

# Darrin Fresh Water Institute

*AT LAKE GEORGE*

*A SURVEY OF TRIBUTARIES TO LAKE GEORGE, NEW YORK*

**FOR THE PRESENCE OF EURASIAN WATERMILFOIL**

prepared for  
The Fund for Lake George

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## EXECUTIVE SUMMARY

A survey of tributary deltas in the south basin of Lake George was conducted in 1998 to assess the extent of Eurasian watermilfoil (*Myriophyllum spicatum* L.) infestation. The Darrin Fresh Water Institute conducted the project with financial support from the Fund for Lake George. Similar surveys were completed in 1987, 1989, 1992, and 1995 as reference points. Delta areas were chosen as readily identifiable points that historically harbor diverse assemblages of native aquatic plants.

Results of these surveys can be used to approximate the rate of spread of milfoil through the Lake George basin. In 1987, when surveys were initiated, 16 percent of the sites were found to have milfoil. By 1989, this number had dropped to 11 percent due to harvesting of milfoil. In 1992, the percentage of infected sites in the central basin had tripled to 33 percent. Results from the 1995 survey showed a slight reduction to 22% of the sites colonized by Eurasian watermilfoil. This number remained the same for 1998, although the actual sites infested were different. This stability is attributed to hand harvesting of milfoil in prior years. All of the new sites were restricted to only a few milfoil plants that were removed.

Management efforts to date have been implemented at 113 of 127 known milfoil locations throughout Lake George. These efforts have reduced the milfoil biomass in these locations; however, milfoil has only been eliminated at a handful of sites and reintroduction at these locations is highly probable. Thus maintenance becomes critical following initial management. At this time, Eurasian watermilfoil is ranked 11<sup>th</sup> by relative abundance (a function of cumulative percent cover) in the central basin and 29<sup>th</sup> by frequency of occurrence for the 43 species found in this survey. The fact that milfoil has reached this level of abundance is testament to the plant's ability to spread rapidly and to outcompete native species. Maintenance will require site visits yearly or every other year to harvest regrowth of milfoil.

Although the number of samples is limited for development of a statistically reliable rate of colonization, new sites continue to be colonized on a year-to-year basis. Expansion of Eurasian watermilfoil at the 45 tributary sites over the ten year span of the study is approximately 4 new sites per year, or an 8% annual rate of colonization. The occurrence of milfoil at sites that had been cleared in previous years also indicates that continued surveillance and maintenance of milfoil sites is necessary. The more sobering indication from the recurrence of milfoil at previously harvested sites is that there are no sites or cases to indicate any natural mortality or demise of small populations of Eurasian watermilfoil in Lake George. Although these populations may not expand for several years, clearly they are not dying off on their own.

Tributary surveys demonstrate the need for continued management of Eurasian watermilfoil in Lake George. Management programs currently encompass several different techniques reflective of different stages of milfoil development. Tributary surveys provide a means of mapping milfoil colonization in Lake George, while management programs limit the spread of milfoil once sites have been located. Increased public awareness of the effects of growth and spread of Eurasian watermilfoil on the Lake George ecosystem can help reduce further introduction.

## **Introduction**

Streams entering Lake George, with nutrients and suspended sediments derived from the terrestrial portion of the basin and deposited on their deltas, are prime locations for the continued establishment and re-establishment of Eurasian watermilfoil (*Myriophyllum spicatum* L.). Delta areas are also disturbed habitats, as a result of sedimentation of terrestrially derived materials and scouring of existing sediments at times of accelerated runoff. The combination of sediment conditions and habitat disruption make tributary deltas prime locations for Eurasian watermilfoil infestation.

Around the entire lakeshore, there are 128 listed stream tributaries (Madsen et al, 1989). Because human activity in the Lake George basin has historically exacerbated water conditions in the south basin, the rate of establishment and spread of milfoil has been of particular concern in the management of Eurasian watermilfoil.

A survey of all the tributaries in the basin was performed as part of the 1987-88 Lake George Aquatic Plant Survey (Madsen et al, 1989). The survey provided a procedure for finding new sites with Eurasian watermilfoil which included establishment of a regular search pattern for milfoil sites to ascertain the relative distribution of milfoil among the native plant communities in Lake George.

In order to balance the number of tributary sites surveyed in each year and stabilize the cost of the survey, south basin tributaries were divided into two groups in 1991. With approximately 45 tributaries in each group, a three-year cycle of surveys was established with a south, central and north component of nearly equal number of tributaries. The tributaries in the southern half of the south basin were surveyed in 1994. Those in the northern half of the south basin (central) were the subject of the current survey.

The south basin tributary survey was repeated in 1989 in order to provide information on the rate of colonization of Eurasian watermilfoil (Madsen et al, 1990). Since these are readily located sites for which the presence or absence of Eurasian watermilfoil was known for 1987, 1989, 1992, and 1995, these sites were revisited in 1998 to determine whether appreciable new infestation, re-invasion or natural mortality of earlier infestation had occurred.

## **Methods**

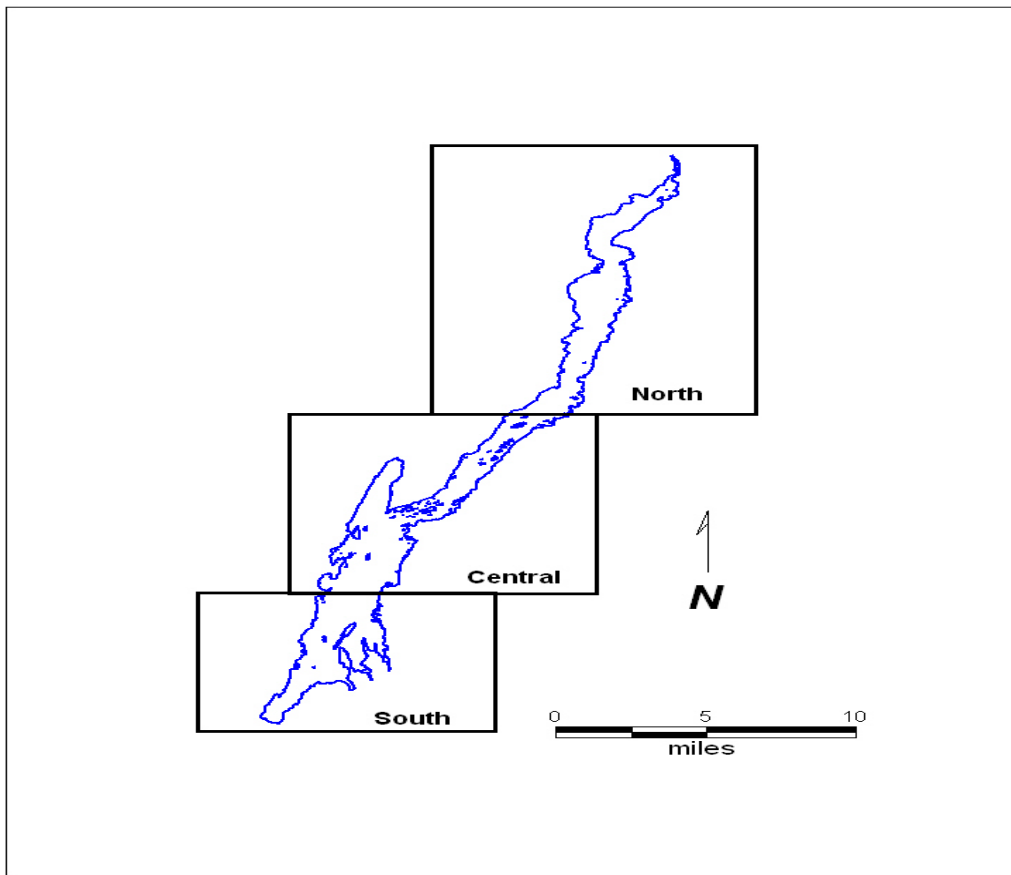
The shoreline adjacent to tributary outflows in the central basin was surveyed for the presence of Eurasian watermilfoil. The tributaries comprising this portion of the survey were visited between June 30 and September 22<sup>nd</sup>, 1998. Surveys consisted of swimming a 100 meter segment of shoreline from the water's edge to the outer edge of the littoral zone. Diver swimover transects were also completed at each site in order to characterize the macrophyte (aquatic plant) community present. Divers skilled in plant identification estimated the abundance of all aquatic plant species in each one meter (3 ft) depth interval using the following abundance classes:

Class	Code	% Cover Range	Centroid
Abundant	A	greater than 50% cover	75.0%
Common	C	25% to 50% cover	37.5%
Present	P	15% to 25% cover	20.0%
Occasional	O	5% to 15% cover	10.0%
Rare	R	less than 5% cover	2.5%

Percent cover data provides both average depth distribution of the plants present and an estimate of relative abundance of the species at the tributary sites. This information is also important for future management decisions concerning milfoil control alternatives and permit applications required as part of any control strategy.

A map showing the general location of this year's survey activity is shown in Figure 1. Specific tributary locations in the current survey are provided in Appendix A.

**Figure 1.** Map of Lake George showing the area of the 1998 Tributary survey.



## Results and Discussion

The current survey included the tributaries located in the central portion of the Lake George basin (45 sites). The northern and southern portions of the lake basin were completed in 1996 and 1997, respectively. The results of the central basin tributary surveys for 1987, 1989, 1992, 1995 and 1998 are presented in Table 1. Methodologies employed for the five surveys are the same. For each site, the tributary number and site name is given. If Eurasian watermilfoil was found, the milfoil site number is also indicated. Maps depicting the locations for all sites are included in Appendix A.

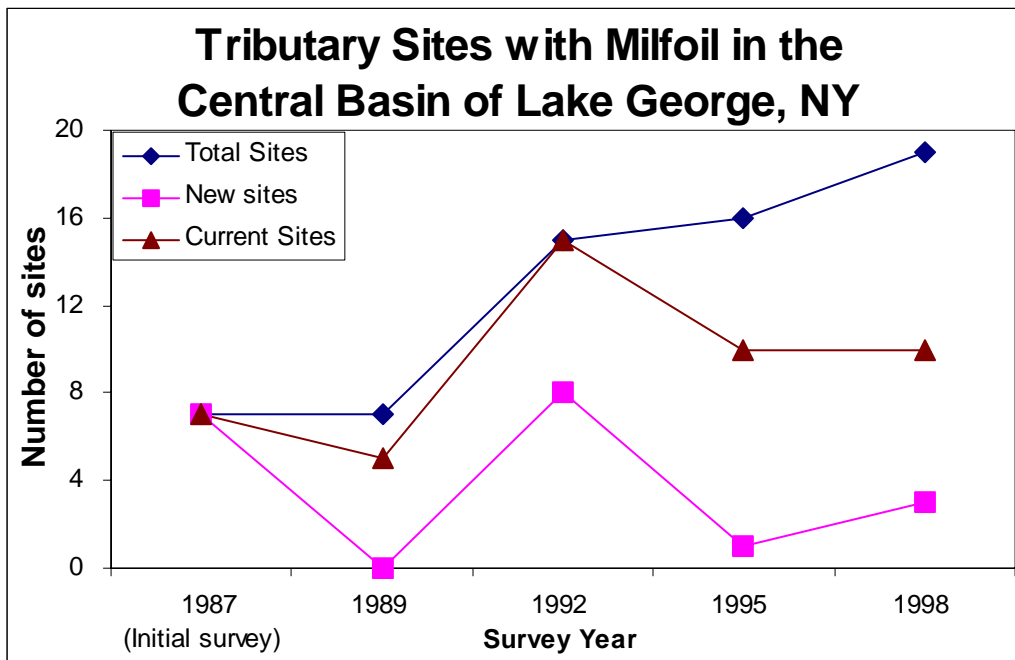
**Table 1.** Tributary survey sites and the presence (yes) or absence (no) of Eurasian watermilfoil. M # is a sequential coding of sites with Eurasian watermilfoil.

