

FINAL REPORT

The Macrophyte and Macroinvertebrate Populations  
Of Three Areas of Lake Onalaska  
(Pool 7, Mississippi River) Following  
the Mechanical Harvesting of Aquatic Macrophytes

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The Northern Prairie Wildlife Field Laboratory (FWS) for providing waterfowl census data for Lake Onalaska.

### Abstract

Following the mechanical harvesting of aquatic macrophytes during the summer of 1979 in selected areas of Lake Onalaska (Pool 7, Mississippi River), macrophytes and macroinvertebrate populations were surveyed throughout the growing season in experimental (harvested) areas and in adjacent control (unharvested) areas.

The Mean biomass ( $\text{g/m}^2$ ) of macrophytes was reduced in experimental plots by harvesting. Statistically, however, the reduction in biomass was significant only at the 90% level of confidence, and then at only two of the three harvest sites and only for one week following the harvest operation. The dominant plant species were reduced by harvesting, but these (and other) macrophytes species rapidly repopulated harvested areas. On four other occasions the estimated macrophyte biomasses of experimental areas were significantly ( $P = 0.05$ ) less than those of control areas, but there was no apparent correlation between the biomass reduction and the time sequence of Mechanical harvesting.

Throughout the post-harvest period, the numbers and biomasses of both benthic and epiphytic invertebrates did not differ significantly ( $P = 0.05$ ) in experimental and control areas.

## Introduction

Lake Onalaska is a shallow (mean depth of 1.7m) 5,400-acre impoundment formed within Pool 7 of the Mississippi River (Figure 1). Three surface water sources (Mississippi and Black Rivers and Halfway Creek) contribute water to the lake. Various and variable currents exist depending on fluctuations of river levels, precipitation, and prevailing winds. Generally, the lake is considered eutrophic, has a sandy bottom often covered with organic material and muck, and is characterized by extensive and luxuriant growths of rooted aquatic macrophytes. As a result of its high primary production and its relationship to the Mississippi River, Lake Onalaska constitutes a substantial fishery resource and is an important feeding area for migratory waterfowl.

The lake is, in part, under the managerial control of the U.S. Fish and Wildlife Service as a part of the Upper Mississippi River Refuge System. As a component of Pool 7 of the Mississippi River, the lake is also influenced by navigation-related activities of the U.S. Army Corps of Engineers which maintains the dams, locks, and navigation channel of the Mississippi River. Since the lake borders the state of Wisconsin, the state Department of Natural Resources also has an interest in the resource. Finally, the Lake Onalaska Protection and Rehabilitation District, constituted by state statute and composed of Wisconsin lakeshore land owners (most of whom maintain year-around residences along the shore), has a concern for Lake Onalaska. A major concern of the Lake District has been that of restricted accessibility to the lake due to extensive summer accumulation of aquatic

macrophytes.

In June of 1979, the Lake District received permission from the U.S. Fish and Wildlife Service to harvest and remove aquatic macrophytes on a limited basis during 1979. One of the conditions of the harvesting permit was that the Lake District conduct a biological monitoring study to determine the effects of harvesting on aquatic macrophytes and macroinvertebrates. Subsequently, the Lake District contracted with Viterbo College to provide the biological monitoring. The College agreed to perform quantitative and qualitative collection and analysis of macrophyte and macroinvertebrate populations on a weekly or bi-weekly basis, from each harvested site and an adjacent control (unharvested) area. The analysis was to include evaluation, by species or other taxonomic unit, of the numbers and biomasses of organisms with particular thrust toward comparison of harvested and unharvested areas and attention to repopulation following the harvest operation(s). However, the limited financial resources of the Lake District did place constraints on the scope of the study.

This is the final report of the biological monitoring study.

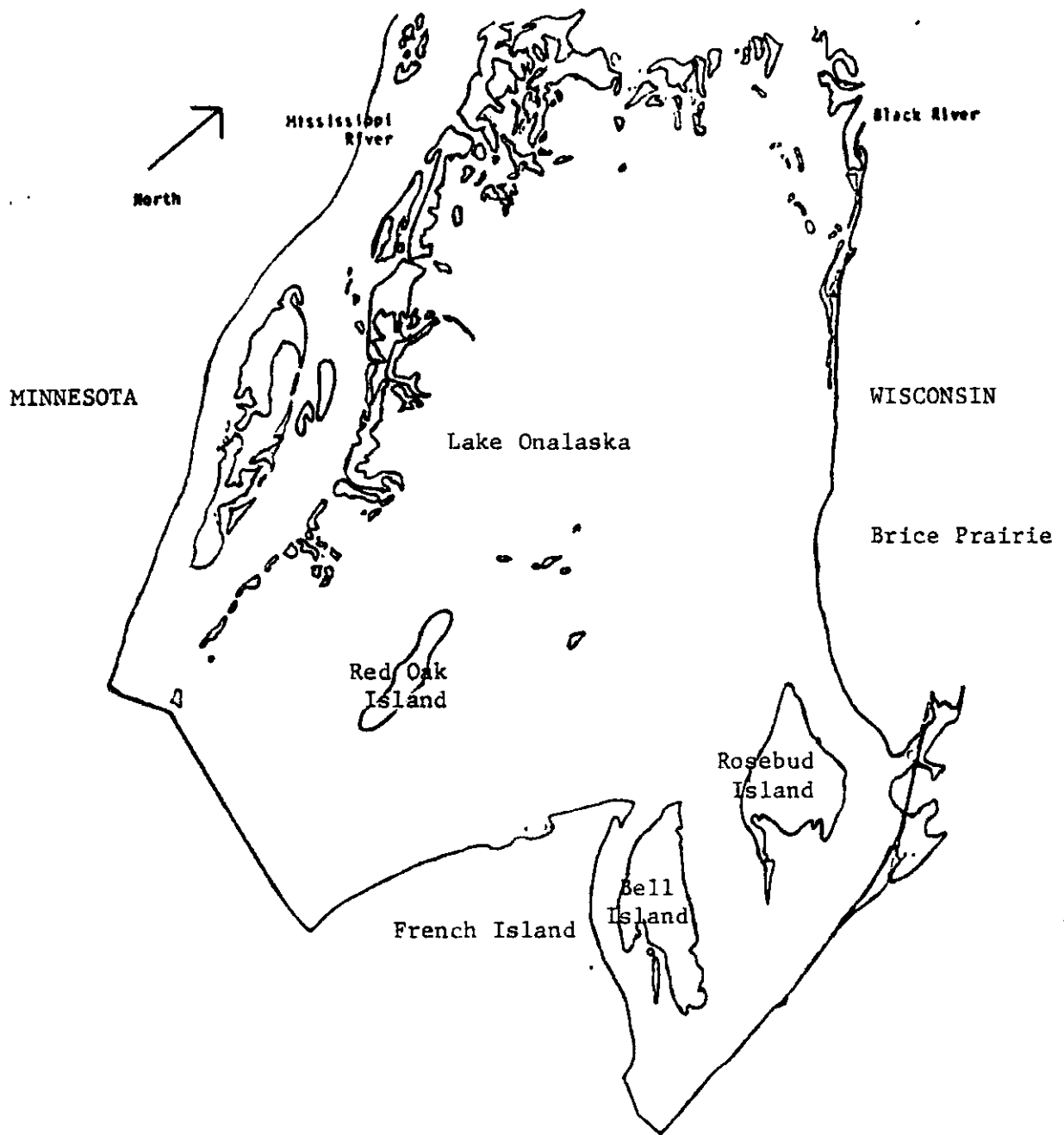


Figure 1. Lake Onalaska of Pool 7, Mississippi River

## Materials and Methods

### Study Sites

The Lake District designated three two-hectare study sites. Site I was near Schafer's Landing; Site II was on the south-east side of Rosebud Island; and Site III was in the bay of the LaCrosse Sailing Club (Figure 2). Each site consisted on one hectare of experimental area (harvested) and one hectare of control area (unharvested). The subdivisions of each site were marked at each corner with willow stakes and buoys.

### Macrophyte Harvesting

Aquatic plants were harvested to a depth of five feet by a commercial harvester. The experimental areas of all three sites were harvested during the second week of July (10-12). Sites I and II were subsequently harvested again on August 7-9.

### Collection Dates

Macrophytes and epiphytic and benthic macroinvertebrates were collected. The numbers of samples and dates of collection are shown in Table 1.

### Collection Methods

The specific potential collection areas were predetermined for both the experimental and control plots of each study site (Figure 3). On each sampling date, the specific locations from which samples were to be collected were selected using a table of random numbers.



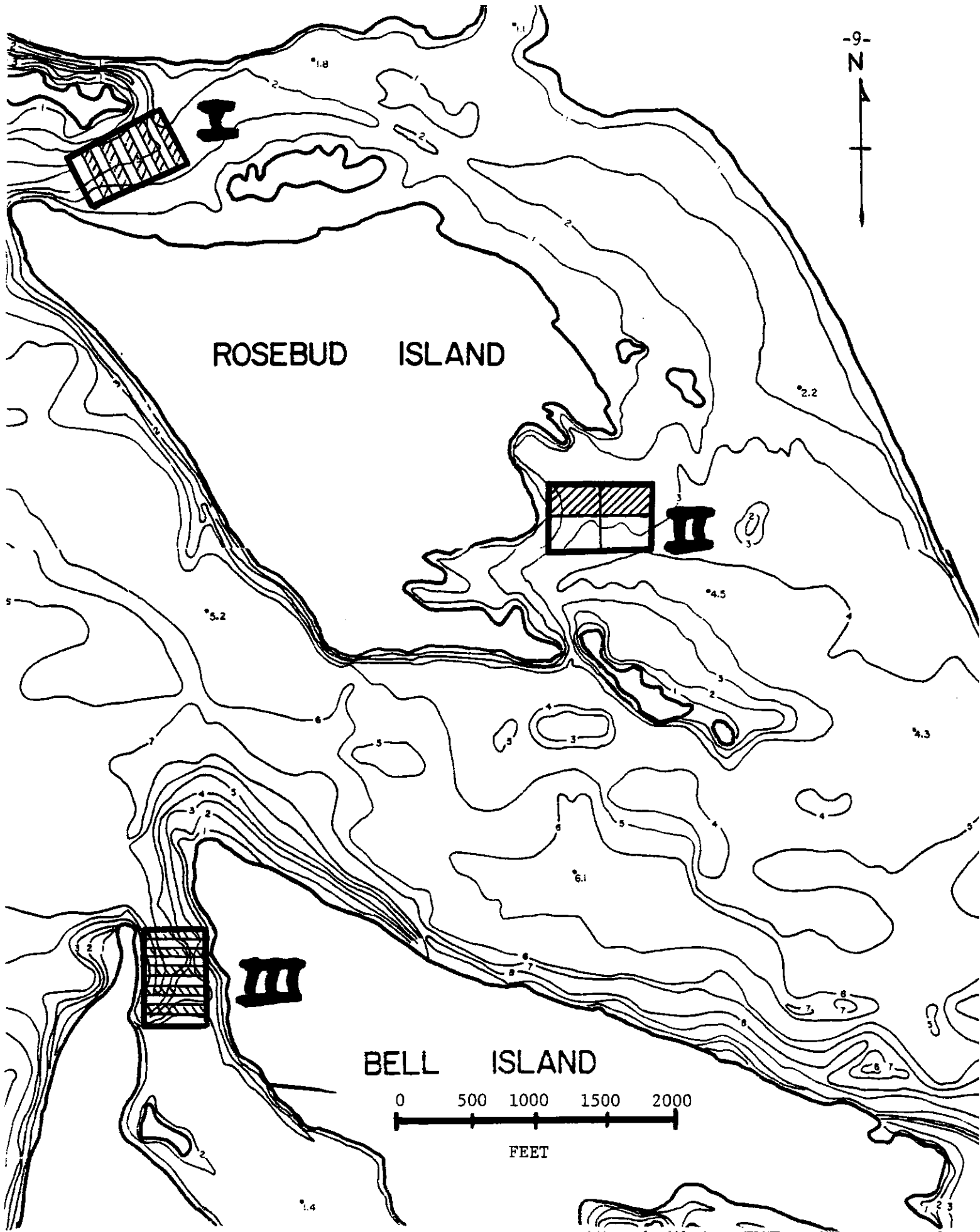


Figure 2. Location of the three experimental harvesting areas in Lake Onalaska. At each site, the cut area is indicated by cross-hatching. Site I= Schafer's Landing; Site II=Rosebud Island; Site III=Sailing Club.

