leaf pondweed
<u>P. epihydrus</u> ²	ribbon-leaf pondweed
<u>P. foliosus</u> ³	leafy pondweed
<u>P. friesii</u>	Fries pondweed
<u>P. gramineus</u>	variable-leaf pondweed
<u>P. illinoensis</u> ³	Illinois pondweed
<u>P. natans</u>	floating-leaf pondweed
<u>P. pectinatus</u>	sago pondweed
<u>P. praelongus</u> ²	white-stem pondweed
<u>P. pusillus</u>	small pondweed
<u>P. Richardsonii</u>	clasping-leaf pondweed
<u>P. Robbinsii</u>	fern pondweed
<u>P. Spirillus</u> ¹	spiral-fruited pondweed
<u>P. strictifolius</u> ¹	stiff pondweed
<u>P. zosterformis</u>	flat-stem pondweed
<u>Ranunculus longirostris</u> ³	water crowfoot