TRIB NUMBER	M #	SITE DESCRIPTION	Milfoil Present				
			1998	1995	1992	1989	1987
T-12		Bay SE of Duran Is.	no	no	no	no	no
T-12aa		SE of Duran Is.	no	no	no	no	no
T-12a		SE of Phenita Is.	no	no	no	no	no
T-12b		E of Phenita Is.	no	no	no	no	no
T-12c	M-125	E of Sagamore Is.	yes	no	no	no	no
T-12d		NE of Coopers Is.	no	no	no	no	no
T-13		E. Floating Battery Is.	no	no	no	no	no
T-14		SE of Three Sirens Is.	no	no	no	no	no
T-15		NE of Black Mtn. Pt.	no	no	no	no	no
T-16		Bay S. Black Mtn. Pt.	no	no	no	no	no
T-17	M-41	Paradise Bay	yes	yes	yes	yes	yes
T-17a		Bay SE Hazel Is.	no	no	no	no	no
T-17b		Bay NE Hazel Is.	no	no	no	no	no
T-18		Shelving Rock Bay	no	no	no	no	no
T-18a	M-92	Bay E Hens & Chicks Is.	no	no	yes	no	no
T-18b		S. Watch Point	no	no	no	no	no
T-19		SW of Watch Point	no	no	no	no	no
T-19a	M-93	East of Refuge Is.	no	yes	yes	no	no
T-20a		S. Phelps Is.	no	no	no	no	no
T-20b		SE Phelps Is.	no	no	no	no	no
T-20c		NE Phelps Is.	no	no	no	no	no
T-50		W-SW of Rush Is.	no	no	no	no	no
T-51		Basin Bay	no	no	no	no	no
T-52	M-25	Basin Bay	yes	yes	yes	yes	yes
T-54a	M-43	Bolton Bay-Mohican Rd.	yes	yes	yes	yes	yes
T-55	M-42	Bolton Bay-Stewart Brook	no	no	yes	no	yes
T-56a		Sawmill Bay @ Braley Pt.	no	no	no	no	no
T-57		NWB-Braley & Pioneer Pt	no	no	no	no	no
T-60		NWB-Polehill Pond Br.	no	no	no	no	no
T-61		NWB-Wingpond Br.	no	no	no	no	no
T-62	M-111	NWB-NNE Walker Pt.	no	yes	no	no	no
T-63a	M-95	NWB- head of bay	no	no	yes	no	no
T-65	M-79	NWB-SE Bear Pt.	no	no	yes	no	no

TRIB NUMBER	M #	SITE DESCRIPTION	Milfoil Present				
			1998	1995	1992	1989	1987
T-66	M-80	NWB-SE of Bear Point	no	yes	yes	no	no
T-68	M-24	NWB-between Bear & Fan Pt	yes	yes	yes	no	no
T-68a	M-35	NWB-South of Fan Pt	yes	yes	yes	no	no
T-68b		NE Little Harbor Is.	no	no	no	no	no
T-69	M-127	SW French Point	yes	no	no	no	no
T-70		N of E & W Dollar Is.	no	no	no	no	no
T-70a	M-126	N of E & W Dollar Is.	yes	no	no	no	no
T-70b	M-94	NW of Three Sirens Is.	no	no	yes	no	no
T-93		Bay S Black Mtn. Point	no	no	no	no	no
T-94	M-40	Bay S of Red Rock Bay	yes	yes	yes	yes	yes
T-100		NWB-Bay NE Fan Pt.	no	no	yes	no	yes
T-101	M-15	Finkle Brook-FWI	yes	yes	yes	yes	yes
<b>Total sites with milfoil</b>			<b>10</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>7</b>

The results of the five surveys are further summarized in Figure 2. In the 1987 survey, a total of 7 (16%) of the 45 sites had Eurasian watermilfoil. By 1989, this number had been reduced to 5 (11%) of the 45 sites surveyed. No new milfoil sites were found in this portion of the 1989 survey; however, two milfoil sites which were cleared during the 1987 survey were free of milfoil in the 1989 survey. In the 1992 survey, 15 (33%) of the sites had Eurasian watermilfoil. Of the 45 sites visited, milfoil was found for the first time at 8 (18%) of the tributary sites. Five (11%) of the sites at which milfoil occurred were positive for the invasive species since the initial survey in 1987. In 1995 and 1998, ten (22%) of the sites were positive for the presence of milfoil. In the 1998 survey, three of the ten tributaries were found to have milfoil for the first time, and five were consistent with all previous surveys for the presence of milfoil.

**Figure 2.** Tributary Sites with Milfoil in the Central Basin of Lake George, NY



The statistics of most interest are the number of sites that had Eurasian watermilfoil during one survey year, but not during the follow-up surveys. Two sites (4.4%) had Eurasian watermilfoil in 1987 but not in 1989, the two sites were Bolton Bay at Stewart Brook (M-42) and Northwest Bay- South of Fan Point (M-35). The milfoil was removed for voucher specimens during the 1987 survey. Through the 1989 survey these sites remained clear of the invasive species. During the 1992 survey the site at Bolton Bay (M-42) had 62 plants removed, and the site in Northwest Bay- South of Fan Point (M-35) had 2 plants which were removed by hand harvesting. Both of these sites have well established milfoil populations in the general vicinity from which the plants may have been reintroduced. Not only initial colonization but also recolonization of tributary sites by Eurasian watermilfoil is occurring in Lake George. The rate of colonization, however, is variable from year to year and between the four portions of the survey.

Five of the sites surveyed in 1998 have had a milfoil population since the first tributary survey in 1987. Those sites are: Finkle Brook (M-15), Basin Bay (M-25), Bay south of Red Rock Bay (M-40), Paradise Bay (M-41), and Bolton Bay-Mohican Rd. (M-43). Each of these sites was hand harvested for milfoil removal during each of the surveys. To date, we have no evidence that the loss of Eurasian watermilfoil populations at specific sites in Lake George can be attributed to natural mortality.

Three locations were found to have milfoil populations present in the 1998 survey where milfoil did not previously occur. Those sites are: East of Sagamore Island (T-12c, M-125), Southwest French Pt. (T-69, M127), and North of the Dollar Islands (T-70a, M-126). One site, NWB between Bear and Fan Point (T-68, M-24), did not have milfoil in the first two surveys, but the invasive plant has been present in every survey since 1992. This site is marked for the aquatic herbicide SONAR™ treatment in 1999 along with Paradise Bay (T-17, M-41).

Of the 50 species of submersed aquatic plants identified for Lake George (Ogden et al, 1976, Madsen et al, 1989), 43 were found at the tributary sites in the central basin. Three of these species are on the New York State Rare Plant List (Mitchell, 1986; Clemants, 1989): *Isoetes macrospora*, *Subularia aquatica*, and *Myriophyllum alterniflorum*. This is particularly important for plant management considerations given the impact that a given management technique may have on non-target species. The impact of the growth and spread of nuisance aquatic plants on the distribution of rare plants, however, must also be included in any management decisions. The diversity of species present at tributary sites is also indicative of the suitability of these sites for aquatic plant growth and conversely, the high probability of milfoil infestation at these sites.

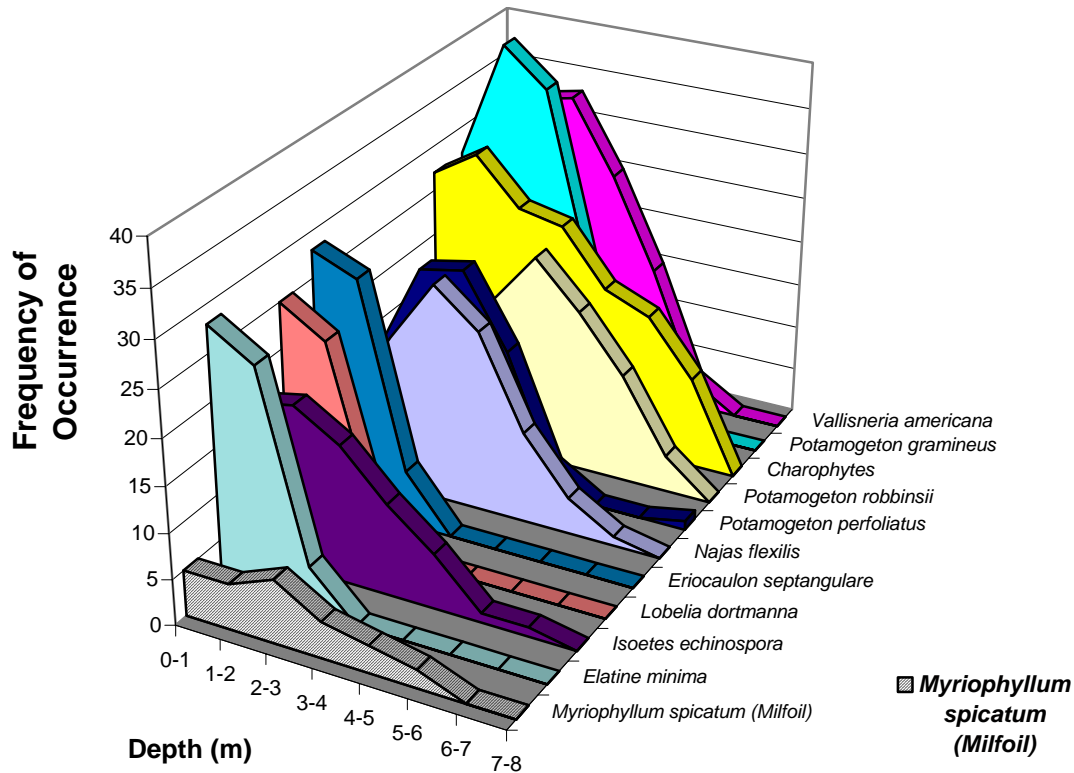


**Table 2.** Frequency of occurrence of all macrophyte species at the tributary sites (n=45).  
Species are listed in order of decreasing frequency.

Species	Depth Interval (m)								Totals
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	
<i>Potamogeton gramineus</i>	27	40	36	17	5	1			42
<i>Charophytes</i>	27	30	25	24	18	16	10		38
<i>Vallisneria americana</i>	20	32	33	25	15	3			33
<i>Potamogeton perfoliatus</i>	12	22	23	15	3			1	32
<i>Eriocaulon septangulare</i>	28	26	6						29
<i>Najas flexilis</i>	9	17	24	20	10	4	1		29
<i>Elatine minima</i>	28	25	5						28
<i>Isoetes echinospora</i>	17	18	15	10	6	1	1		28
<i>Lobelia dortmanna</i>	25	22	4						28
<i>Potamogeton robbinsii</i>	3	10	17	23	18	12	4		26
<i>Sparganium sp.</i>	21	19	6	1					26
<i>Myriophyllum tenellum</i>	17	21	6						24
<i>Elodea canadensis</i>	8	16	16	14	7	3	1		23
<i>Potamogeton amplifolius</i>	1	10	15	14	6				21
<i>Potamogeton crispus</i>		12	15	15	9	4	4	4	21
<i>Potamogeton pusillus</i>	4	5	11	13	9	7	1		20
<i>Sagittaria graminea</i>	15	17	8	1					20
<i>Juncus pelocarpus</i>	13	16	6	2					19
<i>Isoetes macrospora</i>	2	2	5	11	10	12	9	1	18
<i>Heteranthera dubia</i>	7	9	10	4					14
<i>Ranunculus longirostris</i>	4	8	14	6	2				14
<i>Ranunculus reptans</i>	4	8	7	2	2	1	1		13
<i>Bidens beckii</i>	3	6	9	5	5				11
<i>Potamogeton praelongus</i>		1	8	8	2	1	1		11
<i>Potamogeton spirillus</i>	3	5	6	1					10
<i>Potamogeton foliosus</i>	2	4	8	5	2				9
<i>Eleocharis acicularis</i>	6	7	3						8
<i>Subularia aquatica</i>	5	4	1	1					8
<b><u>Myriophyllum spicatum</u></b>	<b><u>5</u></b>	<b><u>5</u></b>	<b><u>7</u></b>	<b><u>4</u></b>	<b><u>3</u></b>	<b><u>2</u></b>			<b><u>7</u></b>
<i>Potamogeton friesii</i>	2	2	2	3	2				7
<i>Lindernia sp.</i>	3	5	1	1	1				6
<i>Myriophyllum alterniflorum</i>	3	6	1						6
<i>Potamogeton vaseyi</i>	2	2	1	2			1		5
<i>Potamogeton zosteriformis</i>	1	2	4	2	1				5
<i>Potamogeton epihydrus</i>	4								4
<i>Utricularia resupinata</i>	2	3	2	1	1				4
<i>Fontinalis sp.</i>	2								3
<i>Utricularia vulgaris</i>		2		1					3
<i>Brasenia schreberi</i>	2								2
<i>Najas guadalupensis</i>	2	1	1	1					2
<i>Potamogeton richardsonii</i>				1	1				2
<i>Ceratophyllum demersum</i>	1	1	1	1	1	1	1	1	1
<i>Filamentous algae</i>	1								1
<i>Freshwater sponge</i>			1						1
<i>Myriophyllum sibiricum</i>		1							1
<i>Nuphar luteum</i>		1							1
<i>Potamogeton obtusifolius</i>			1						1
<i>Sagittaria latifolia</i>	1	1							1

In Table 2, the species present and their depth distribution are ranked in order of the frequency for which they appeared at the tributary sites. The depth distribution of the ten most frequently occurring species is presented in Figure 3. Depth distribution and species diversity remains comparable to that reported in previous surveys of the tributaries of the central basin.