The macrophyte sampler was a square metal enclosure, 0.5m on the side and 1.2m high. This device was lowered over the side of the boat and pushed securely into the substrate at each designated sampling location. The macrophytes (including underground parts) included within the device were then collected with a garden rake and by hand. Samples were placed in coded polyethylene bags, transported to the laboratory, and stored at 8-10°C until analyzed.

Table 1. Number of samples taken at sites and collection dates.

Date	SITES					
	I		II		III	
	Control	Experimental	Control	Experimental	Control	Experimental
7/14*	6	6	3	3	6	6
7/21	6	6	3	3	6	6
7/28*	3	3	3	3	3	3
8/4	3	3	3	3	3	3
8/11*	3	3	3	3	3	3
8/20	3	3	3	3	3	3
9/1*	3	3	3	3	3	3
9/15*	3	3	3	3	3	3
9/29*	4	4	0	0	4	4
10/13*	4	4	0	0	4	4
10/27*	4	4	0	0	4	4
11/10*	0	0	0	0	3	3

\*Collection dates for benthic and epiphytic invertebrates; macrophytes were collected on all dates listed.

SITE I

21	21	16	16	11	11	6	6	1	1
22	22	17	17	12	12	7	7	2	2
23	23	18	18	13	13	8	8	3	3
24	24	19	19	14	14	9	9	4	4
25	25	20	20	15	15	10	10	5	5
C	E	C	E	C	E	C	E	C	E

SITE II

C	1	2	3	4	5
E	1	2	3	4	5

SITE III

13	13	10	10	7	7	4	4	1	1
14	14	11	11	8	8	5	5	2	2
15	15	12	12	9	9	6	6	3	3
C	E	C	E	C	E	C	E	C	E

Figure 3. Illustrations of assignment of specific sampling locations within the collection sites I, II, and III. C=Control; E=Experimental

In the laboratory, macrophytes were washed by hand under a stream of water to remove debris and epiphytes, which were saved. Plants were identified and separated according to species and dried in a forced-draft oven at 60°C for 24 hours, after which dry weights were determined.

Benthic samples were taken with an Ekman bottom grab (6" X 6") by lowering the grab into the metal enclosure after the macrophytes had been collected. Benthos samples were washed in a screened bucket, bottled, and transported to the laboratory. Samples were preserved with FAA and stained with Rose Bengal. Both benthic and epiphytic invertebrates were sorted (most according to genus or family), counted, and dried.

The dry weights of all taxonomic groups of all samples were expressed as biomass in grams per square meter ( $g/m^2$ ).

#### Data Analysis

Statistical probabilities that differences existed among sampling sites or between harvested and unharvested areas were determined by analysis of variance of mean values of samples collected on all dates. The analysis was performed on the biomass of macrophytes, benthic invertebrates, epiphytic invertebrates, and total invertebrates. This analysis was also performed on the numbers/ $m^2$  for the invertebrates

Comparison between control and experimental areas at every site on every individual sampling date were made by Student's t-test.

#### Water Analysis

Chemical and physical water analysis data was provided by the U.S. Fish and Wildlife Service, which performed monthly analysis of control and experimental areas (Tables 1-4, Appendix).

Waterfowl Utilization

Utilization by waterfowl of the lakeshore area was studied by the District Researcher and several lakeshore residents. A description of that study and a tabular summary of the data is in the Appendix (Figure 1, Insert 1, and Tables 5-8).

## Results

During the study, a total of 101 individual control samples of macrophytes and 150 invertebrate samples were collected; a like number of experimental samples (from harvested areas) were analyzed. Eighteen different species of plants were identified, and 88 taxa of invertebrates were found. The numbers of taxa collected at each harvest site are shown in Table 2.

Table 2. Numbers of different taxonomic groups of organisms at three sites on Lake Onalaska, 1979.

Collection Site	Macrophytes	Benthic Invertebrates	Epiphytic Invertebrates	All Invertebrates
I (Schafer's Landing)	14	35	48	60
II (Rosebud Island)	14	29	34	45
III (Sailing Club)	12	47	53	72

A more detailed listing of numbers of taxa collected at each site throughout the study period is shown in Table 3 of the Appendix, and the comprehensive listing of data by taxonomic name, biomass, and numbers of individuals is presented in Tables 12-20 of the Appendix.

Mean values for biomasses and numbers of individual organisms on each of the several sampling dates are shown in Tables 3-C. Statistically, there were only three occasions (sampling dates) when a significant difference ( $p=0.05$ ) was observed between macrophyte biomass at control and experimental areas and these all occurred at Site I (Schafer's Landing). On a daily basis, there was never a significant

difference ( $p=0.05$ ) between control and experimental areas with regard to invertebrate biomass. On one occasion (Site II), there were significantly ( $p=0.05$ ) more benthic invertebrates at the experimental area than at the control area.

When the daily samples at individual sites were pooled and statistical comparisons were made between control and experimental areas over the entire sampling period, there was a probability of significant difference (at the 85-89% level of confidence) for all three harvest sites with regard to macrophyte biomass (Table 7). That is, there was an overall reduction of plants in harvested areas. Analysis of the mean invertebrate populations at control and experimental areas over the duration of the study, revealed no significant difference in either benthic or epiphythic invertebrates relative to macrophyte harvesting at any of the three sites (Table 7).

Table 3. Total mean biomass (g/m<sup>2</sup>) of macrophytes (all species combined) collected from Lake Onalaska. Standard deviations given in parentheses.

Date	Site I		Site II		Site III	
	Control	Experimental	Control	Experimental	Control	Experimental
7/14	95.1 (85.5)	27.7 <sup>2</sup> (15.7)	176.4 (47.7)	85.0 <sup>2</sup> (52.6)	56.4 (77.2)	5.2 (9.2)
7/21	185.8 (159.4)	59.0 (40.6)	178.8 (115.7)	104.4 (60.3)	38.9 (63.0)	19.9 (44.0)
7/28	190.1 (192.1)	136.8 (173.2)	247.7 (120.2)	92.8 (114.5)	45.5 (51.3)	38.3 (76.6)
8/4	69.9 (51.4)	283.8 <sup>1</sup> (34.4)	218.9 (112.4)	136.8 (76.0)	97.1 (95.5)	59.5 (52.2)
8/11	143.8 (67.5)	55.1 (36.4)	234.8 (138.7)	25.5 <sup>1</sup> (15.4)	125.0 (121.9)	65.8 (59.6)
8/20	340.4 (186.8)	137.1 (163.2)	201.7 (31.7)	322.4 (367.1)	40.5 (24.4)	42.8 (48.2)
9/1	247.6 (36.3)	79.0 <sup>1</sup> (72.4)	250.9 (235.5)	326.4 (113.6)	45.3 (14.8)	55.0 (38.1)
9/15	384.1 (137.9)	51.9 <sup>1</sup> (70.0)	350.4 (73.3)	220.4 (101.5)	92.5 (32.3)	48.1 (45.1)
9/29	329.4 (242.1)	322.8 (370.6)	-	-	163.3 (110.0)	28.0 (25.9)
10/13	473.7 (150.2)	337.8 (154.5)	-	-	15.5 (13.7)	26.9 <sup>2</sup> (28.8)
10/27	271.0 (185.6)	265.7 (180.4)	-	-	63.7 (109.6)	2.0 (1.5)
11/10	-	-	-	-	13.2 (11.1)	53.9 (89.2)

<sup>1</sup> Significantly different from the control value at p=0.05  
<sup>2</sup> Significantly different from the control value at p=0.10



Table 4. Total mean biomass and numbers of individuals (all taxa included) of benthic invertebrates from Lake Onalaska.

Date	Site I			Site II			Site III					
	Control	Experimental		Control	Experimental		Control	Experimental				
	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>		
7/14	0.34 (0.32)	337 (307)	0.49 (0.26)	616 <sup>1</sup> (195)	0.29 (0.38)	502 (555)	0.55 (0.28)	788 <sup>2</sup> (561)	1.71 (1.44)	1555 (1081)	2.69 (2.55)	1039 (1027)
7/28	0.80 (0.32)	2050 (913)	0.90 (0.23)	1247 (1125)	0.33 (0.19)	602 (129)	1.17 (0.79)	2035 <sup>1</sup> (821)	8.85 (7.67)	1089 (871)	36.51 (49.36)	3555 (1939)
8/11	0.56 (0.34)	1032 (837)	0.49 (0.51)	502 (424)	1.93 (2.47)	1218 (1254)	0.82 (0.74)	516 (372)	2.12 (0.52)	2609 (861)	7.39 (6.41)	5997 <sup>1</sup> (3818)
9/1	0.55 (0.55)	1161 (1569)	0.22 (0.12)	315 (124)	0.17 (0.11)	487 (174)	1.39 (2.31)	1003 (870)	0.23 (0.15)	903 (276)	2.21 (2.93)	1247 (485)
9/15	0.34 (0.16)	201 (151)	0.71 (0.42)	459 <sup>2</sup> (66)	1.39 (1.75)	1691 (1062)	1.00 (0.90)	1742 (334)	8.05 (12.17)	774 (341)	0.39 (0.36)	674 (691)
9/29	0.68 (0.34)	882 (418)	0.47 (0.29)	398 <sup>2</sup> (102)	-	-	-	-	0.84 (0.56)	1000 (491)	0.54 (0.23)	796 (204)
10/13	1.26 (1.60)	1817 (1425)	0.45 (0.50)	1322 (1212)	-	-	-	-	1.42 (2.05)	1086 (863)	1.74 (1.74)	3257 (3596)
10/27	0.94 (0.95)	1548 (869)	0.98 (0.42)	1473 (792)	-	-	-	-	6.03 (9.10)	2075 (1156)	476.43 (938.54)	2333 (2663)
11/10	-	-	-	-	-	-	-	-	5.13 (5.88)	2731 (2767)	21.99 (35.89)	523 (255)

<sup>1</sup> Significantly different from the control value at p=0.05

<sup>2</sup> Significantly different from the control value at p=0.10

Table 5. Total mean biomass and numbers of individuals (all taxa combined) of epiphytic invertebrates from Lake Onalaska.

Date	Site I		Site II		Site III	
	Control	Experimental	Control	Experimental	Control	Experimental
	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>
7/14	0.16 (0.12)	159 (147)	0.13 (0.10)	192 (62)	0.13 (0.22)	161 (305)
7/28	0.33 (0.43)	140 (111)	0.06 (0.03)	103 (24)	0.12 (0.12)	211 (246)
8/11	0.21 (0.10)	333 (230)	0.19 (0.15)	403 (257)	0.09 (0.64)	128 (118)
9/1	0.13 (0.02)	327 (150)	0.09 (0.06)	120 (42)	0.08 (0.02)	213 (81)
9/15	0.22 (0.11)	612 (714)	0.19 (0.03)	849 (181)	8.19 (12.50)	376 (159)
9/29	0.26 (0.12)	613 (535)	-	-	173.03 (282.16)	2857 (2080)
10/13	0.16 (0.07)	753 (396)	-	-	0.23 (0.30)	961 (1422)
10/27	0.14 (0.10)	270 (335)	-	-	0.18 (0.18)	386 (424)
11/10	-	-	-	-	0.48 (0.61)	364 (467)
						0.02 (0.04)
						0.26 (0.24)
						0.06 (0.46)
						0.08 (0.06)
						1.29 (0.38)
						0.54 (0.45)
						0.24 (0.12)
						0.08 (0.08)
						1.37 (2.10)

] Significantly different from the control value at p=0.10

Table 6. Total mean biomass and numbers of individuals (all taxa combined) of invertebrates (benthic and epiphytic) from Lake Onalaska.