**Figure 3.** Frequency and depth distribution of the 10 most common macrophyte species.



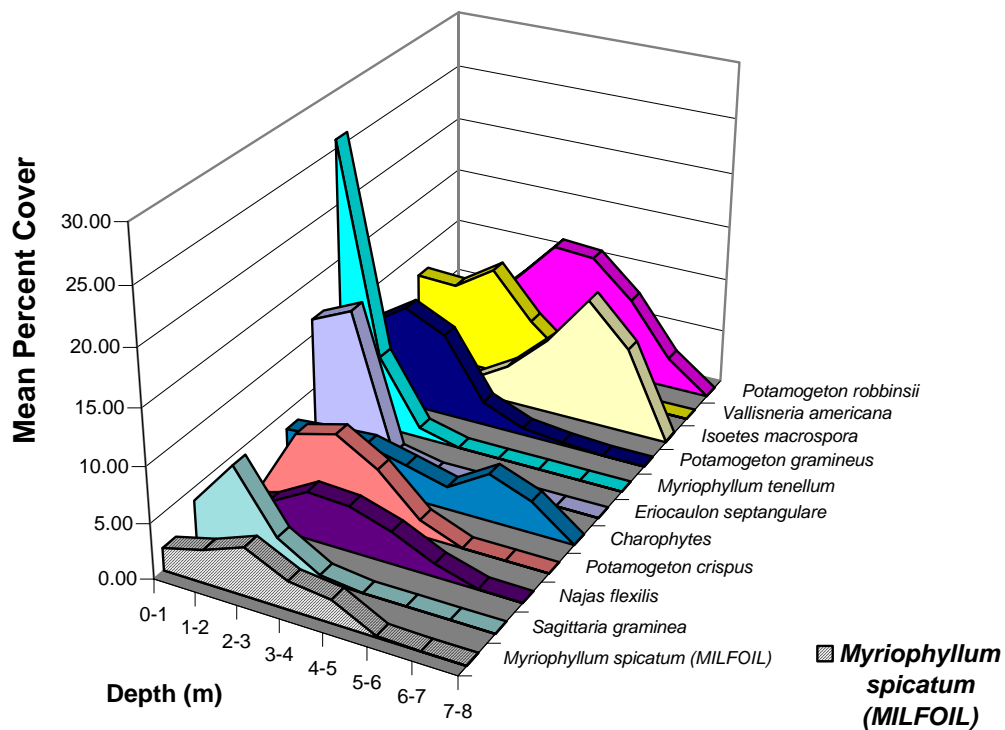
Frequency of occurrence, or the number of tributaries where each species was present, is an important measure of the distribution of a species but does not consider the relative abundance of that species within the overall population. Table 3 lists the species present and their depth distribution ranked in order of mean percent cover. This ranking is a better measure of the dominance of certain plants, and in conjunction with frequency data, provides a more complete picture of aquatic plant community structure. In Figure 4, the depth distribution of the 10 most abundant species is presented. A comparison of Figures 3 and 4 indicates that the 10 most abundant species by frequency of occurrence are not the same as the 10 most abundant species by mean percent cover. Six of the ten species on the two lists, however, are the same. The notable exceptions are species of the genus *Isoetes*. *Isoetes macrospora*, while not a common species by frequency of occurrence, forms a nearly monospecific carpet in depths of 5 to 7 meters at a number of sites. This density of growth makes it a common member of the plant community by mean percent cover. This demonstrates that certain species, while not appearing as often as others, can tend to dominate at the locations where they do occur. This species is also listed on the rare plant list for New York State, however it is a common member of the Lake George aquatic plant community.

**Table 3.** Mean percent cover of all macrophyte species at the tributary sites. Species are listed in order of decreasing abundance.

<b>Species</b>	<b>0-1</b>	<b>1-2</b>	<b>2-3</b>	<b>3-4</b>	<b>4-5</b>	<b>5-6</b>	<b>6-7</b>	<b>7-8</b>	<b>Totals</b>
<i>Potamogeton robbinsii</i>	1.94	3.56	7.17	11.11	10.83	7.56	2.78		5.62
<i>Myriophyllum tenellum</i>	25.78	6.72	0.89						4.17
<i>Vallisneria americana</i>	6.00	7.28	9.67	5.78	2.78	0.17			3.96
<i>Isoetes macrospora</i>	0.28	0.11	1.22	3.44	6.89	11.61	7.89	0.06	3.94
<i>Potamogeton gramineus</i>	6.94	9.33	7.61	2.11	0.61	0.22			3.35
<i>Eriocaulon septangulare</i>	11.44	13.11	0.72						3.16
<i>Charophytes</i>	3.33	3.67	3.89	3.00	2.06	4.33	2.89		2.90
<i>Potamogeton crispus</i>		6.21	7.19	5.00	1.48				2.49
<i>Najas flexilis</i>	1.17	2.28	4.33	4.11	2.94	1.17	0.06		2.01
<i>Sagittaria graminea</i>	3.83	8.06	2.67	0.44					1.88
<b><u>Myriophyllum spicatum</u></b>	<b>2.06</b>	<b>3.00</b>	<b>4.39</b>	<b>2.56</b>	<b>2.11</b>	<b>0.11</b>			<b>1.78</b>
<i>Potamogeton perfoliatus</i>	2.06	3.72	3.00	2.06	0.33			0.06	1.40
<i>Sparganium sp.</i>	3.89	3.50	2.44	0.83					1.33
<i>Potamogeton amplifolius</i>	0.06	3.50	3.94	2.50	0.67				1.33
<i>Elodea canadensis</i>	1.28	2.72	2.83	2.00	0.72	0.50	0.22		1.28
<i>Juncus pelocarpus</i>	3.11	3.72	1.39	0.28					1.06
<i>Isoetes echinospora</i>	1.28	3.67	1.50	1.06	0.67	0.06	0.06		1.03
<i>Ranunculus longirostris</i>	0.94	1.78	3.00	1.22	0.11				0.88
<i>Ranunculus reptans</i>	0.39	2.17	2.50	0.67	0.67	0.22	0.22		0.85
<i>Potamogeton pusillus</i>	0.61	0.67	1.17	1.50	1.22	0.78	0.06		0.75
<i>Lobelia dortmanna</i>	2.39	3.00	0.56						0.74
<i>Elatine minima</i>	2.78	2.06	0.67						0.69
<i>Potamogeton praelongus</i>		0.44	2.06	2.22	0.28	0.22	0.22		0.68
<i>Eleocharis acicularis</i>	2.44	1.44	1.50						0.67
<i>Heteranthera dubia</i>	1.33	2.17	1.28	0.56					0.67
<i>Bidens beckii</i>	0.50	0.83	1.44	0.61	0.61				0.50
<i>Potamogeton foliosus</i>	0.11	0.72	1.00	0.67	0.28				0.35
<i>Lindernia sp.</i>	0.33	1.39	0.44	0.22	0.22				0.33
<i>Potamogeton zosteriformis</i>	0.44	0.50	1.00	0.11	0.06				0.26
<i>Myriophyllum alterniflorum</i>	0.17	1.67	0.22						0.26
<i>Utricularia resupinata</i>	0.28	0.72	0.28	0.22	0.22				0.22
<i>Filamentous algae</i>	1.67								0.21
<i>Najas guadalupensis</i>	0.89	0.06	0.06	0.22					0.15
<i>Potamogeton friesii</i>	0.28	0.28	0.11	0.33	0.11				0.14
<i>Potamogeton spirillus</i>	0.17	0.28	0.33	0.06					0.10
<i>Subularia aquatica</i>	0.28	0.22	0.06	0.06					0.08
<i>Potamogeton vaseyi</i>	0.11	0.11	0.06	0.11			0.06		0.06
<i>Sagittaria latifolia</i>	0.22	0.22							0.06
<i>Potamogeton epihydrus</i>	0.39								0.05
<i>Utricularia vulgaris</i>		0.28		0.06					0.04
<i>Brasenia schreberi</i>	0.28								0.03
<i>Nuphar luteum</i>		0.22							0.03
<i>Ceratophyllum demersum</i>	0.06	0.06							0.01
<i>Fontinalis sp.</i>	0.11								0.01
<i>Potamogeton richardsonii</i>				0.06	0.06				0.01
<i>Freshwater sponge</i>			0.06						0.01
<i>Myriophyllum sibiricum</i>		0.06							0.01
<i>Potamogeton obtusifolius</i>			0.06						0.01

A comparison of the major species by frequency of occurrence reported during the 1995 tributary survey (Eichler et al. 1996) with the current list (Table 2) shows few differences. Eight of the ten most abundant species are the same. *Isoetes echinospora* and *Lobelia dortmanna* were not among the top ten species during the 1995 survey, but were ranked eight and ninth respectively in the 1998 survey. Eurasian watermilfoil was ranked 31<sup>st</sup> and 29<sup>th</sup> by frequency of occurrence in the 1995 and 1998 surveys, respectively. The decrease in frequency of occurrence of Eurasian watermilfoil coincided with a decrease in the number of locations where milfoil was found in Lake George. This relationship also coincides with the mean percent cover between the two survey years. In 1995, milfoil is listed as fourth in terms of percent cover, and by 1998 milfoil had dropped to eleventh on the list.

**Figure 4.** Mean percent cover and depth distribution for the 10 most common macrophyte species and Eurasian watermilfoil (*Myriophyllum spicatum*).



Although the number of samples is too few to suggest a statistically reliable rate of colonization, new sites continue to be colonized on a year to year basis. The occurrence of milfoil at sites that had been cleared in previous years also indicates that continued surveillance of milfoil sites is necessary. The more sobering indication from the recurrence of milfoil at previously harvested sites is that there are no sites or cases to

indicate any natural mortality or demise of small populations of Eurasian watermilfoil in Lake George. Although these populations may not expand for several years, clearly they are not dying off on their own.

Analysis of long term data of species richness indicates a trend developing in relationship to frequency of occurrence of milfoil. Since 1992, the number of tributary sites in the central basin with milfoil present has decreased by 11%. Over this same time frame, the total number of species observed has increased by 16% (from 36 to 43 species present). This developing trend may be an indicator of the effect that the presence of milfoil can have on native aquatic plant communities. However, the decrease in the frequency of occurrence of milfoil does not show the whole picture. At the sites where milfoil has become an established presence, average percent cover of the invasive plant has increased, while the average percent cover of several native species that compete for the same niche occupied by milfoil has decreased by as much as 26%. Native macrophytes *Potamogeton perfoliatus*, *P. amplifolius*, and *Vallisneria americana* have decreased 26%, 13%, and 25%, respectively between the 1992 and 1998 surveys. For this same time frame, the average percent cover for Eurasian watermilfoil has increased 1700% (0.1 to 1.8). One native species that competes directly with milfoil, *P. robbinsii*, has increased in percent cover. This species is low-growing and extremely tolerant of low light intensities, thus allowing the species to survive under a milfoil canopy where other native plants cannot. One explanation for the increase in average percent cover of milfoil over the past few years is expansion of existing populations. Several sites have increased dramatically in density over the past few years, largely due to a lack of management. These sites are proposed for treatment by an aquatic herbicide, SONAR™, and thus have only been surveyed for control purposes.

## REFERENCES

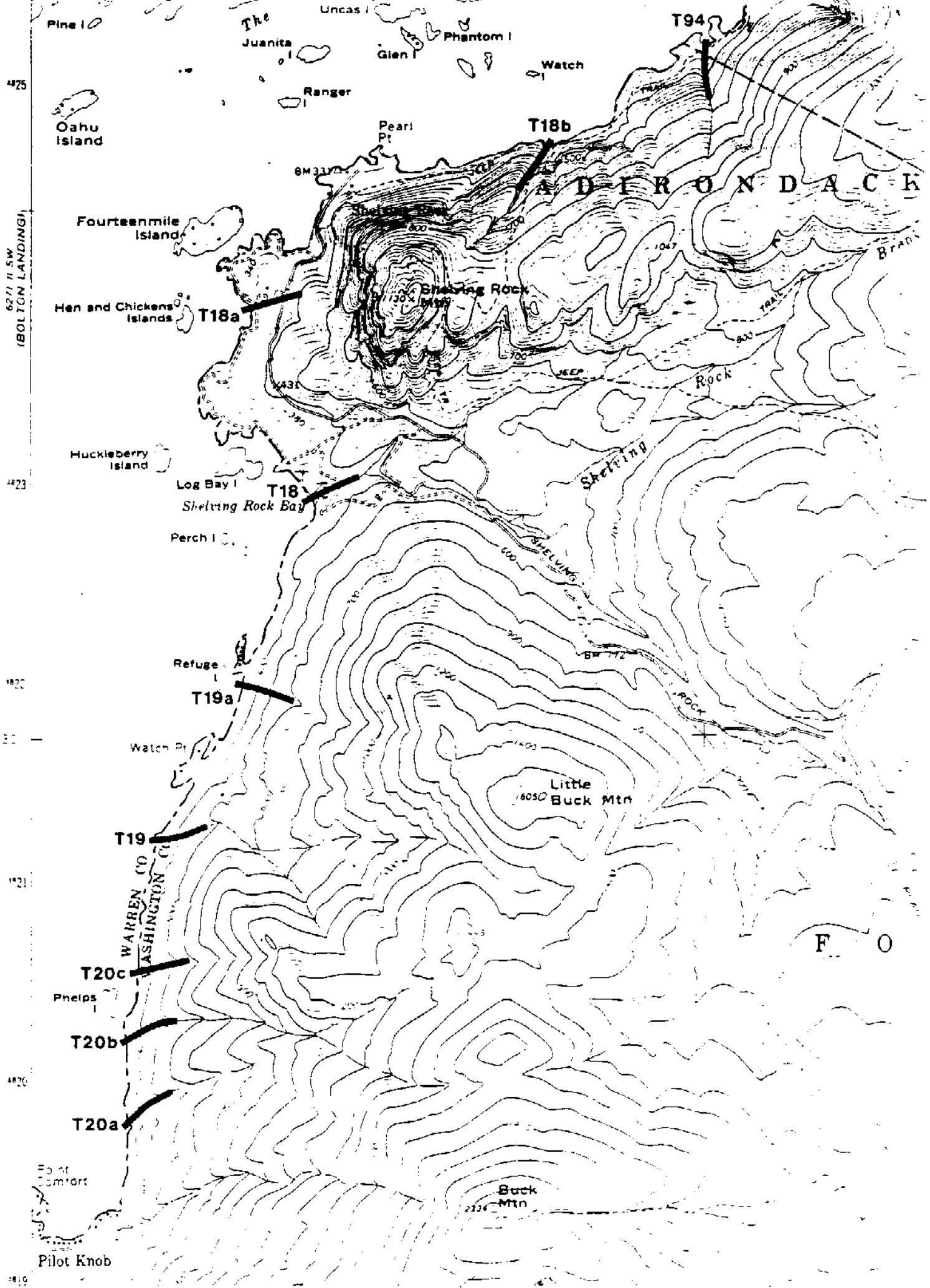
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## ACKNOWLEDGMENTS

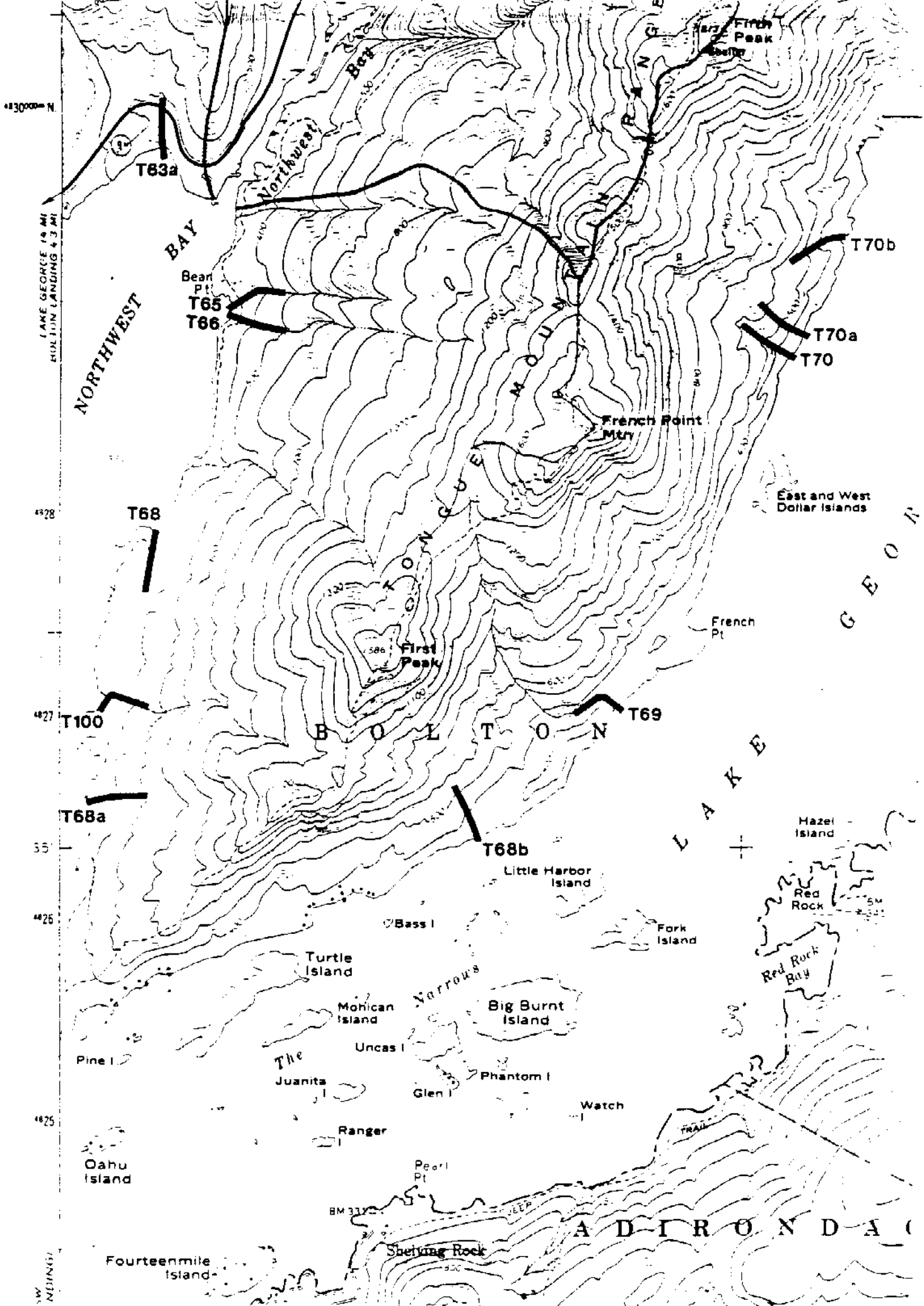
This project was supported by the FUND for Lake George through a grant to the Darrin Fresh Water Institute. We gratefully acknowledge this support. Field assistance for this project was provided by Valerie Van Leuven, Sarah Mengers, Katherine Van Voorhis, and Kendra Dwenger.

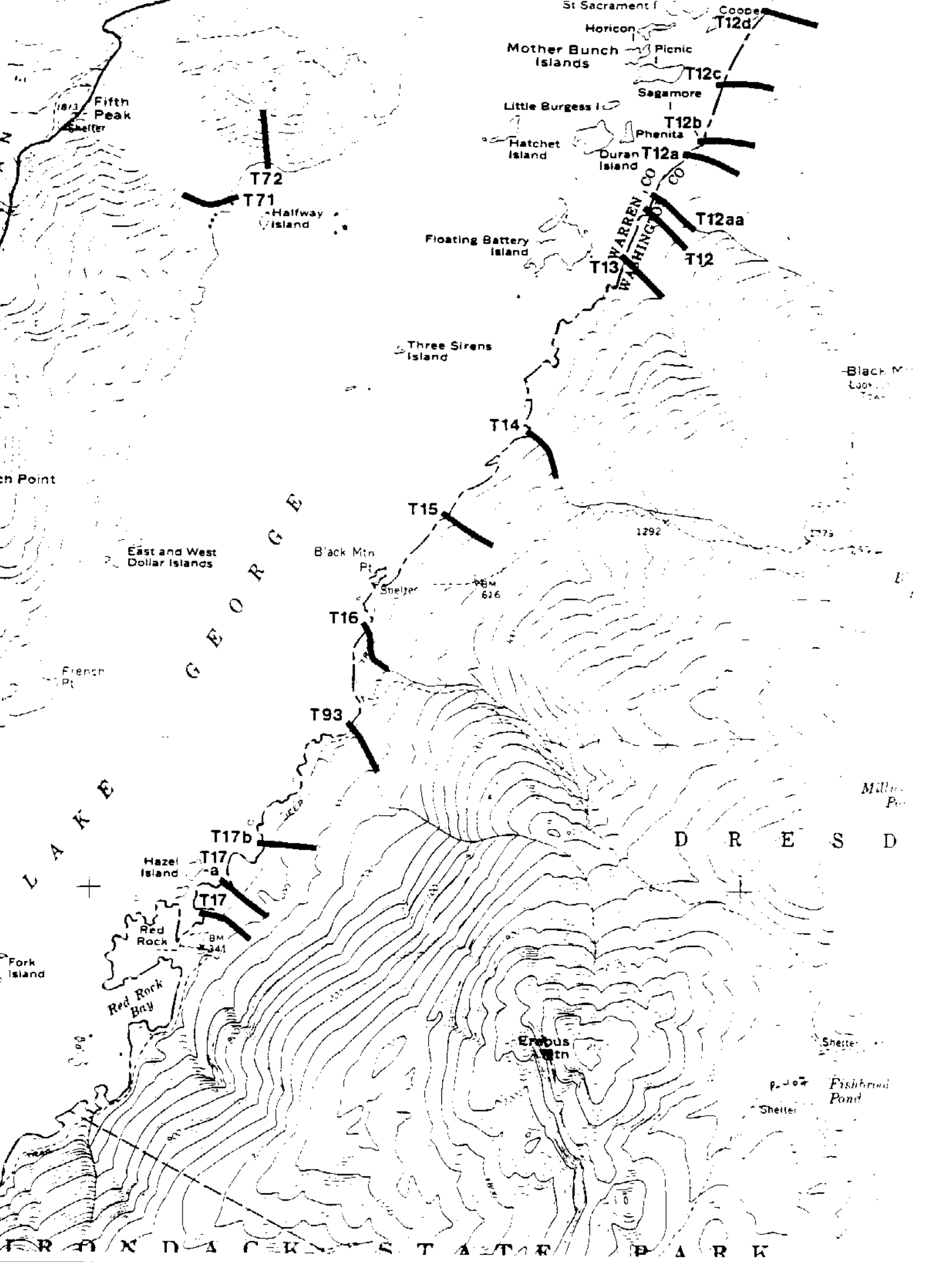
Critical comments on this manuscript were provided by Dr. Carol Collins and Dr. Robert Johnson.