Date	Site I		Site II		Site III	
	Control	Experimental	Control	Experimental	Control	Experimental
	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>	g/m <sup>2</sup>	no. ind./m <sup>2</sup>
7/14	0.50 (0.34)	643 (292)	0.42 (0.40)	694 (610)	1.85 (1.45)	1717 (1304)
7/28	1.13 (0.75)	2190 (871)	0.34 (0.18)	705 (146)	8.97 (7.77)	1300 (1117)
8/11	0.77 (0.31)	1365 (813)	2.12 (2.40)	1621 (1027)	2.21 (0.48)	2737 (912)
9/1	0.68 (0.56)	1488 (1706)	0.26 (0.10)	607 (212)	0.30 (0.13)	1016 (348)
9/15	0.56 (0.13)	813 (854)	1.58 (1.78)	2541 (991)	16.24 (-)	1149 (-)
9/29	0.94 (0.45)	1495 (799)	-	-	173.87 (282.42)	3857 (2108)
10/13	1.41 (1.61)	2570 (1664)	-	-	1.65 (1.93)	2097 (1354)
10/27	1.07 (0.96)	1818 (926)	-	-	6.21 (9.26)	2461 (1488)
11/10	-	-	-	-	5.61 (5.63)	3145 (2617)
						g/m <sup>2</sup>
						no. ind./m <sup>2</sup>
						g/m <sup>2</sup>
						no. ind./m <sup>2</sup>

↓ Significantly different from the control value at p=0.10.

Table 7. Statistical probabilities\* that differences exist among sampling sites or between harvested and unharvested areas by analysis of the variance of mean values of samples collected on all dates.

Comparison	Invertebrates							
	Macrophytes		Benthos		Epiphytes		Both Benthos and Epiphytes	
	g/m <sup>2</sup>	g/m <sup>2</sup>	#/m <sup>2</sup>	#/m <sup>2</sup>	g/m <sup>2</sup>	#/m <sup>2</sup>	g/m <sup>2</sup>	#/m <sup>2</sup>
<u>Among Sites:</u>								
Controls (unharvested)	0.996	0.987	0.975	0.382	0.526	0.382	0.637	0.871
Experimental (harvested)	0.951	0.593	0.911	0.287	0.408	0.287	0.596	0.956
<u>Control vs. Experimental</u>								
Site I	0.894	0.548	0.739	0.355	0.594	0.355	0.006	0.818
Site II	0.852	0.321	0.577	0.281	0.640	0.281	0.445	0.354
Site III	0.893	0.713	0.598	0.407	0.685	0.407	0.492	0.408

\*A probability value of 1.000 indicates certainty; a value of 0.000 indicates no chance; a value of 0.500 represents a 50:50 possibility.

## Discussion

One would logically expect that there would be a reduction in biomass of macrophytes following the harvesting of plants. However, the mean biomasses of several samples of control and experimental plots taken within one week following the harvesting do not statistically demonstrate reduction in plant mass. Over the entire study, though, the mean collective biomass of all plant species was 29 to 38% less in experimental plots compared to respective control plots. Other differences were apparent, although not statistically demonstrable.

The statistical analyses applied to this data were simple comparisons to determine if differences existed between control and experimental plots. The comparisons failed to show the expected differences primarily because the degree of variance between samples was considerable. This variance could only be minimized by increasing the number of samples and/or reducing human error in the sampling procedure. High variance in such ecological samples is inherent, and it points to the fact that living organisms in natural environments are seldom dispersed in a random manner.

In spite of the variance and the constraints of limited numbers of samples, it is readily apparent that the macrophytes repopulated at remarkable rates following the harvest. If one examines the macrophyte biomass by species (Table 12 of the Appendix), it is evident that, immediately following the harvest, the dominant species of control plants were represented in experimental plots by reduced biomass. Other (or new) plant species, however, occurred in greater amounts in the experimental plots. Within three weeks of harvesting, most

macrophyte species had re-established their populations at levels indistinguishable from those of control plots. This biomass regeneration is shown graphically in Figures 4-7 for those observed macrophytes which serve as important waterfowl foods.

The numbers and biomasses of benthic invertebrates did not vary between control and experimental plots throughout the study. This is not surprising since most of these benthic organisms are found in the substrate quite independently of living vegetation in the water above.

The variance within samples of epiphytic invertebrates was considerable; these organisms showed no difference between experimental and control plots.

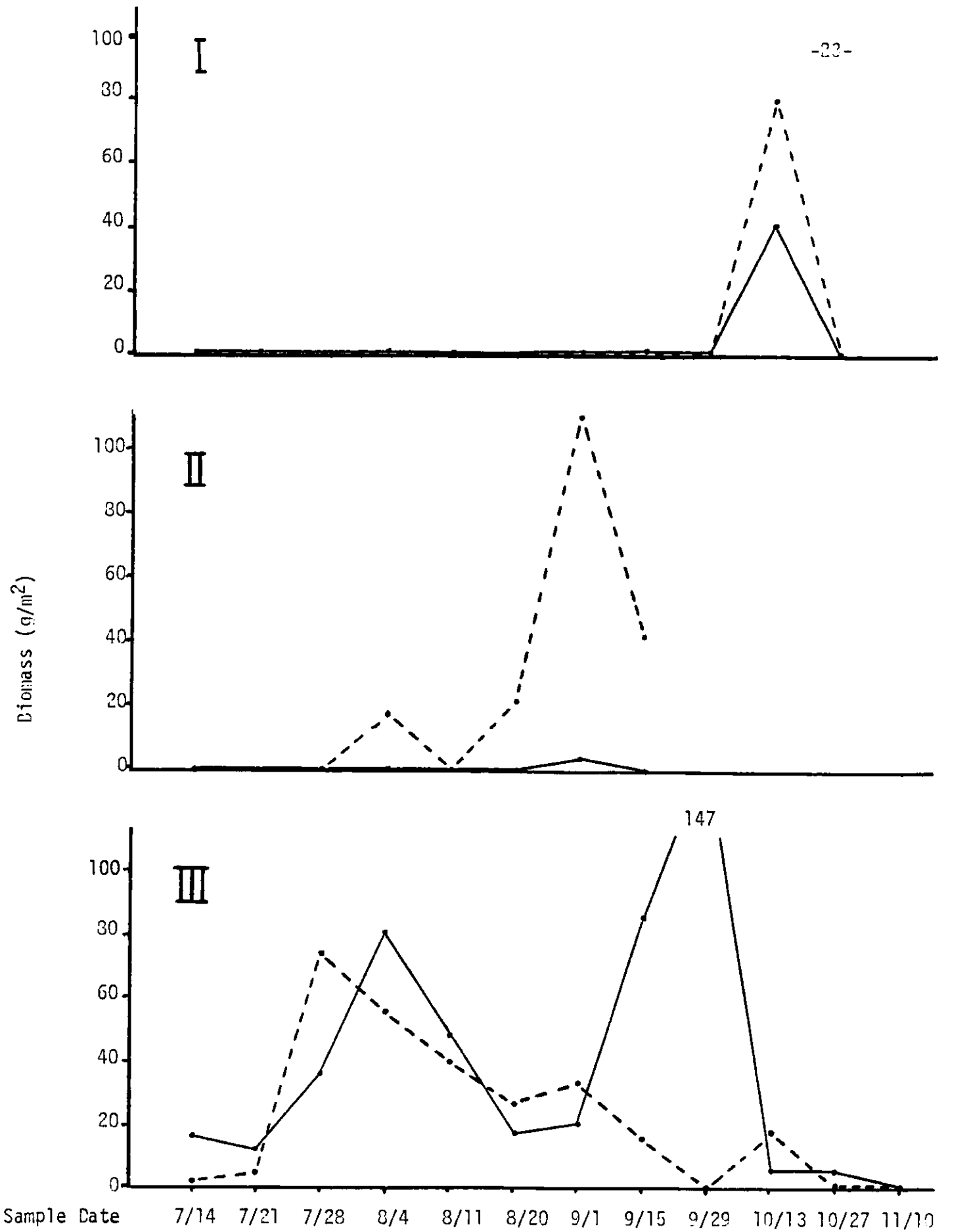


Figure 4. Comparison of Vallisneria biomass at control (—) and experimental (---) areas

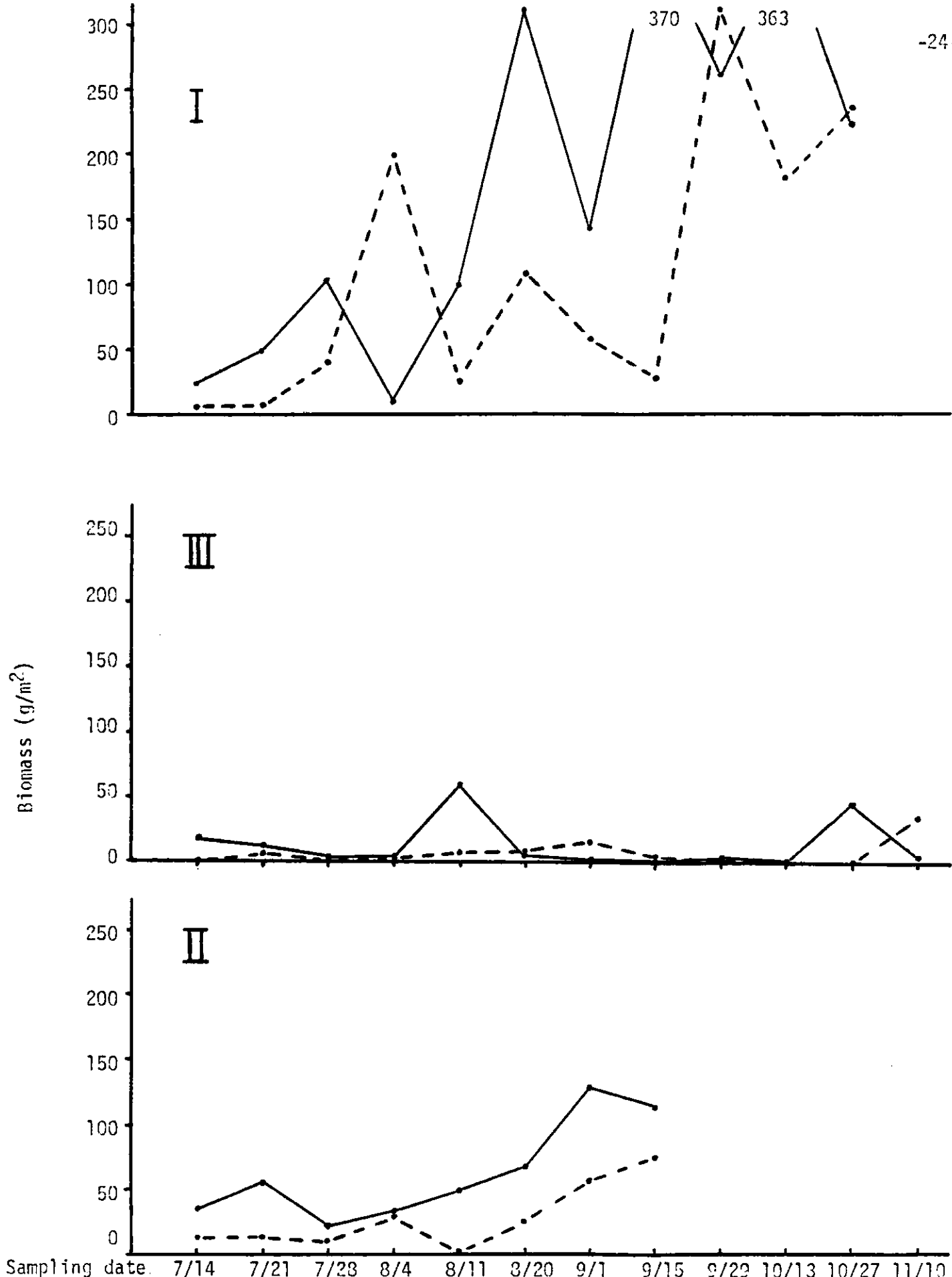


Figure 5. Comparison of *Anacharis* (2 species) biomass at control (—) and experimental (---) areas.