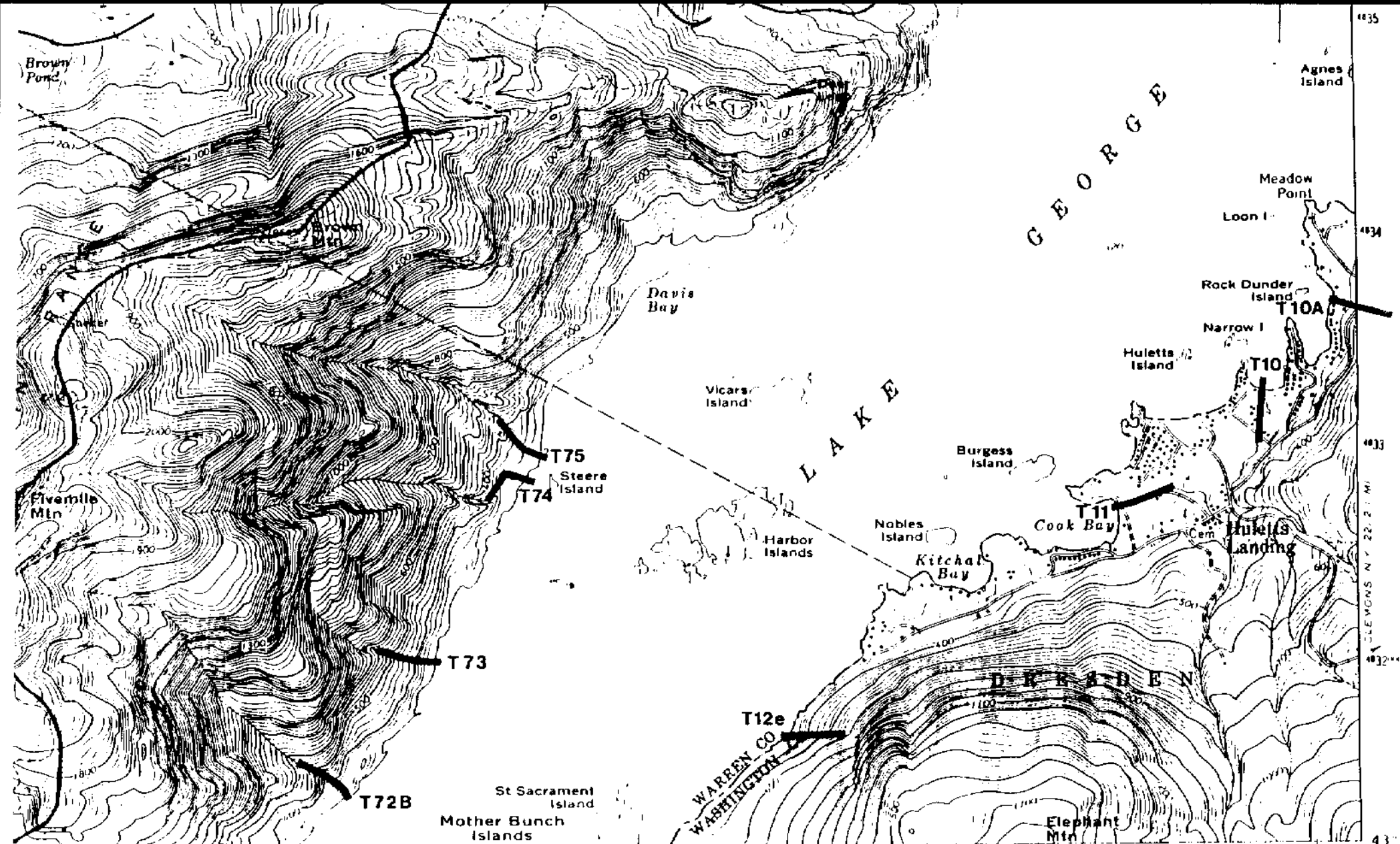
**APPENDIX A**  
**SITE LOCATIONS**











Brown Pond

Agnes Island

Meadow Point

Loon I.

Rock Dunder Island

Narrow I.

Hulett's Island

Davis Bay

Vicars Island

Burgess Island

T75

Steere Island

T74

Fivemile Mtn

Nobles Island

Cook Bay

Hulett's Landing

Harbor Islands

Kitchal Bay

T73

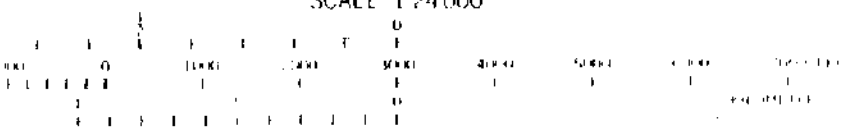
T12e

St Sacrament Island

Mother Bunch Islands

Elephant Mtn

ISHELVING ROCKS  
6271 II SE  
SCALE 1:24,000



CONTOUR INTERVAL 20 FEET  
ELEVATION IN FEET

ROAD CLASSIFICATION

- Primary highway, all weather, hard surface
- Secondary highway, all weather, hard surface
- Light duty road, all weather, improved surface
- Unimproved road, fair or dry weather

State Route

WARREN CO  
WASHINGTON

DUNDEN

GEORGE STRAIT

LAKE

CLEMENS N. 22.2. W.

615 617 619 621 623 625 627 629 631 633 635

12° 10'

618

619

620000-E

73° 30'

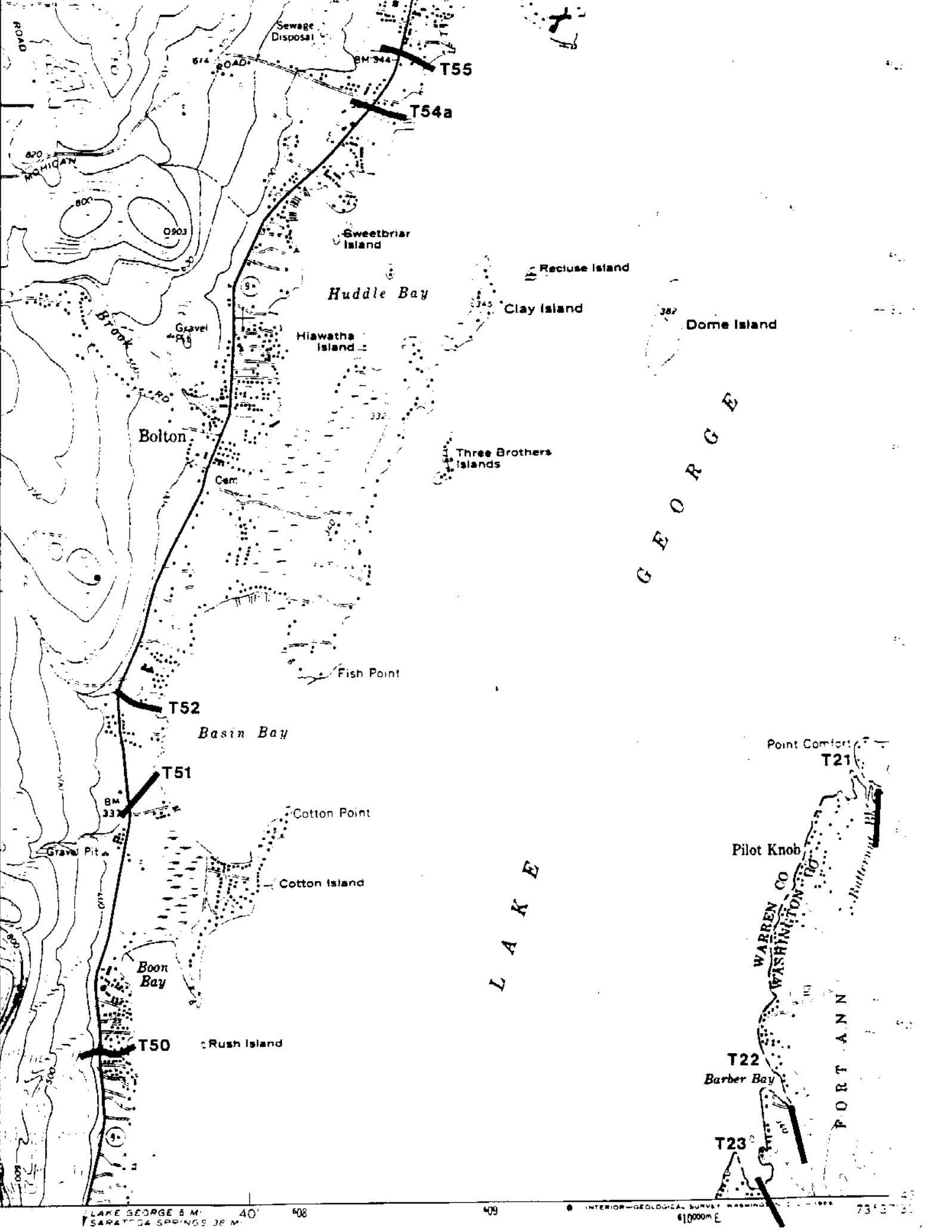
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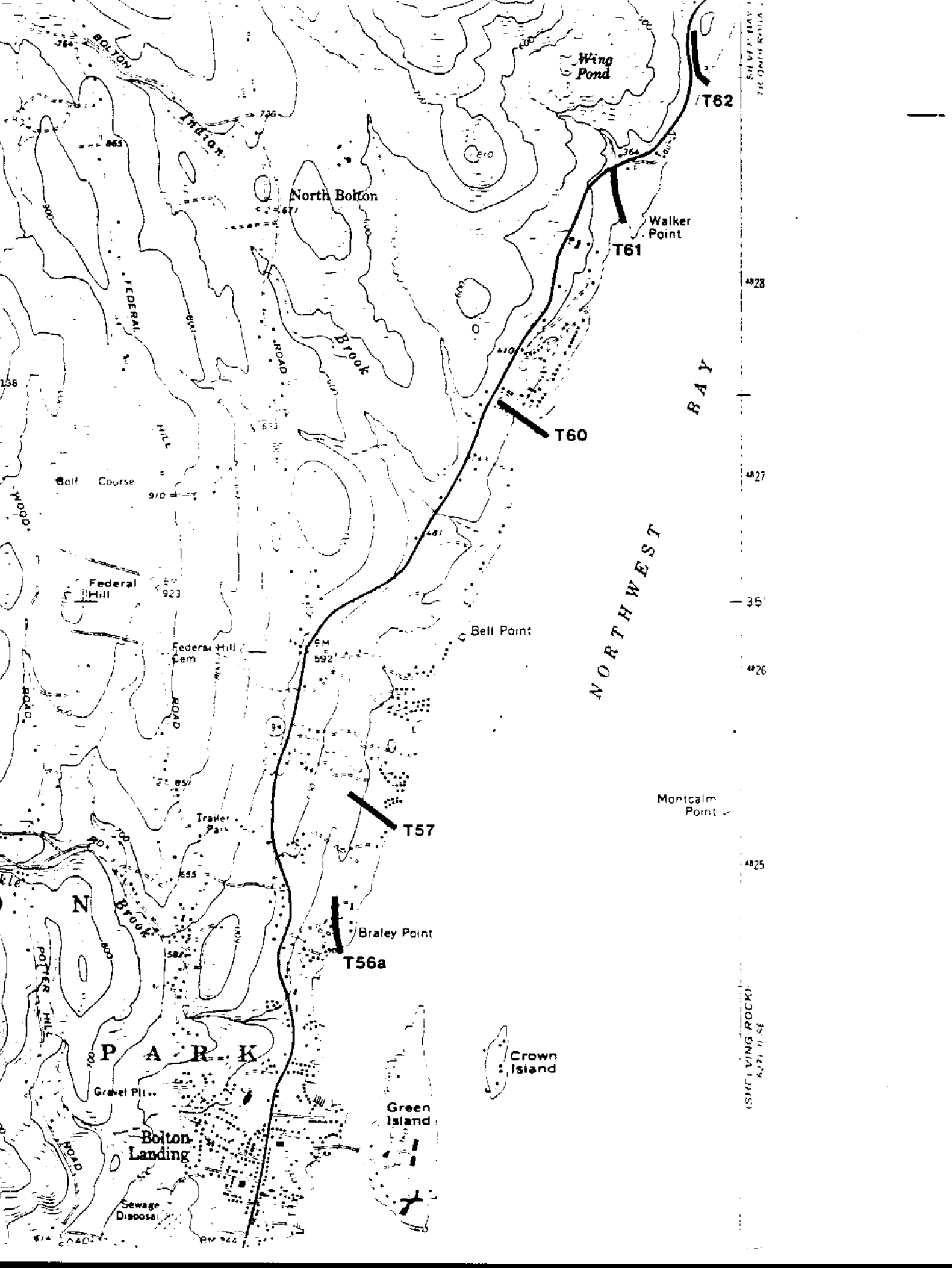
634

633

632

631





SHEET 1141  
TIC 010118 K011A

4828

4827

4826

4825

4825

(SHELF VING ROCK)  
6,271 71 SE

RAY

NORTHWEST

T62

T61

T60

T57

T56a

Wing Pond

North Bolton

Walker Point

Brook

FEDERAL HILL

HILL

Golf Course

Federal Hill

Federal Hill Cem

Bell Point

Montcalm Point

Traver Park

Braley Point

Crown Island

Green Island

Bolton Landing

Sewage Disposal

Gravel Pl...