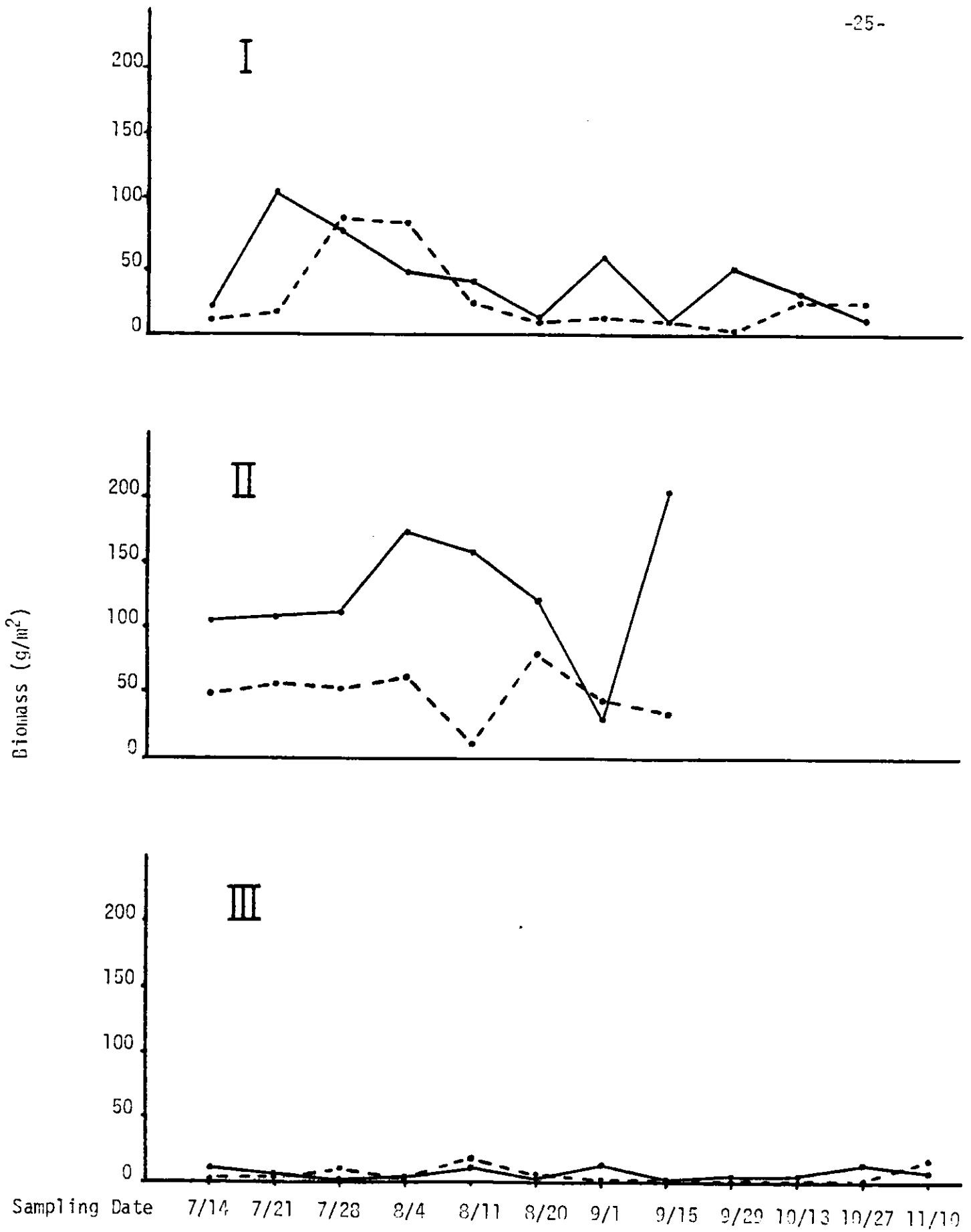


Figure 6. Comparison of Ceratophyllum biomass at control (—) and experimental areas (---)

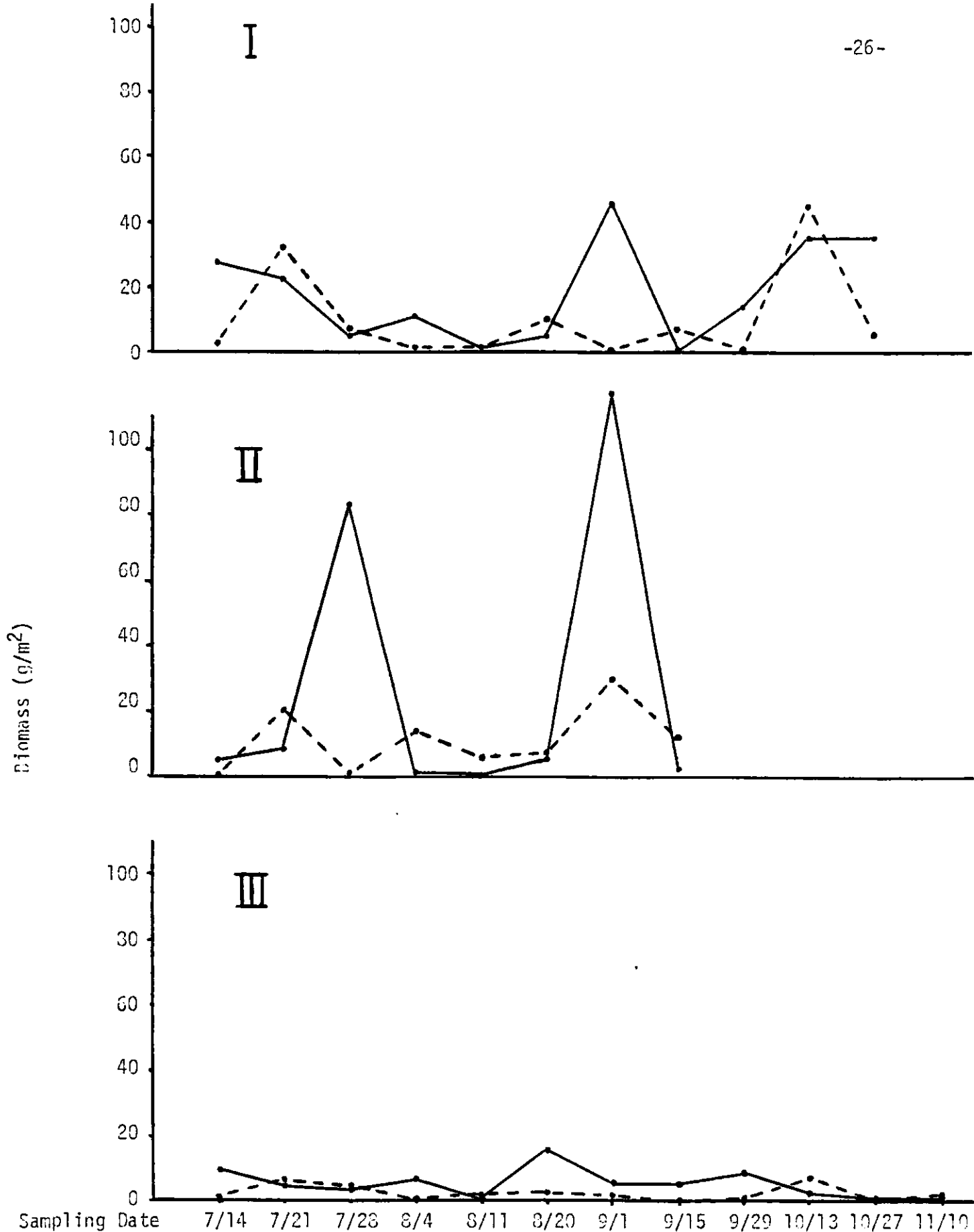


Figure 7. Comparison of Potamogeton (6 species) at control (—) and experimental (---) areas.

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Table 1. Chemical and physical analyses of experimental sites on Lake Onalaska, June 18, 1979 (prior to first cutting).

Parameter	Site I	Site II	Site III
Temperature (°C)	19.0	19.5	19.5
Dissolved Oxygen (mg/l)	5.8	9.8	7.0
pH	8.3	8.9	8.2
Alkalinity (mg/l)	230	97	76
Hardness (mg/l, EDTA)	216	102	79
Conductivity (µmhos/cm at 25 °C)	428	209	174
COD (mg/l)	14	29	43
BOD (mg/l, 5 day)	1.8	1.1	4.2
Turbidity (NTU)	15	13	27
Suspended Solids (mg/l)	11.0	2.0	23.8
N-NH <sub>3</sub> (mg/l)	< 0.050	< 0.050	< 0.050
N-NO <sub>2</sub> (mg/l)	0.006	0.017	0.015
N-NO <sub>3</sub> (mg/l)	0.07	0.12	0.32
PO <sub>4</sub> (mg/l)	0.49	0.49	0.70
SO <sub>4</sub> (mg/l)	17.3	13.8	25.6
Cl (mg/l)	5.5	< 2.0	4.4
Mn (mg/l)	< 0.10	0.15	0.24
Fe (mg/l)	0.73	0.67	1.23
Na (mg/l)	9.1	1.6	3.0
Ca (mg/l)	24.5	14.9	10.2
Mg (mg/l)	-----	9.5	-----
K (mg/l)	1.16	1.49	1.76
Chlorophyll-a (mg/l)	0.0120	0.0158	0.0975
Phaeophytin-a (mg/l)	0.0340	0.0124	0.0287

1] A single analysis of mid-depth water.

2] Average of two values (one of surface water; the other of water from near the bottom).

Table 2. Chemical and physical analyses of experimental sites on Lake Onalaska, July 17, 1979.

Parameter	1) Site I		1) Site II		2) Site III	
	Control	Experi- mental	Control	Experi- mental	Control	Experi- mental
Temperature (°C)	23.0	----	24.0	----	----	----
Dissolved Oxygen (mg/l)	8.9	----	7.4	----	----	----
pH	8.4	9.2	9.0	9.3	8.8	9.0
Alkalinity (mg/l)	207	138	88	100	104	100
Hardness (mg/l, EDTA)	207	150	96	111	126	128
Conductivity (µmhos/cm at 25°C)	401	294	203	228	275	275
COD (mg/l)	8	----	31	----	----	24
BOD (mg/l, 5 day)	1.0	0.7	7.8	2.2	6.0	1.4
Turbidity (NTU)	2.6	2.3	16.5	7.2	6.0	29
Suspended Solids (mg/l)	2.8	4.2	21.0	11.0	26.5	2.5
N-NH <sub>3</sub> (mg/l)	<0.050	<0.050	<0.07	<0.05	<0.05	<0.05
N-NO <sub>2</sub> (mg/l)	0.002	0.002	0.006	0.005	0.006	0.005
N-NO <sub>3</sub> (mg/l)	0.04	0.08	0.20	0.16	0.21	0.15
PO <sub>4</sub> (mg/l)	0.18	0.33	0.83	1.10	0.64	0.30
SO <sub>4</sub> (mg/l)	11.2	12.4	21.9	16.2	34.0	32.5
Cl (mg/l)	4.8	3.3	2.7	5.6	6.4	6.0
Mn (mg/l)	<0.10	<0.10	0.21	<0.10	<0.10	<0.10
Fe (mg/l)	0.42	0.64	2.03	1.14	0.60	0.31
Na (mg/l)	3.4	2.8	1.8	2.1	3.0	10.4
Ca (mg/l)	20.0	14.4	14.3	13.9	20.0	19.9
Mg (mg/l)	26.7	19.6	11.7	12.4	13.4	11.5
K (mg/l)	0.62	0.52	1.0	1.18	1.75	1.76
Chlorophyll-a (mg/l)	0.0068	----	0.0200	----	----	----
Pheophytin-a (mg/l)	0.0116	----	0.0370	----	----	----

1) Average of two values (one of surface water, the other of water from near the bottom).

2) A single analysis of mid-depth water.

Table 3. Chemical and physical analyses of experimental sites on Lake Onalaska, August 20, 1979

Parameter	Site I		Site II		Site III	
	Control	Experimental	Control	Experimental	Control	Experimental
Temperature (°C)	18.0	18.0	19.0	20.0	20.0	20.0
Dissolved Oxygen (mg/l)	5.8	4.4	6.0	7.9	4.9	5.2
pH	8.6	8.5	8.8	8.9	8.8	8.7
Alkalinity (mg/l)	216	219	154	156	125	114
Hardness (mg/l, EDTA)	215	225	229	160	146	134
Conductivity (µmhos/cm at 25°C)	432	449	308	314	317	229
COD (mg/l)	< 10	< 10	< 16	13	19	19
BOD (mg/l)	0.3	0.5	1.7	0.5	0.1	1.4
Turbidity (NTU)	2.0	5.2	11.8	2.0	6.0	6.2
Suspended Solids (mg/l)	< 10.8	< 19.0	26.5	2.5	8.0	14.0
N-NH <sub>3</sub> (mg/l)	< 0.08	< 0.062	< 0.050	< 0.050	< 0.050	< 0.050
N-NO <sub>2</sub> (mg/l)	0.014	0.018	0.005	0.005	0.007	0.005
N-NO <sub>3</sub> (mg/l)	0.07	0.18	0.12	0.05	0.10	0.11
PO <sub>4</sub> (mg/l)	0.32	0.55	0.79	0.39	0.25	0.33
SO <sub>4</sub> (mg/l)	19.8	17.7	10.3	23.8	37.7	37.0
Cl (mg/l)	4.9	5.8	3.8	3.5	6.9	5.0
Mn (mg/l)	0.42	0.52	< 0.16	-----	0.43	0.36
Fe (mg/l)	0.29	0.79	1.22	0.33	0.34	0.40
Na (mg/l)	2.7	2.6	1.9	2.2	3.8	3.8
Ca (mg/l)	23.7	26.6	15.8	14.0	20.3	19.0
Mg (mg/l)	21.2	21.0	18.8	17.3	13.1	13.3
K (mg/l)	1.79	2.36	1.45	1.30	1.43	1.55
Chlorophyll-a (mg/l)	0.0112	0.0091	0.0357	0.0244	0.0593	0.0503
Pheophytin-a (mg/l)	0.0311	0.0216	0.0268	0.0122	0.0360	0.0412

1] Average of two values (one of surface water; the other of water from near the bottom).

2] A single analysis of mid-depth water.

Table 4. Chemical and physical analyses of experimental sites on Lake Onalaska, September 18, 1979.

Parameter	1/ Site I		2/ Site II		3/ Site III	
	Control	Experi- mental	Control	Experi- mental	Control	Experi- mental
Temperature (OC)	18.5	18.5	17.0	17.2	17.5	17.5
Dissolved Oxygen (mg/l)	12.7	12.7	7.4	6.4	8.2	8.2
pH	8.7	8.9	8.3	8.8	8.4	8.4
Alkalinity (mg/l)	180	173	158	156	161	161
Hardness (mg/l, EDTA)	203	198	238	174	206	210
Conductivity (µmhos/cm at 25OC)	395	376	342	335	429	436
COD (mg/l)	14	12	<10.5	<13.5	41	42
BOD (mg/l, 5 day)	2.2	2.2	1.7	1.9	2.5	2.4
Turbidity (NTU)	1.0	1.3	3.1	1.8	5.0	6.4
Suspended Solids (mg/l)	0.5	<2.8	<2.0	<1.0	10.5	15.0
N-NH <sub>3</sub> (mg/l)	<0.050	<0.050	<0.306	<0.050	<0.050	<0.050
N-NO <sub>2</sub> (mg/l)	0.002	0.002	0.004	0.002	0.051	0.052
N-NO <sub>3</sub> (mg/l)	0.055	0.06	-----	0.08	0.58	1.27
PO <sub>4</sub> (mg/l)	0.16	0.16	0.24	0.19	0.24	0.28
SO <sub>4</sub> (mg/l)	14.8	15.2	11.4	11.7	39.8	40.9
Cl (mg/l)	12.9	12.0	7.8	8.2	12.1	14.0
Mn (mg/l)	<0.10	0.11	<0.11	<0.10	0.12	0.12
Fe (mg/l)	0.10	0.16	0.42	0.22	0.35	0.47
Na (mg/l)	3.2	3.6	2.8	2.9	4.9	5.9
Ca (mg/l)	21.0	19.2	14.6	15.8	34.0	33.2
Mg (mg/l)	21.1	20.0	20.4	17.0	15.5	16.5
K (mg/l)	2.57	2.50	2.18	2.36	2.16	2.18
Chlorophyll-a (mg/l)	0.0078	0.0088	0.0198	0.0198	0.0950	0.0875
Pheophytin-a (mg/l)	0.0234	0.0324	0.0287	0.0258	0.1100	0.0606

1/ Average of two values (one of surface water; the other of water from near the bottom).

2/ A single analysis of mid-depth water.

Insert 1. Waterfowl Utilization of Lake Onalaska

Waterfowl were observed on Lake Onalaska at fourteen sites totaling 70.0 acres of the 5,400 lake (Table 1). These sites were along the east shore of the lake, which is along the shores of French Island and Brice Prarie (Figure 1). Observations were made from September 19 to December 1, 1979. A total of 264 observations were made by residents of the lake shore and Wm. Westphal, the District Researcher, during the period (Table 5-7). Personnel of the Fish and Wildlife service provided data for waterfowl utilization of the total lake. Table 8 shows species and numbers of waterfowl utilizing the 14 sites.

The 70 acres of observed areas constitute 1.30% of the total lake area, and its utilization by waterfowl was 1.62% of the waterfowl use-days. Only two waterfowl in 19 observations were seen in area #6 which include Harvesting site III. No observations were made on Harvesting site II. Of 18 observations recorded from observational site #8, 1140 birds were observed on Harvesting site I. Only two bird species were noted (1038 coot and 102 wigeon). Waterfowl utilization of the harvested shoreline areas was very limited during the fall of 1979.



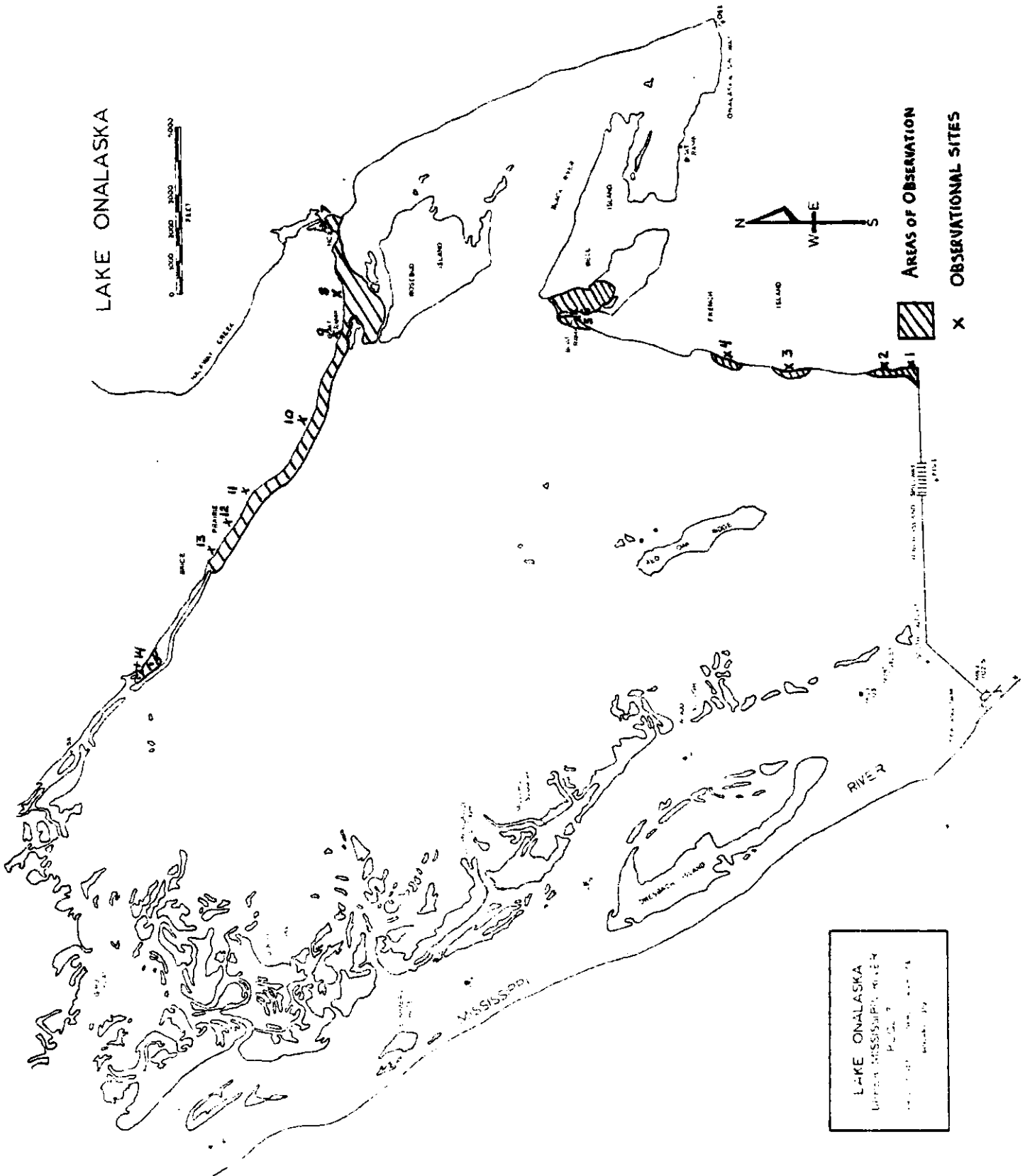


Figure 1. Waterfowl observation areas along the shoreline of Lake Onalaska.

Table 5. Description of shoreline waterfowl observation sites.

Site Identification <sup>1/</sup>	Estimated Size of Observation Site (ft. x ft.)	Estimated Acres/Site
1	300 x 300	2.066
2	400 x 300	2.755
3	400 x 300	2.755
4	400 x 300	2.755
5	500 x 300	3.443
6	600 x 800	11.019
7	300 x 300	2.066
8	800 x 300	5.510
9	800 x 1000	18.365
10	1000 x 300	6.887
11	400 x 300	2.755
12	400 x 300	2.755
13	400 x 300	2.755
14	600 x 300	4.132

<sup>1/</sup> See Figure 1 for map showing location of observation sites.

Table 6. Periods of the day during which spot shoreline waterfowl observations were made on Lake Onalaska.

Period of the Day	Number of Recorded Observations
12:01 - 4:00 A.M.	2
4:01 - 8:00 A.M.	26
8:01 - 12:00 Noon	134
12:01 - 4:00 P.M.	67
4:01 - 8:00 P.M.	32
8:01 - 12:00 P.M.	3

Table 7. Total of Waterfowl observed at 14 shorelines sites on Lake Onalaska, 1979

Date	Willard	Teal	Pintail	Wigeon	Black	Cadwall	Canvasback	Redhead	Ringneck	Scamp	Coldenye	Bullhead	Merganser	Noddy	Coot	Ogre
9-19	11	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9-21	-	326	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9-26	9	215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9-29	43	104	-	5	-	-	-	-	-	-	-	-	-	-	-	-
10-1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10-2	9	36	-	4	-	-	-	-	-	-	-	-	-	-	43	-
10-4	70	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-
10-5	50	24	-	110	-	-	-	-	-	-	-	-	-	-	-	-
10-8	37	15	13	438	-	-	-	-	-	-	-	-	-	-	330	-
10-10	-	22	-	80	-	-	-	-	-	-	-	-	-	-	525	-
10-12	-	17	12	6	-	-	-	-	-	-	-	-	-	-	689	-
10-13	-	233	-	233	-	-	-	-	-	-	-	-	-	-	1866	-
10-14	-	-	-	93	-	28	-	-	-	-	-	-	-	-	4573	-
10-15	38	-	-	181	-	-	-	-	-	-	-	-	-	-	549	-
10-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	-
10-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	614	-
10-19	1	4	22	129	8	-	3	-	-	-	-	-	3	-	893	-
10-22	13	-	13	189	-	-	88	-	-	-	-	-	-	-	1194	2
10-25	-	21	-	-	-	-	-	-	-	-	-	-	-	-	133	-
10-26	-	-	-	123	-	-	308	-	-	-	-	-	-	-	619	6
10-29	-	23	10	-	-	-	416	21	-	-	-	11	-	-	2179	4
10-30	35	-	-	-	-	-	37	-	-	56	-	-	-	-	515	-
10-31	-	17	41	145	13	-	301	-	-	13	-	-	-	-	2229	1
11-2	25	-	32	30	-	12	105	23	-	-	-	-	-	-	1599	-
11-6	-	5	-	34	-	-	45	-	-	6	-	-	1	-	1104	3
11-8	36	-	10	97	-	-	79	6	6	37	-	-	-	-	91	-
11-12	-	-	6	-	-	-	84	-	-	42	-	-	-	-	151	-
11-13	18	-	-	20	-	-	69	-	41	12	-	41	1	-	337	1
11-15	65	-	11	15	-	-	21	-	23	49	-	18	-	-	81	-
11-16	-	-	-	-	-	-	98	-	-	70	-	-	-	-	28	-
11-17	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	1
11-20	53	-	-	19	-	-	11	-	27	62	7	22	-	-	169	4
11-24	42	-	4	-	-	-	-	-	-	43	-	-	3	-	35	-
11-26	34	-	5	-	-	-	-	-	-	-	-	36	-	-	48	-

Table 8. Summary of Waterfowl census, Lake Oonake, 1979.