P A R K

N B R O O K

P O T T E R H I L L

N B R O O K

R O A D

R O A D

R O A D

R O A D

R O A D

R O A D

**APPENDIX B**

**PERCENT COVER DATA**

**Eurasian Watermilfoil (*Myriophyllum spicatum*) is shaded.**

Tributary Survey Transect Data

Site: T-12 and 12aa Bay SE of Duran Isl.

Date: 8-4-98

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5	2.5	2.5	2.5			
Elatine minima	2.5	2.5					
Elodea canadensis		2.5	2.5	2.5			
Eriocaulon septangulare	10	37.5	2.5				
Fontinalis sp.							
Isoetes echinospora	2.5	2.5	2.5	10			
Juncus pelocarpus	2.5	2.5					
Lobelia dortmanna	2.5	2.5					
Myriophyllum tenellum	10	2.5					
Najas flexilis		2.5	10	20			
Potamogeton amplifolius		2.5	10	10			
Potamogeton friesii			2.5				
Potamogeton gramineus		2.5	2.5	2.5			
Potamogeton perfoliatus			2.5	10			
Potamogeton pusillus				2.5			
Potamogeton robbinsii			2.5	2.5			
Ranunculus longirostris		2.5	2.5				
Ranunculus reptans	2.5	2.5					
Vallisneria americana		2.5	10	10			

Site: T-12a

SE Phenita Island

4-Aug-98

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	10	10	10				
Elatine minima	10						
Eriocaulon septangulare	37.5						
Isoetes echinospora	10						
Isoetes macrospora			10		10	37.5	
Juncus pelocarpus	10						
Lobelia dortmanna	10						
Myriophyllum tenellum	10						
Najas flexilis	10	10	10	10	20	37.5	
Potamogeton gramineus	20	10					
Potamogeton perfoliatus	10	10					
Ranunculus longirostris		10		10			
Utricularia resupinata		20	10	10	10		
Vallisneria americana		10	20	20	10		

Tributary Survey Transect Data

Site: T-12b E of Phenita Island  
4-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes				10			
Isoetes echinospora			2.5	10			
Isoetes macrospora				10			
Najas flexilis	10	2.5	10	10			
Potamogeton amplifolius		37.5					
Potamogeton friesii		2.5					
Potamogeton gramineus	75	10					
Potamogeton robbinsii				10			
Sagittaria graminea		75					
Sparganium sp.	2.5						
Vallisneria americana	37.5	10	37.5	10			

Site: T-12c E. of Sagamore Island  
Date: 8/4

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes		2.5	2.5	2.5	2.5	2.5	2.5
Elatine minima	2.5	2.5					
Eriocaulon septangulare	2.5	20					
Heteranthera dubia							
Isoetes echinospora	2.5	10					
Isoetes macrospora				2.5	2.5	75	75
Najas flexilis			2.5	2.5		2.5	
Potamogeton amplifolius							
Potamogeton gramineus		2.5	2.5				
Potamogeton perfoliatus		2.5					
Potamogeton pusillus	2.5						
Potamogeton vaseyi							2.5
Sparganium sp.		2.5					
Vallisneria americana		10	20				

Site: T-12d NE of Cooper Island

Species	4-Aug-98 Depth Interval (m)							
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Charophytes	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Elodea canadensis				2.5				
Eriocaulon septangulare	2.5	10						
Heteranthera dubia	2.5	2.5	2.5					
Isoetes echinospora	2.5	2.5	2.5	2.5	2.5			
Isoetes macrospora						75	75	
Lobelia dortmanna	2.5	2.5						
Najas flexilis		2.5	2.5	2.5	10	2.5		
Potamogeton amplifolius		10	10	2.5	2.5			
Potamogeton foliosus			2.5					
Potamogeton gramineus	2.5	10	10					
Potamogeton perfoliatus				2.5				
Potamogeton pusillus				2.5	10	2.5		
Potamogeton richardsonii					2.5			
Potamogeton robbinsii				2.5	20	2.5		
Potamogeton spiritus		2.5	2.5					
Vallisneria americana			2.5	2.5				



Tributary Survey Transect Data

Site: T-13

E of Floating Battery Island

4-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	10	10	10	10	10	10	
Elatine minima	10	10					
Floodea canadensis	10	20	20	20			
Eriocaulon septangulare	37.5	20					
Heteranthera dubia	10	10					
Isoetes macrospora			2.5	10		75	75
Juncus pelocarpus	10	20					
Myriophyllum tenellum	10	20					
Najas flexilis	10	10	10	10	20		
Potamogeton amplifolius		10	20	10			
Potamogeton epihydrus	2.5						
Potamogeton friesii	2.5		2.5	2.5			
Potamogeton gramineus	20	20	10	10			
Potamogeton perfoliatus	10	20	10	10			
Potamogeton rubbinsii		10	10	20	20	10	
Ranunculus longirostris		10	10				
Ranunculus reptans	10	20	20				
Sparganium sp.	2.5						
Utricularia resupinata		10	2.5				
Vallisneria americana	10	20	20	20	10	2.5	

Site: T 14

SE of Three Sirens Island

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	10	10					
Eriocaulon septangulare	75	20					
Isoetes echinospora		2.5					
Juncus pelocarpus	20	10					
Lindernia sp.	10	10					
Lobelia dortmanna	10	10					
Najas flexilis	10		2.5				
Potamogeton epihydrus	10						
Potamogeton friesii	10						
Potamogeton gramineus	10	10	10				
Potamogeton perfoliatus	20	10	2.5				
Sagittaria graminea	10	10	10				
Sparganium sp.	75	20	10				
Vallisneria americana	75	10	10				

Site: T-15

NE of Black Mt. Point

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Elatine minima	2.5	2.5					
Eriocaulon septangulare	2.5	2.5					
Isoetes macrospora	2.5	2.5	2.5				
Lobelia dortmanna	2.5	2.5					
Najas flexilis			2.5				
Potamogeton gramineus	2.5	10	2.5				
Potamogeton perfoliatus			2.5				
Potamogeton spirillus	2.5						
Ranunculus reptans		2.5	2.5				
Sagittaria graminea	2.5						
Sparganium sp.	2.5						

Tributary Survey Transect Data

Site: T-16

Bay S of Black Mt. Point

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Elatine minima	2.5	2.5					
Eleocharis acicularis	2.5						
Elodea canadensis		2.5	10.0				
Eriocaulon septangulare	10.0	2.5					
Najas flexilis	2.5	10.0					
Potamogeton amplifolius			2.5				
Potamogeton epihydrus	2.5						
Potamogeton gramineus	37.5	10.0	2.5				
Potamogeton perfoliatus	2.5	10.0	10.0				
Potamogeton praelongus				10.0			
Sparganium sp.	2.5	2.5					
Vallisneria americana	2.5	10.0	10.0				

Site: T-17

Paradise Bay

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Bidens beckii	10	10	20				
Charophytes	10	10	10				
Elatine minima	10	2.5					
Eleocharis acicularis	10	37.5	10				
Elodea canadensis	10	10	10	10			
Eriocaulon septangulare	20	37.5					
Filamentous algae	75						
Heteranthera dubia	37.5	37.5	20	10			
<b>Myriophyllum spicatum</b>	10	20	20	37.5	75		
Myriophyllum tenellum	75	10	2.5				
Najas flexilis		10	10				
Najas guadalupensis	37.5						
Potamogeton amplifolius		10	20	2.5	2.5		
Potamogeton gramineus	10	10	10				
Potamogeton perfoliatus		10	10				
Potamogeton praelongus			10	10			
Potamogeton pusillus		20	20				
Potamogeton robbinsii	75	75	37.5	37.5	37.5		
Ranunculus longirostris	20	10	10	10			
Sagittaria graminea	20	20	10				
Sparganium sp.	20	20	10				
Vallisneria americana	75	20	20	20	10		

Tributary Survey Transect Data

Site: T-17a

Bay SE Hazel Island

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Bidens beckii		10	20				
Charophytes	10	10					
Elatine minima	10	10					
Elodea canadensis	10	10					
Eriocaulon septangulare	75	75					
Juncus pelocarpus	20	10	10				
Lobelia dortmanna		2.5	2.5				
Myriophyllum tenellum		20	20				
Potamogeton amplifolius			10	20			
Potamogeton gramineus	10	20	10				
Potamogeton pusillus			10				
Potamogeton robbinsii	10	10	20	37.5			
Potamogeton zosteriformis	10	10					
Ranunculus longirostris		10	10				
Sagittaria graminea	37.5	10					
Sparganium sp.	10	10					
Vallisneria americana	20	20	10	10			

Tributary Survey Transect Data

Site: T-17b

Bay NE Hazel Island

Date: 8-3-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes			10	10			
Elatine minima	2.5	10	20				
Elodea canadensis	10	10	10	10			
Eriocaulon septangulare	20	75	20				
Freshwater sponge			2.5				
Isoetes echinospora		10	10				
Isoetes macrospora			2.5	10			
Lobelia dortmanna	2.5						
Potamogeton gramineus	10	10	20	10			
Potamogeton perfoliatus		10	10	20			
Potamogeton robbinsii				10			
Potamogeton zosteriformis		2.5	2.5				
Ranunculus longirostris		10	10	20			
Sagittaria graminea	10						
Sparganium sp.	2.5						
Vallisneria americana	10	10	10	20			

Site: T-18

Shelving Rock Bay

26-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	2.5						
Lindernia sp.	2.5						
Potamogeton epihydrus	2.5						
Potamogeton gramineus			2.5				
Potamogeton perfoliatus			2.5				
Sparganium sp.	2.5	2.5					

Site: T-18a

Bay F. Hens and Chicks Islands

26-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	2.5	2.5	2.5	2.5	2.5	2.5	
Elatine minima	2.5	2.5	2.5				
Eleocharis acicularis		10					
Elodea canadensis		2.5	2.5				
Eriocaulon septangulare	20	10	2.5				
Fontinalis sp.	2.5						
Isoetes echinospora	2.5						
Isoetes macrospora					2.5	2.5	
Juncus pelocarpus		2.5					
Lobelia dortmanna	2.5						
Myriophyllum tenellum	20	2.5	2.5				
Najas flexilis	2.5	2.5	2.5	2.5			
Potamogeton amplifolius			10	10			
Potamogeton gramineus	2.5	20	10	2.5			
Potamogeton perfoliatus		2.5	10				
Potamogeton pusillus		2.5	2.5	2.5			
Potamogeton robbinsii					2.5	2.5	
Potamogeton spirillus	2.5						
Ranunculus longirostris			2.5				
Ranunculus reptans			10				
Sagittaria graminea	2.5	2.5					
Sparganium sp.	2.5	2.5					
Subularia aquatica		2.5					
Vallisneria americana	2.5	10	10	10	10	2.5	

Tributary Survey Transect Data

Site: T-18b

S Watch Point

Date:

3-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	2.5	2.5	2.5	10	2.5	2.5	2.5
Elatine minima	2.5	2.5					
Eleocharis acicularis		2.5	2.5				
Eriocaulon septangulare	20	10					
Isoetes echinospora	2.5	2.5	2.5	2.5			
Isoetes macrospora				2.5	75	75	2.5
Lobelia dortmanna	2.5	2.5					
Myriophyllum tenellum		2.5					
Najas flexilis		2.5	10	10			
Potamogeton amplifolius				2.5			
Potamogeton foliosus			2.5	2.5	2.5		
Potamogeton gramineus		2.5	10				
Potamogeton pusillus			2.5	2.5			
Sparganium sp.		2.5					
Utricularia resupinata	2.5	2.5					
Vallisneria americana		2.5	2.5				

Site: T-19

SW Watch Pt.