Waterfowl Species	Average daily estimates of waterfowl utilizing the shoreline observation sites (estimates for total lake are given in parenthesis) for weeks ending:												Total Waterfowl use-days	Percent of total Waterfowl using Observed Shoreline Areas
	9/22	9/29	10/6	10/13	10/20	10/27	11/3	11/10	11/17	11/21	12/1	12/1		
<b>Dabbling Ducks:</b>														
Mallard & Blackduck	9 (791)	26 (642)	32 (600)	9 (4332)	8 (3846)	4 (1935)	10 (3735)	18 (3211)	13 (2685)	48 (2149)	34 (1988)	1477 (181,398)	0.81	
Teal	249 (1110)	100 (166)	16 (200)	41 (200)	1							3262 (10,332)	31.57	
Pintail	(110)	(124)	(200)	(850)	(813)	(500)	(985)	(517)	(50)	(125)	(225)	350 (31,493)	1.11	
Wigeon	(9380)	(8768)	(6000)	(6229)	(2618)	(2060)	(1343)	(735)	7	9		3724 (261,226)	1.43	
Gadwall												21 (3,520)	0.54	
<b>Diving Ducks:</b>														
Canvasback	(6)	(10)	(50)	(10875)	(21163)	(30750)	(43965)	(13220)	(7146)	(4716)	(1435)	3507 (933,352)	0.38	
Redhead	(6)	(50)	(300)	(75)	(200)	(11)	(3)	(110)				98 (5187)	1.89	
Ringneck				(100)	(4050)	(3655)	(2435)	(750)	(400)	(50)	(190)	210 (81,410)	0.26	
Scaup	(10)	(200)	(6900)	(5620)	(3375)	(10325)	(7401)	(4470)	(1285)	(1785)		882 (289,369)	0.30	
Goldeneye												21 (1,064)	1.97	
Bufflehead												357 (28,581)	1.25	
Merganser												28 (3,745)	0.75	
Ruddy												7 (3,395)	0.21	
<b>Total of Diving Ducks</b>														
													5110 (1,346,373)	0.38
Coot	(5685)	(15486)	(23000)	(23003)	(29377)	(31255)	(31320)	(22428)	(7575)	(2215)	(355)	38,225 (1,383,893)	2.76	
<b>Total of all Waterfowl</b>														
													52,169 (3,218,635)	1.62

Table 9. Numbers of different taxa collected at harvested and unharvested areas in Lake Onalaska.

Date	Site I			Site II			Site III			
	Macro- phytes	Benthos + Epiphytes	Benthos + Epiphytes	Macro- phytes	Benthos + Epiphytes	Benthos + Epiphytes	Macro- phytes	Benthos + Epiphytes	Benthos + Epiphytes	
7/14 Control	7	8	13	7	4	9	5	12	14	22
7/14 Experimental	7	15	17	7	7	10	4	11	9	16
7/21 Control	5	—	—	5	—	—	7	—	—	—
7/21 Experimental	6	—	—	6	—	—	6	—	—	—
7/28 Control	5	9	12	6	5	12	4	14	13	21
7/28 Experimental	7	9	10	7	7	14	6	12	13	20
8/4 Control	6	—	—	5	—	—	6	—	—	—
8/4 Experimental	6	—	—	8	—	—	5	—	—	—
8/11 Control	9	6	18	3	16	13	6	14	6	15
8/11 Experimental	5	6	12	4	4	6	5	13	8	18
8/20 Control	4	—	—	5	—	—	5	—	—	—
8/20 Experimental	5	—	—	6	—	—	5	—	—	—
9/1 Control	5	11	13	6	9	12	4	8	13	15
9/1 Experimental	6	7	13	7	7	11	6	14	13	19
9/15 Control	3	7	12	4	6	15	4	9	10	14
9/15 Experimental	4	8	6	7	5	13	3	9	9	15
9/29 Control	5	6	14	—	—	—	6	11	24	28
9/29 Experimental	3	6	14	—	—	—	3	14	15	20
10/13 Control	5	9	9	—	—	—	4	10	10	16
10/13 Experimental	6	9	8	—	—	—	4	11	13	17
10/27 Control	5	8	12	—	—	—	4	12	7	15
10/27 Experimental	4	8	10	—	—	—	4	12	10	18
11/10 Control	—	—	—	—	—	—	4	10	8	13
11/10 Experimental	—	—	—	—	—	—	4	9	11	16

Table 10. Alphabetical listing of Macrophytes collected from three study areas of Lake Onalaska, 1979.

---

<u>Anacharis canadensis</u>	(waterweed)
<u>Anacharis occidentalis</u>	(waterweed)
<u>Carex</u> sp.	
<u>Ceratophyllum demersum</u>	(coontail)
<u>Lemna trisulca</u>	(duckweed)
<u>Myriophyllum alterniflorum</u>	(water milfoil)
<u>Myriophyllum exalbescens</u>	(water milfoil)
<u>Myriophyllum verticillatum</u>	(water milfoil)
<u>Najas flexilis</u>	(bushy pondweed)
Nymphaeaceae	
<u>Nymphaea tuberosa</u>	(water lily)
<u>Potamogeton crispus</u>	(pondweed)
<u>Potamogeton filiformis</u>	(pondweed)
<u>Potamogeton pectinatus</u>	(pondweed)
<u>Potamogeton pusillus</u>	(pondweed)
<u>Potamogeton strictifolius</u>	(pondweed)
<u>Potamogeton zosteriformis</u>	(pondweed)
<u>Vallisneria americana</u>	(wild celery)

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Table 11. Alphabetical listing (lowest taxonomic unit) of invertebrates collected from three study areas of Lake Onalaska, 1979.

Lowest taxonomic Unit	Phylum	Class	Order	Family
<u>Aeshnidae</u>	Arthropoda	Insecta	Odonata	Aeshnidae
<u>Agaylea</u> sp.	Arthropoda	Insecta	Trichoptera	Hydroptilidae
<u>Amblema</u> sp.	Mollusca	Pelecypoda		Amblemidae
<u>Amnicola</u> sp.	Mollusca	Gastropoda	Ctenobranchiata	Amnicolidae
<u>Argia</u> sp.	Arthropoda	Insecta	Odonata	Coenagrionidae
<u>Arrhenurus</u> sp.	Arthropoda	Eucrustacea	Acanth	Arrhenuridae
<u>Asellus</u> sp.	Arthropoda	Eucrustacea	Isopoda	Asellidae
<u>Baetidae</u>	Arthropoda	Insecta	Ephemeroptera	Baetidae
<u>Berosus striatus</u>	Arthropoda	Insecta	Coleoptera	Hydrophilidae
<u>Caenis</u> sp.	Arthropoda	Insecta	Ephemeroptera	Caenidae
<u>Callibaetis</u> sp.	Arthropoda	Insecta	Ephemeroptera	Baetidae
<u>Campeloma</u> sp.	Mollusca	Gastropoda	Ctenobranchiata	Viviparidae
<u>Centroptilum</u> sp.	Arthropoda	Insecta	Ephemeroptera	Baetidae
<u>Chaoborus</u> sp.	Arthropoda	Insecta	Diptera	Chaoboridae
<u>Chilopoda</u>	Arthropoda	Chilopoda		
<u>Chironomidae</u>	Arthropoda	Insecta	Diptera	Chironomidae
<u>Coenagrionidae</u>	Arthropoda	Insecta	Odonata	Coenagrionidae
<u>Corixidae</u>	Arthropoda	Insecta	Hemiptera	Corixidae
<u>Dasythelia</u> sp.	Arthropoda	Insecta	Diptera	Ceratopogonidae
<u>Dineutus</u> sp.	Arthropoda	Insecta	Coleoptera	Gyrinidae
<u>Diptera</u>	Arthropoda	Insecta	Diptera	
<u>Donacia</u> sp.	Arthropoda	Insecta	Coleoptera	Chrysomelidae
<u>Dugesia</u> sp.	Platyhelminthes	Turbellaria	Tricladida	Planariidae
<u>Dytiscidae</u>	Arthropoda	Insecta	Coleoptera	Dytiscidae
<u>Enallagma</u> sp.	Arthropoda	Insecta	Odonata	Coenagrionidae
<u>Ephydriidae</u>	Arthropoda	Insecta	Diptera	Ephydriidae
<u>Fusconia</u> sp.	Mollusca	Pelecypoda		Amblemidae
<u>Ferrisia</u> sp.	Mollusca	Gastropoda	Pulmonata	Ancylidae
<u>Glossiphonia</u> sp.	Annelida	Hirudinea	Rhynchobdella	Glossiphoniidae
<u>Gyraulus</u> sp.	Mollusca	Gastropoda	Pulmonata	Planorbidae
<u>Gyrinus</u> sp.	Arthropoda	Insecta	Coleoptera	Gyrinidae
<u>Heliosoma</u> sp.	Mollusca	Gastropoda	Pulmonata	Planorbidae

(Table 11 cont.)

Lowest taxonomic Unit	Phylum	Class	Order	Family
<u>Hemiptera</u>	Arthropoda	Insecta	Hemiptera	
<u>Neopbylix</u> sp.	Arthropoda	Insecta	Trichoptera	Limnephilidae
<u>Pegomyia</u> sp.	Arthropoda	Insecta	Ephemeroptera	Ephemeridae
<u>Mirudinea</u>	Annelida	Mirudinea		
<u>Byzalis azteca</u>	Arthropoda	Eucrystacea	Amphipoda	Talitridae
<u>Sydophyllidae</u>	Arthropoda	Insecta	Coleoptera	Hydrophilidae
<u>Hydroptilidae</u>	Arthropoda	Insecta	Trichoptera	Hydroptilidae
<u>Ilinochobdella</u> sp.	Annelida	Mirudinea	Arhynchobdella	
<u>Land snails</u>	Mollusca	Gastropoda		
<u>Lamellis</u> sp.	Mollusca	Pelecypoda		Unionidae
<u>Lepidoptera</u>	Arthropoda	Insecta	Lepidoptera	
<u>Lepidostoma</u> sp.	Arthropoda	Insecta	Trichoptera	Lepidostomatidae
<u>Lepoceridae</u>	Arthropoda	Insecta	Trichoptera	Leptoceridae
<u>Leptocerus</u> sp.	Arthropoda	Insecta	Trichoptera	Leptoceridae
<u>Limnephilidae</u>	Arthropoda	Insecta	Trichoptera	Limnephilidae
<u>Limnesia</u> sp.	Arthropoda	Eucrystacea	Acanthi	Limnesiidae
<u>Limnophora</u> sp.	Arthropoda	Insecta	Diptera	Anthomyiidae
<u>Lipoxis</u> sp.	Mollusca	Gastropoda	Ctenobranchiata	
<u>Mesovella</u> sp.	Arthropoda	Insecta	Hemiptera	Mesovellidae
<u>Midopsis</u> sp.	Arthropoda	Eucrystacea	Acanthi	Midopsidae
<u>Molana</u> sp.	Arthropoda	Insecta	Trichoptera	Mollanidae
<u>Mollanidae</u>	Arthropoda	Insecta	Trichoptera	Mollanidae
<u>Muscilium</u> sp.	Mollusca	Pelecypoda		
<u>Mematoda</u>	Mematoda			
<u>Neopbylix</u> sp.	Arthropoda	Insecta	Trichoptera	Limnephilidae
<u>Neureclipsis</u> sp.	Arthropoda	Insecta	Trichoptera	Polycentropodidae
<u>Neurocoridula</u> sp.	Arthropoda	Insecta	Odonata	Corduliidae
<u>Nymphia</u> sp.	Arthropoda	Insecta	Lepidoptera	Pyralidae
<u>Oecetia</u> sp.	Arthropoda	Insecta	Trichoptera	Leptoceridae
<u>Oligochaeta</u>	Annelida	Oligochaeta		
<u>Orthotrichia</u> sp.	Arthropoda	Insecta	Trichoptera	Hydroptilidae
<u>Palpomyia</u> sp.	Arthropoda	Insecta	Diptera	Caratopogonidae
<u>Parasyrictis</u> sp.	Arthropoda	Insecta	Lepidoptera	
<u>Parasynyx</u> sp.	Arthropoda	Insecta	Lepidoptera	
<u>Phryganeta</u> sp.	Arthropoda	Insecta	Trichoptera	Phryganetidae
<u>Phya</u> sp.	Mollusca	Gastropoda	Pulmonata	Physidae
<u>Pisidium</u> sp.	Mollusca	Pelecypoda		Sphaeriidae
<u>Plecochobdella</u> sp.	Annelida	Mirudinea	Rhynchobdella	Glossiphoniidae



(Table 11 cont.)

Lowest taxonomic Unit	Phylum	Class	Order	Family
<u>Planorbula</u> sp.	Mollusca	Gastropoda	Pulmonata	Planorbidae
<u>Plea</u> sp.	Arthropoda	Insecta	Hemiptera	Pleidae
<u>Pleurocera acuta</u>	Mollusca	Gastropoda	Ctenobranchiata	Pleuroceridae
<u>Polycentropodidae</u>	Arthropoda	Insecta	Trichoptera	Polycentropodidae
<u>Polycentropus</u> sp.	Arthropoda	Insecta	Trichoptera	Polycentropodidae
<u>Pseudostenophylax</u> sp.	Arthropoda	Insecta	Trichoptera	Limnephilidae
<u>Sphaeriidae</u>	Mollusca	Pelecypoda		Sphaeriidae
<u>Sphaerium</u> sp.	Mollusca	Pelecypoda		Sphaeriidae
<u>Stactobiella</u> sp.	Arthropoda	Insecta	Trichoptera	Hydroptilida
<u>Stagnicola</u> sp.	Mollusca	Gastropoda		
<u>Stenelmis</u> sp.	Arthropoda	Insecta	Coleoptera	Elmidae
<u>Succinea rutosa</u>	Mollusca	Gastropoda		
<u>Tetragoneuria</u> sp.	Arthropoda	Insecta	Odonata	Corduliidae
<u>Triaenodes</u> sp.	Arthropoda	Insecta	Trichoptera	Leptoceridae
<u>Trichoptera</u>	Arthropoda	Insecta	Trichoptera	
<u>Valvata</u> sp.	Mollusca	Gastropoda	Ctenobranchiata	Valvatidae
<u>Viviparus</u> sp.	Mollusca	Gastropoda	Ctenobranchiata	Viviparidae

Table 12. Summary of macrophyte biomass ( $g/m^2$ ) by species as collected from Lake Onalaska at harvest site I (Schafer's Landing), 1979.

Collection date & species	Control			Experimental					
	Sample Replications	Mean	Mean	Sample replications	Mean	Mean			
7/14/79									
<u>A. canadensis</u>	125.2	18.4	1.2	0.2	4.8	29.6	10.0	0.32	7.4533
<u>C. demersum</u>	40.6	74.0	18.4	8.4	0.432	23.639	11.2	22.0	6.032
<u>N. flexilis</u>	3.916	3.6	68.8	14.4	22.4	18.853	6.0	0.92	3.224
<u>P. crispus</u>	58.96	50.6	26.4	-----	22.66	0.48	1.96	1.476	6.092
<u>P. filiformis</u>	0.04	-----	-----	-----	0.0067	-----	0.16	-----	0.2
<u>P. pectinatus</u>	-----	-----	0.216	34.4	5.769	-----	3.48	-----	0.364
<u>V. americana</u>	-----	-----	0.252	-----	0.042	0.04	0.048	-----	0.0147
7/21/79									
<u>A. canadensis</u>	6.4	25.6	122.8	-----	51.6	25.2	1.756	-----	8.985
<u>C. demersum</u>	120.4	5.2	207.2	-----	110.933	38.0	13.6	-----	17.267
<u>L. trisulca</u>	-----	-----	-----	-----	-----	0.208	-----	-----	0.0693
<u>NYMPHAEACEAE</u>	1.304	-----	-----	-----	0.4347	-----	-----	-----	-----
<u>P. crispus</u>	-----	32.4	36.0	-----	22.8	32.8	2.008	-----	11.603
<u>P. pectinatus</u>	-----	-----	-----	-----	-----	2.232	-----	-----	0.744
<u>P. pusillus</u>	-----	-----	-----	-----	-----	-----	61.2	-----	20.4
<u>V. americana</u>	0.196	-----	-----	-----	0.0653	-----	-----	-----	-----
7/28/79									
<u>A. canadensis</u>	29.2	2.72	280.4	-----	104.106	0.6	69.2	49.6	39.8
<u>C. demersum</u>	136.4	8.4	96.0	-----	80.266	6.8	254	5.2	88.66
<u>L. trisulca</u>	-----	-----	-----	-----	-----	-----	-----	0.04	0.0134
<u>P. crispus</u>	-----	0.16	16.8	-----	5.6534	1.12	9.2	12.8	7.706
<u>P. pusillus</u>	-----	-----	-----	-----	-----	-----	0.84	0.36	0.4
<u>P. zosteriformis</u>	0.16	-----	-----	-----	0.0534	-----	0.44	-----	0.1467
<u>V. americana</u>	0.08	-----	-----	-----	0.0266	-----	0.08	-----	0.0266

(Table 12 cont.)

	8/4/79			8/11/79			8/20/79			9/1/79		
	Sample Replications	Mean	Mean	Sample Replications	Mean	Mean	Sample Replications	Mean	Mean	Sample Replications	Mean	Mean
<u>A. canadensis</u>	---	30.0	0.56	190.8	46.8	101.8667	178.0	260.	317.8667	11.4	310.	112.5335
<u>C. demersum</u>	112.4	20.8	12.4	24.0	26.0	38.1333	15.2	16.4	16.4	13.6	6.4	14.
<u>L. trisulca</u>	---	---	---	---	---	0.0533	0.2	0.72	0.3733	0.32	3.52	2.2267
<u>H. flexilis</u>	0.4	---	---	---	0.64	0.2133	---	---	---	---	3.28	1.0933
<u>P. crispus</u>	---	25.2	---	---	4.8	1.6	---	---	5.733	---	---	---
<u>P. pectinatus</u>	---	7.6	---	0.8	0.2	0.3333	---	---	---	21.6	---	7.2
<u>V. americana</u>	0.16	0.04	---	---	---	0.2133	0.64	0.2133	---	---	---	---
<u>8/11/79</u>												
<u>A. canadensis</u>	68.0	190.8	46.8	190.8	46.8	101.8667	178.0	260.	317.8667	11.4	310.	112.5335
<u>C. demersum</u>	64.4	24.0	26.0	24.0	26.0	38.1333	15.2	16.4	16.4	13.6	6.4	14.
<u>L. trisulca</u>	0.16	---	---	---	---	0.0533	0.2	0.72	0.3733	0.32	3.52	2.2267
<u>H. exalbescens</u>	---	---	0.64	---	0.64	0.2133	---	---	---	---	3.28	1.0933
<u>H. tuberosa</u>	---	---	4.8	---	4.8	1.6	---	---	5.733	---	---	---
<u>P. crispus</u>	---	0.8	0.2	0.8	0.2	0.3333	---	---	---	21.6	---	7.2
<u>P. pectinatus</u>	1.76	---	1.56	---	1.56	1.1067	---	---	---	---	---	---
<u>P. pusillus</u>	---	---	0.96	---	0.96	0.32	---	---	---	---	---	0.2267
<u>V. americana</u>	---	---	0.64	---	0.64	0.2133	---	---	---	---	---	0.04
<u>8/20/79</u>												
<u>A. canadensis</u>	515.6	178.0	260.	178.0	260.	317.8667	178.0	260.	317.8667	11.4	310.	112.5335
<u>C. demersum</u>	17.6	15.2	16.4	15.2	16.4	16.4	15.2	16.4	16.4	13.6	6.4	14.
<u>P. crispus</u>	0.2	0.2	0.72	0.2	0.72	0.3733	0.2	0.72	0.3733	0.32	3.52	2.2267
<u>P. pectinatus</u>	---	---	---	---	---	---	---	---	---	---	3.28	1.0933
<u>P. strictifolius</u>	17.2	---	---	---	---	5.733	---	---	---	---	---	---
<u>P. zosteriformis</u>	---	---	---	---	---	---	---	---	---	21.6	---	7.2
<u>9/1/79</u>												
<u>A. canadensis</u>	140.0	88.8	201.6	88.8	201.6	143.4667	88.8	201.6	143.4667	118.	40.4	14.4
<u>C. demersum</u>	70.0	25.6	78.0	25.6	78.0	57.8667	25.6	78.0	57.8667	36.4	4.0	6.4
<u>L. trisulca</u>	---	---	---	---	---	---	---	---	---	0.16	---	---
<u>H. flexilis</u>	---	---	---	---	---	---	---	---	---	7.6	---	---
<u>H. tuberosa</u>	---	---	---	---	---	---	---	---	---	---	9.2	3.0667
<u>P. crispus</u>	---	135.2	1.44	135.2	1.44	45.5467	---	---	---	---	0.4	0.1333
<u>P. filliformis</u>	---	---	1.88	---	1.88	0.6267	---	---	---	---	---	---

(Table 12 cont.)

Collection date & Species	9/15/79			9/29/79			10/13/79			10/27/79		
	Sample Replications	Mean	Sample Replications	Sample Replications	Mean	Sample Replications	Sample Replications	Mean	Sample Replications	Sample Replications	Mean	
<u>A. canadensis</u>	383.2	231.2	496.4	-----	370.2667	-----	3.6	11.6	70.4	28.5		
<u>C. demersum</u>	4.4	12.4	22.8	-----	13.2	-----	-----	6.0	38.8	14.9		
<u>M. exalbescens</u>	2.0	-----	-----	-----	0.6667	-----	-----	-----	-----	-----		
<u>N. flexilis</u>	-----	-----	-----	-----	-----	-----	2.0	-----	-----	0.6667		
<u>P. crispus</u>	-----	-----	-----	-----	-----	-----	-----	-----	23.2	7.9333		
9/29/79												
<u>A. canadensis</u>	14.8	553.2	312.4	176.4	264.2	750.8	24.8	492.4	1.4	317.35		
<u>C. demersum</u>	6.4	78.0	6.4	116.4	51.8	13.2	6.8	-----	0.64	5.16		
<u>P. crispus</u>	19.2	-----	16.4	6.8	10.6	-----	-----	-----	-----	-----		
<u>P. filiformis</u>	-----	-----	9.2	-----	2.3	1.0	-----	-----	-----	0.25		
<u>V. americana</u>	-----	-----	2.08	-----	0.52	-----	-----	-----	-----	-----		
10/13/79												
<u>A. canadensis</u>	506.8	415.2	491.2	38.0	362.8	496.8	80.8	70.8	98.0	186.6		
<u>C. demersum</u>	17.6	55.6	51.6	8.0	33.2	10.8	6.4	21.2	62.4	25.2		
<u>P. crispus</u>	4.8	-----	82.4	40.4	31.9	6.4	0.8	160.4	7.6	43.8		
<u>P. filiformis</u>	-----	-----	-----	17.2	4.3	-----	5.6	-----	-----	1.4		
<u>P. pectinatus</u>	-----	-----	-----	-----	-----	-----	-----	5.6	-----	1.4		
<u>V. americana</u>	-----	-----	-----	166.0	41.5	-----	317.6	-----	-----	79.4		
10/27/79												
<u>A. canadensis</u>	322.4	264.0	306.4	-----	223.2	16.8	219.2	336.	369.6	235.4		
<u>C. demersum</u>	11.6	38.8	0.36	-----	12.69	16.0	-----	34.	46.4	24.1		
<u>P. crispus</u>	-----	26.0	-----	-----	6.5	0.4	-----	-----	6.0	1.6		
<u>P. pectinatus</u>	-----	-----	102.0	-----	25.5	-----	-----	-----	18.4	4.6		
<u>P. strictifolius</u>	-----	-----	12.4	-----	3.1	-----	-----	-----	-----	-----		

Table 13. Summary of MACROPHYTE biomass (g/m<sup>2</sup>) by species as collected from Lake Onalaska at Harvest Site II. (Rosebud Island), 1979.