26-Aug-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	10	10	2.5				
Elatine minima	10	2.5					
Eriocaulon septangulare	10	10					
Isoetes echinospora	2.5						
Juncus pelocarpus		10	10				
Lobelia dortmanna	10	10	2.5				
Myriophyllum tenellum	10	10					
Najas flexilis		10	10				
Potamogeton gramineus	2.5	20	10				
Sparganium sp.	2.5	10					
Subularia aquatica	2.5						

Site: T-19a

E Refuge Island

Date:

26 Aug-98

Species	Depth Interval (m)					
	0-1	1-2	2-3	3-4	4-5	5-6
Charophytes	2.5	2.5				
Elatine minima	2.5	2.5				
Eriocaulon septangulare	10	10	2.5			
Juncus pelocarpus	2.5	10	10	2.5		
Lobelia dortmanna		2.5				
Myriophyllum sibiricum		2.5				
Myriophyllum tenellum		10				
Najas flexilis			2.5	2.5	10	
Nuphar luteum		10				
Potamogeton amplifolius		10				
Potamogeton gramineus	2.5	10	10	2.5	2.5	
Potamogeton perfoliatus				2.5	2.5	
Potamogeton pusillus	2.5	2.5				
Potamogeton robbinsii				2.5	2.5	
Sagittaria graminea	2.5	2.5				
Sparganium sp.	2.5	2.5				
Utricularia vulgaris		2.5				
Vallisneria americana	2.5	10	10	2.5	2.5	

Tributary Survey Transect Data

Site: T 20a

S Phelps Island

Date:

26-Aug-98

Species	0-1	Depth Interval (m)						
		<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>	<u>7-8</u>
Charophytes	2.5							
Elatine minima	2.5	2.5						
Eleocharis acicularis	2.5	2.5						
Eriocaulon septangulare	10.0	2.5						
Isoetes echinospora	2.5	2.5	2.5	2.5				
Isoetes macrospora						10	75	2.5
Lobelia dortmanna	2.5	2.5						
Myriophyllum tenellum	10.0	2.5	2.5					
Najas flexilis	2.5	10.0	20.0	2.5				
Potamogeton gramineus	2.5	20.0	20.0	2.5				
Potamogeton perfoliatus			10.0	2.5				
Potamogeton pusillus					2.5	2.5		
Sparganium sp.	2.5	2.5						

Site: T-20b

SE Phelps Island

Date:

26-Aug-98

Species	0-1	Depth Interval (m)					
		<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Brasenia schreberi	2.5						
Charophytes	10	10	10	2.5	2.5	2.5	
Elatine minima	2.5	2.5					
Eriocaulon septangulare	10	10					
Isoetes echinospora	2.5						
Lobelia dortmanna	10	10					
Myriophyllum tenellum	10						
Najas flexilis		10	10	10			
Potamogeton foliosus				2.5			
Potamogeton gramineus	10	10	10	2.5			
Potamogeton robbinsii				10			
Sparganium sp.	2.5						
Subularia aquatica	2.5	2.5	2.5	2.5			
Vallisneria americana		10	10	2.5			

Site: T-20c

NE Phelps Island

Date:

26-Aug-98

Species	0-1	Depth Interval (m)					
		<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5	2.5	2.5	2.5	2.5	2.5	10
Elatine minima	2.5	2.5					
Heteranthera dubia			2.5	2.5			
Isoetes macrospora		2.5	37.5	75	75	2.5	
Lobelia dortmanna	2.5	2.5					
Najas flexilis	2.5	2.5	10	20			
Najas guadalupensis	2.5	2.5	2.5	10			
Potamogeton gramineus		2.5	10				
Potamogeton perfoliatus			2.5	2.5			
Potamogeton pusillus			2.5	2.5			
Potamogeton spirillus			2.5				
Potamogeton vaseyi			2.5	2.5			
Vallisneria americana		2.5	10				

Survey Transect Data  
 Site: T-50  
 22-Sep-98

WSW Rush Island

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Bidens beckii				2.5			
Charophytes	10	10					20
Clatine minima	2.5	2.5					
Eleocharis acicularis		10	10				
Eriocaulon septangulare	10						
Isoetes macrospora				20	37.5	75	10
Juncus pelocarpus	10	10					
Lobelia dortmanna	2.5	10					
Myriophyllum tenellum	37.5	10					
Potamogeton gramineus	10	10	10				
Potamogeton obtusifolius			2.5				
Potamogeton perfoliatus		2.5	10				
Potamogeton robbinsii		10	10	37.5	37.5	10	
Ranunculus reptans		10					
Subularia aquatica	2.5	2.5					
Vallisneria americana	20	20	20	10	10		

Site: T-51

Basin Bay

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Bidens beckii			2.5	10	10		
Clatine minima	2.5	2.5					
Eleocharis acicularis	75	10	37.5				
Elodea canadensis			2.5				
Eriocaulon septangulare	2.5	2.5	2.5				
Heteranthera dubia	2.5	2.5	10				
Isoetes macrospora				10			
Juncus pelocarpus			10	10			
Lobelia dortmanna	2.5	2.5					
Myriophyllum alterniflorum	2.5	2.5					
Myriophyllum tenellum	75	75					
Najas flexilis			2.5	2.5	10		
Potamogeton foliosus			20	20	10		
Potamogeton gramineus	2.5	10	10	2.5			
Potamogeton perfoliatus	10	2.5	2.5	10			
Potamogeton robbinsii			20	20	20	75	
Potamogeton zosteriformis				20	20		
Ranunculus reptans			20				
Sagittaria graminea	37.5	37.5	10				
Subularia aquatica		2.5					
Vallisneria americana	20	20	10				

Survey Transect Data

Site: T-52

Basin Bay - South

Date: 7-20-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
<i>Bidens beckii</i>		2.5	10	2.5	2.5		
Charophytes	2.5	2.5	2.5	2.5	2.5		
<i>Elodea canadensis</i>	2.5	10					
<i>Elodea canadensis</i>	2.5	2.5	10	2.5	2.5		
<i>Heteranthera dubia</i>	2.5	20	2.5				
<i>Isoetes echinospora</i>	2.5	2.5					
<i>Isoetes macrospora</i>				2.5	75		
<i>Juncus pelocarpus</i>	2.5	2.5					
<i>Myriophyllum alterniflorum</i>	2.5	2.5					
<b><i>Myriophyllum spicatum</i></b>	2.5	2.5	2.5	2.5			
<i>Myriophyllum tenellum</i>	2.5	2.5					
<i>Potamogeton amplifolius</i>		10	20	2.5			
<i>Potamogeton friesii</i>					2.5		
<i>Potamogeton gramineus</i>		2.5					
<i>Potamogeton perfoliatus</i>	10	2.5	2.5				
<i>Potamogeton praelongus</i>			10	2.5	2.5		
<i>Potamogeton pusillus</i>				2.5			
<i>Potamogeton robbinsii</i>	2.5	10	75	75	2.5		
<i>Potamogeton spirillus</i>		2.5					
<i>Potamogeton zosteriformis</i>			2.5	2.5			
<i>Ranunculus longirostris</i>	2.5	2.5	10				
<i>Ranunculus reptans</i>							
<i>Sagittaria graminea</i>	20	37.5					
<i>Sagittaria latifolia</i>	10	10					
<i>Vallisneria americana</i>	10	10	2.5	2.5	2.5		

Survey Transect Data

Site: T-54a

Date: 7/17/98

Bolton Bay - Mohican Rd.

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5						
Flatine minima	2.5						
Eleocharis acicularis	10						
Elodea canadensis				2.5	2.5		
Eriocaulon septangulare	10	2.5					
Heteranthera dubia	2.5		2.5	2.5			
Isoetes echinospora	2.5	2.5					
Juncus pelocarpus	37.5	37.5	2.5				
Lobelia dortmanna	10	2.5					
Myriophyllum tenellum	37.5	37.5	10				
Najas flexilis			2.5	10			
Potamogeton amplifolius			2.5	10	10		
Potamogeton gramineus	2.5	2.5	10	2.5			
Potamogeton perfoliatus	2.5	2.5	2.5	2.5			
Potamogeton praelongus				10	10		
Potamogeton robbinsii		2.5	2.5	10	75	75	
Potamogeton vaseyi				2.5			
Potamogeton zosteriformis				2.5	2.5		
Ranunculus longirostris			2.5	2.5			
Ranunculus reptans	2.5	2.5	2.5				
Sagittaria graminea	2.5	2.5	2.5				
Subularia aquatica							
Vallisneria americana	2.5	2.5	10	10	2.5		

Site: T-55

Date: 7/20/98

Bolton Bay - Stewart Brook

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Bidens beckii			2.5		2.5		
Ceratophyllum demersum	2.5	2.5					
Charophytes		2.5	20	2.5	2.5	37.5	
Elodea canadensis		2.5	2.5	2.5			
Heteranthera dubia		10					
Isoetes echinospora		10					
Lobelia dortmanna	2.5	20					
Myriophyllum alterniflorum	2.5	37.5					
Myriophyllum tenellum		2.5					
Potamogeton amplifolius			10	10	2.5		
Potamogeton gramineus		2.5	10	10	2.5		
Potamogeton perfoliatus	10	2.5	2.5	2.5			
Potamogeton robbinsii			10	20	75	2.5	
Potamogeton spirillus		2.5	2.5				
Potamogeton zosteriformis					2.5		
Ranunculus longirostris			2.5	10	2.5		
Ranunculus reptans		20	37.5				
Sagittaria graminea		10					
Vallisneria americana	10	2.5	20	10	10		



Survey Transect Data

Site: T-56a

June 30-98

Sawmill Bay @ Braley Point

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes		2.5					
Elodea canadensis		20	10	10	10	10	10
Isoetes echinospora		20					
Lindernia sp.		37.5	20				
Lobelia dortmanna		20					
Myriophyllum alterniflorum		20	10				
Myriophyllum tenellum		37.5					
Potamogeton gramineus		20	20				
Potamogeton perfoliatus		37.5	20	10			
Potamogeton praelongus						10	10
Potamogeton robbinsii		10	50	75	75	75	75
Ranunculus longirostris		20	37.5				
Ranunculus reptans		37.5	20				
Sagittaria graminea	10	75	10				
Vallisneria americana	10	37.5	10	10	2.5		

Site: T-57

Date: 6-30-98

NWB - Braley and Pioneer Point

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5	10	37.5	10	20	20	
Elatine minima	2.5	2.5	2.5				
Elodea canadensis		2.5	10	10	10	2.5	
Isoetes echinospora		2.5	10	10	2.5		
Lobelia dortmanna	2.5						
Myriophyllum tenellum	75	37.5					
Potamogeton amplifolius				10	10		
Potamogeton gramineus		10	2.5	10	2.5		
Potamogeton perfoliatus		10	2.5	2.5	2.5		
Potamogeton pusillus		2.5	2.5	2.5	2.5	2.5	
Potamogeton robbinsii			2.5	10	10	37.5	
Ranunculus longirostris		2.5	2.5	10	2.5		
Sagittaria graminea	2.5	10	37.5	20			
Sparganium sp.		2.5					
Vallisneria americana	2.5	2.5	2.5	2.5	2.5	2.5	

Survey Transect Data

Site: T-60

Date: June 30, 1998

NWB - Polehill Pond Brook

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes		2.5	10	10			
Elodea canadensis		10					
Isoetes echinospora			10				
Juncus pelocarpus			20				
Lindernia sp.		2.5		10	10		
Myriophyllum alterniflorum		10					
Potamogeton gramineus	10	20	10	10	10		
Potamogeton perfoliatus		2.5			10		
Potamogeton praelongus			10				
Potamogeton zosteriformis			10				
Ranunculus longirostris			37.5				
Ranunculus reptans				20	20		
Sagittaria graminea		10					
Sparganium sp.		10	10				
Vallisneria americana	10	10	37.5	10	10		

Survey Transect Data  
 Site: T 61  
 June 30 1998

NWB - Wingpond Brook

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Brasenia schreberi	10						
Charophytes	2.5	2.5	2.5	2.5			
Elatine minima	2.5	2.5	2.5				
Eleocharis acicularis	10	2.5					
Elodea canadensis	2.5	2.5	2.5	2.5			
Enocaulon septangulare	37.5	20					
Fontinalis sp.	2.5						
Isoetes echinospora	2.5	2.5	2.5	2.5			
Juncus pelocarpus	2.5	10					
Lobelia dortmanna	2.5						
Myriophyllum tenellum		2.5	2.5				
Potamogeton gramineus	2.5	2.5	2.5	2.5			
Potamogeton perfoliatus		2.5					
Potamogeton pusillus	2.5	2.5		2.5			
Ranunculus longirostris	10	2.5	2.5	2.5			
Ranunculus reptans	2.5	2.5					
Sagittaria graminea	2.5	2.5					
Sparganium sp.	2.5	2.5	2.5				
Vallisneria americana	2.5	2.5	2.5	2.5			

Site: T 62  
 Date: 6/30/98

NWB - NNF Walker Point

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	10	10	10	10	10	10	
Elodea canadensis			2.5				
Enocaulon septangulare	2.5	10					
Isoetes echinospora			2.5				
Juncus pelocarpus		10					
Lindernia sp.	2.5	10					
Lobelia dortmanna	2.5	2.5	10				
Najas flexilis							
Potamogeton gramineus	10	10	10				
Potamogeton robbinsii						37.5	37.5
Ranunculus reptans				10	10	10	10

## Survey Transect Data

Site: T-63a

Date: 6/30/98

NWB - head of bay

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes				2.5	2.5	2.5	2.5
Isoetes macrospora				2.5	2.5	10	37.5
Potamogeton amplifolius					2.5		
Potamogeton gramineus		2.5	2.5				
Potamogeton perfoliatus			2.5				
Potamogeton pusillus				2.5	2.5	2.5	
Potamogeton robbinsii				2.5	2.5	10	2.5
Potamogeton zosteriformis				2.5			
Sparganium sp.	2.5	2.5	2.5				
Utricularia vulgaris				2.5			
Vallisneria americana		2.5	10	2.5			

Site: T 65+68

Date: 6/30/98

NWB - SE Rear Point

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes		10					
Eleocharis acicularis		10					
Elodea canadensis		2.5					
Eriocaulon septangulare		10					
Isoetes echinospora	2.5	7.5					
Lindernia sp.		2.5					
Potamogeton amplifolius		37.5	37.5				
Potamogeton gramineus		10	10				
Potamogeton perfoliatus		10					
Potamogeton robbinsii						37.5	
Potamogeton zosteriformis						2.5	
Sagittaria graminea		37.5	37.5				
Sparganium sp.	2.5	20					
Utricularia vulgaris		10					
Vallisneria americana		2.5	2.5				

Site: T-68

Date: 6/30/98

NWB between Bear &amp; Fan Point

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Bidens bockii	2.5	2.5	2.5				
Charophytes	10	2.5	2.5	2.5	2.5	10	
Elodea canadensis	2.5	2.5	2.5	2.5	2.5		
Heteranthera dubia		2.5	2.5				
<b>Myriophyllum spicatum</b>	2.5	37.5	7.5	37.5	10	2.5	
Potamogeton crispus		2.5					
Potamogeton amplifolius			2.5	2.5			
Potamogeton foliosus	2.5	10	2.5	2.5			
Potamogeton gramineus	2.5	2.5	2.5	2.5			
Potamogeton perfoliatus	2.5	2.5	2.5	2.5			
Potamogeton praelongus			2.5	10			
Potamogeton robbinsii		20	10	37.5	37.5		
Potamogeton vaseyi	2.5	2.5					
Potamogeton zosteriformis		2.5	2.5	2.5			
Ranunculus longirostris		2.5	2.5				
Sparganium sp.	2.5	2.5					
Vallisneria americana	2.5	2.5	2.5	10			

Survey Transect Data

Site: T-68a

NWB - S of Fan Point

Date: 7-29-98

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Bidens beckii					2.5		
Charophytes		2.5	2.5	10	2.5	2.5	2.5
Elatine minima	2.5						
Elodea canadensis				2.5	2.5	10	
Eriocaulon septangulare	2.5	2.5					
Heteranthera dubia		2.5	2.5				
Isoetes echinospora	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>Myriophyllum spicatum</b>	2.5	37.5	7.5	37.5	10	2.5	
Najas flexilis			10	10	10		
Potamogeton amplifolius			2.5	10			
Potamogeton crispus		2.5					
Potamogeton foliosus	2.5	10	2.5	2.5			
Potamogeton gramineus		10	10				
Potamogeton perfoliatus			2.5				2.5
Potamogeton praelongus			2.5	10			
Potamogeton pusillus			2.5		2.5	2.5	
Potamogeton robbinsii			2.5	2.5	10	2.5	10
Potamogeton spirillum				2.5			
Potamogeton vaseyi	2.5	2.5					
Potamogeton zosteriformis		2.5	2.5	2.5			10
Ranunculus longirostris			2.5				
Sagittaria graminea	2.5	10					
Sparganium sp.	2.5						
Vallisneria americana		2.5	2.5	2.5	2.5		

Site: T-68b

22-Sep-98

NF Little Harbor Island

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	10	2.5	2.5	10	10	7.5	7.5
Elatine minima	2.5	2.5					
Eleocharis acicularis	2.5	2.5					
Elodea canadensis					2.5		
Eriocaulon septangulare	10	7.5					
Isoetes echinospora	2.5				10		
Juncus pelocarpus		10					
Lobelia dortmanna	2.5	2.5					
Myriophyllum tenellum	20						
Najas flexilis		2.5					
Potamogeton amplifolius	2.5	10	10				
Potamogeton foliosus		2.5	2.5				
Potamogeton gramineus	10	10					
Potamogeton perfoliatus	2.5	2.5					
Potamogeton pusillus			2.5	2.5	2.5	2.5	
Potamogeton richardsonii				2.5			
Potamogeton robbinsii				10	2.5		
Subularia aquatica	2.5						
Vallisneria americana		10	20				

Site: T-69

Date: 8-4-98

SW French Point

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Charophytes	2.5	2.5	2.5	2.5	2.5	2.5	
Elatine minima	2.5	2.5	2.5				
Elodea canadensis			20				
Heteranthera dubia			2.5				
Isoetes echinospora		2.5	10				
<b>Myriophyllum spicatum</b>			2.5				
Najas flexilis		2.5	2.5				
Potamogeton gramineus	2.5	2.5	10				
Potamogeton pusillus			2.5	37.5	20	20	2.5
Potamogeton spirillum		2.5	2.5				
Sparganium sp.		2.5					

Survey Transect Data

Site: T 70

Date:

N of E & W Dollar Islands

4-Aug-98

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes							2.5
Isoetes macrospora					20	75	2.5
Najas flexilis				20	20	10	2.5
Potamogeton friesii				2.5	2.5		
Potamogeton gramineus				10	10	10	

Site: T-70a

Date: 08/4/98

N of E & W Dollar Islands

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5						
Elatine minima	2.5	2.5					
Eriocaulon septangulare	10	2.5					
Isoetes echinospora	2.5	2.5	2.5				
Juncus pelocarpus	2.5	2.5					
Lobelia dortmanna	2.5	2.5					
Myriophyllum tenellum	2.5	2.5					
Najas flexilis			2.5	10	20		
Potamogeton gramineus		2.5	2.5				
Vallisneria americana		2.5	2.5	2.5			

Site: T-70b

Date:

NW of Three Sirens Islands

4-Aug-98

Species	Depth Interval (m)						
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Bidens beckii			2.5	10	10		
Charophytes		10	10	10	10	10	10
Elatine minima	20	10					
Elodea canadensis	10	20	10	10			
Eriocaulon septangulare	10						
Heteranthera dubia			10	10			
Isoetes echinospora	10	10					
Isoetes macrospora				10	10	10	2.5
Lobelia dortmanna	10	10					
Myriophyllum tenellum		10					
Najas flexilis				10			
Potamogeton amplifolius		20	10	10			
Potamogeton friesii		10		10			
Potamogeton gramineus	20	37.5	10				
Potamogeton perfoliatus	10	10		10			
Potamogeton praelongus			10	10			
Potamogeton pusillus							
Potamogeton robbinsii		10	20	20	20		
Ranunculus longirostris	10	20	10				
Sagittaria graminea	10	10					
Sparganium sp.	10						
Subularia aquatica	2.5						
Utricularia resupinata	10						
Vallisneria americana	10	37.5	37.5				

Survey Transect Data

Site: T-93

Bay S of Black Mt. Point

Date:

3-Aug-98

Depth Interval (m)

Species	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Charophytes	2.5	2.5	2.5	2.5			
Elatine minima	2.5	2.5					
Eriocaulon septangulare	37.5	37.5					
Isoetes echinospora			2.5	2.5	2.5		
Lobelia dortmanna	2.5	2.5					
Myriophyllum tenellum	2.5	2.5					
Najas flexilis		2.5	20	10	10		
Potamogeton gramineus	2.5	2.5					
Potamogeton perfoliatus			2.5				
Potamogeton pusillus			2.5	2.5	2.5		
Potamogeton robbinsii			2.5	10			
Potamogeton spirillus			2.5				
Vallisneria americana		2.5	2.5	20	2.5		

Site: T 94

Bay S of Red Rock Bay

Date:

3-Aug-98

Depth Interval (m)

Species	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-6</u>	<u>6-7</u>
Bidens beckii		2.5	2.5	2.5			
Charophytes	2.5	2.5	2.5	2.5	2.5		
Elatine minima	2.5	2.5					
Eriocaulon septangulare	10	7.5	2.5				
Isoetes echinospora			2.5	2.5	10		
Juncus sp.	10	10					
Lobelia dortmanna	2.5						
<b>Myriophyllum spicatum</b>			2.5				
Myriophyllum tenellum	10	2.5					
Najas flexilis	2.5	10	10	10	2.5		
Potamogeton foliosus			2.5				
Potamogeton gramineus		2.5	10	2.5			
Potamogeton perfoliatus	2.5	2.5	10	2.5			
Potamogeton praelongus			10				
Potamogeton pusillus			2.5	2.5	10		
Potamogeton robbinsii		2.5	10	37.5	37.5		
Potamogeton spirillus	2.5	2.5	2.5				
Potamogeton zosteriformis			2.5				
Ranunculus longirostris			2.5				
Vallisneria americana	10	10	37.5	37.5	37.5		

Survey Transect Data

Site: T-101

Finkle Brook - FWI

Date: July 2, 1998

Species	Depth Interval (m)						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
<i>Bidens beckii</i>	10	10	2.5				
<i>Eleocharis acicularis</i>	10	20	20				
<i>Heteranthera dubia</i>	2.5	10					
<i>Isoetes macrospora</i>	10						
<i>Juncus</i> sp.	10	10					
<i>Lobelia dortmanna</i>	2.5	10	10				
<i>Myriophyllum alterniflorum</i>		2.5					
<b><i>Myriophyllum spicatum</i></b>	75	37.5	20				
<i>Najas flexilis</i>			20				
<i>Potamogeton foliosus</i>		10	10				
<i>Potamogeton gramineus</i>	20	37.5	37.5	10			
<i>Potamogeton praelongus</i>		20	37.5	37.5			
<i>Potamogeton zosteriformis</i>	20	20	37.5				
<i>Ranunculus longirostris</i>	20	20	10	10			
<i>Sagittaria graminea</i>			2.5				
<i>Sparganium</i> sp.	20	37.5	75	37.5			