Species	Control			Experimental				
	Sample Replication	Mean	Sample Replication	Sample Replication	Mean	Sample Replication		
7/14								
<u>A. canadensis</u>	85.6	12.8	30.0	42.8	10.4	24.8	7.0	14.13
<u>C. demersum</u>	114.0	114.0	86.8	104.93	61.2	60.4	28.0	49.867
<u>L. trisulca</u>	8.4	45.2	11.6	21.73	7.2	47.2	0.612	18.337
<u>M. exalbescens</u>	0.884	---	---	0.2947	---	---	---	---
<u>M. verticillatum</u>	---	---	---	---	---	0.264	---	0.088
<u>N. flexilis</u>	---	---	---	---	---	4.8	---	1.6
<u>P. crispus</u>	12.4	---	---	4.133	---	2.584	---	0.8613
<u>P. filliformis</u>	---	---	1.924	0.6413	---	0.464	---	0.1547
<u>P. pectinatus</u>	4.276	1.168	---	1.8417	---	---	---	---
7/21								
<u>A. canadensis</u>	128.8	11.2	22.0	54.0	5.2	26.4	10.8	14.133
<u>C. demersum</u>	162.0	36.4	126.0	108.133	25.6	126.8	21.6	58.0
<u>L. trisulca</u>	4.0	8.4	10.8	7.733	8.8	20.0	6.4	11.733
<u>M. verticillatum</u>	4.8	---	---	1.6	---	---	---	---
<u>P. crispus</u>	---	---	---	---	---	---	20.0	6.656
<u>P. pusillus</u>	3.6	---	---	1.2	---	---	---	---
<u>P. pectinatus</u>	---	16.8	---	5.6	---	---	2.0	0.744
<u>P. zosteriformis</u>	---	1.6	---	0.533	---	---	---	---
roots	---	---	---	---	39.6	---	---	13.2

(Table 13 cont.)

Species	7/28			8/4			8/11		
	Sample Replication	Mean	Mean	Sample Replication	Mean	Mean	Sample Replication	Mean	Mean
<u>A. canadensis</u>	6.4	18.8	48.0	24.4	24.4	34.8	2.2	0.96	12.653
<u>A. occidentalis</u>	0.16	0.16	---	0.1067	---	---	---	---	---
<u>C. demersum</u>	25.6	18.4	302.8	115.6	114.4	114.4	47.6	3.84	55.267
<u>L. trisulca</u>	---	72.0	---	24.0	71.2	1.04	---	---	24.08
<u>P. crispus</u>	---	6.4	0.36	2.253	1.32	---	---	---	0.44
<u>P. pusillus</u>	244.0	---	---	81.33	0.44	---	---	---	0.1467
<u>P. zosteriformis</u>	---	---	---	---	---	---	0.44	---	0.1467
<u>V. americana</u>	---	---	---	---	0.12	---	---	---	0.04
8/4									
<u>A. canadensis</u>	1.0	55.6	56.4	37.67	24.8	56.0	12.8	31.2	65.067
<u>C. demersum</u>	66.0	199.2	251.6	172.26	64.0	118.8	12.4	7.867	10.813
<u>L. trisulca</u>	24.4	---	1.04	8.48	11.6	10.4	1.6	0.067	2.267
<u>M. alterniflorum</u>	---	---	---	---	---	0.2	---	---	18.53
<u>P. crispus</u>	---	---	---	---	29.6	---	2.84	---	---
<u>P. pectinatus</u>	1.52	---	---	0.507	---	---	3.04	---	---
<u>P. pusillus</u>	---	---	---	---	---	6.8	---	---	---
<u>V. americana</u>	0.04	---	---	0.0133	38.0	---	17.6	---	---
8/11									
<u>A. canadensis</u>	4.8	112.8	32.4	50.0	4.8	0.56	---	---	1.7867
<u>C. demersum</u>	84.0	187.2	205.6	158.93	14.4	21.2	12.4	---	16.0
<u>L. trisulca</u>	---	64.8	12.8	25.867	---	---	---	---	---
<u>P. crispus</u>	---	---	---	---	0.44	---	---	---	0.147
<u>P. pectinatus</u>	---	---	---	---	22.8	---	---	---	7.6

(Table 13 cont.)

Species	8/20			9/1			9/15		
	Sample Replication	Mean	Sample Replication	Mean	Sample Replication	Mean	Sample Replication	Mean	
<u>A. canadensis</u>	51.2	67.6	90.8	69.867	42.8	34.8	1.6	26.4	
<u>C. demersum</u>	99.6	146.0	110.4	118.67	28.8	462.8	54.4	182.0	
<u>L. trisulca</u>	0.32	19.6	---	6.973	3.52	242.8	3.44	83.25	
<u>P. crispus</u>	---	---	---	---	24.4	---	---	8.133	
<u>P. pectinatus</u>	0.64	---	---	0.213	---	1.48	---	0.493	
<u>P. zosteriformis</u>	18.0	---	---	6.0	---	---	---	---	
<u>V. americana</u>	---	---	---	---	66.4	---	---	22.13	
9/1									
<u>A. canadensis</u>	116.4	4.2	150.0	90.2	14.4	116.8	46.4	59.2	
<u>C. demersum</u>	96.4	0.24	---	32.213	8.8	44.4	86.4	46.53	
<u>L. trisulca</u>	4.8	---	13.6	6.133	4.4	220.8	10.0	78.4	
<u>M. exalbescens</u>	0.88	---	---	0.293	---	---	---	---	
<u>N. flexilis</u>	---	---	---	---	1.44	2.88	---	1.44	
<u>P. crispus</u>	---	---	---	---	---	15.2	37.6	17.6	
<u>P. filiformis</u>	31.6	1.2	319.2	117.333	38.0	---	---	12.67	
<u>P. pectinatus</u>	---	0.48	4.0	1.493	---	---	---	---	
<u>V. americana</u>	---	9.6	---	3.2	316.4	---	15.2	110.53	
9/15									
<u>A. canadensis</u>	102.4	236.0	14.4	117.6	46.0	81.6	98.0	75.2	
<u>C. demersum</u>	208.0	198.0	211.2	205.73	24.8	44.8	47.2	38.933	
<u>L. trisulca</u>	---	0.4	74.0	24.8	---	15.6	133.6	49.73	
<u>N. flexilis</u>	---	---	---	---	---	0.72	---	0.24	
<u>P. crispus</u>	6.8	---	---	2.267	32.4	---	---	10.8	
<u>P. filiformis</u>	---	---	---	---	---	5.6	---	1.867	
<u>V. americana</u>	---	---	---	---	---	130.8	---	43.6	

Table 14. Summary of MACROPHYTE biomass (g/m<sup>2</sup>) by species as collected from Lake Onalaska at Harvest Site III (Sailing Club), 1979.

Species	Control			Experimental		
	Sample Replication	Mean	Standard Deviation	Sample Replication	Mean	Standard Deviation
7/14						
<u>A. canadensis</u>	0.516	0.424	123.2	-----	20.69	-----
<u>C. demersum</u>	-----	-----	3.788	36.4	13.2	8.898
<u>P. crispus</u>	-----	-----	0.024	16.0	-----	2.671
<u>P. pectinatus</u>	-----	-----	13.2	29.2	0.1876	7.097
<u>V. americana</u>	7.344	6.4	-----	88.4	-----	17.024
7/21						
<u>A. canadensis</u>	-----	-----	78.4	-----	13.07	2.904
<u>Carex sp.</u>	-----	-----	-----	-----	0.34	0.056
<u>C. demersum</u>	-----	-----	41.6	40.	0.16	7.627
<u>P. crispus</u>	-----	-----	2.4	-----	3.204	0.934
<u>P. filiformis</u>	0.24	-----	-----	-----	0.316	0.0927
<u>P. pectinatus</u>	-----	-----	20.4	5.6	-----	4.333
<u>P. zosteriformis</u>	-----	-----	-----	-----	-----	-----
<u>V. americana</u>	-----	31.2	20.8	24.8	-----	12.8
				0.48	4.28	23.6
						4.727



(Table 14 cont.)

Species	7/28			8/4			8/11		
	Sample Replication	Mean	Mean	Sample Replication	Mean	Mean	Sample Replication	Mean	Mean
<u>A. canadensis</u>	---	8.4	2.8	---	0.28	---	---	0.093	---
<u>C. demersum</u>	---	8.8	2.93	0.2	---	24.92	---	8.373	---
<u>L. trisulca</u>	---	---	---	---	---	2.0	---	0.667	---
<u>P. crispus</u>	---	---	---	---	---	10.8	---	3.6	---
<u>P. pectinatus</u>	---	9.2	3.24	---	6.8	---	---	2.267	---
<u>V. americana</u>	26.4	6.0	36.53	58.4	24.0	137.6	---	73.33	---
8/4									
<u>A. canadensis</u>	---	0.16	3.253	---	---	0.4	---	0.133	---
<u>A. Occidentale</u>	0.64	---	0.213	---	---	---	---	---	---
<u>C. demersum</u>	---	2.24	6.08	---	5.6	2.48	---	2.693	---
<u>N. flexilis</u>	---	---	0.44	---	0.32	---	---	0.1067	---
<u>P. pusillus</u>	7.6	13.6	7.067	---	1.84	1.32	---	1.053	---
<u>V. americana</u>	50.8	10.4	80.0	19.6	110.8	36.0	---	55.467	---
8/11									
<u>A. canadensis</u>	---	---	64.4	---	---	13.2	---	4.4	---
<u>C. demersum</u>	---	0.96	12.053	---	---	58.8	---	19.6	---
<u>P. crispus</u>	---	0.24	0.173	---	---	---	---	---	---
<u>P. filliformis</u>	---	---	---	---	---	5.6	---	1.867	---
<u>P. pectinatus</u>	---	---	0.133	---	---	---	---	---	---
<u>P. pusillus</u>	1.12	---	0.373	0.64	---	---	---	0.213	---
<u>V. americana</u>	29.6	80.4	47.867	0.2	118.0	0.92	---	39.707	---

(Table 14 cont.)

Species	8/20		9/1		9/15	
	Sample Replication	Mean	Sample Replication	Mean	Sample Replication	Mean
<u>A. canadensis</u>	10.8	4.04	4.0	1.333	4.0	18.454
<u>C. demersum</u>	---	2.08	1.12	14.773	1.56	0.947
<u>P. crispus</u>	---	0.1067	---	---	---	0.52
<u>P. filliformis</u>	16.8	16.667	---	8.8	0.64	2.12
<u>V. americana</u>	10.4	17.6	54.8	20.4	22.0	32.93
9/1						
<u>A. canadensis</u>	---	---	4.0	1.333	0.12	0.44
<u>C. demersum</u>	18.8	14.773	24.4	---	2.84	---
<u>P. crispus</u>	---	---	---	---	---	---
<u>P. filliformis</u>	26.4	---	---	8.8	0.64	0.12
<u>V. americana</u>	6.4	20.4	54.8	---	22.0	40.8
9/15						
<u>A. canadensis</u>	---	---	---	---	---	3.4667
<u>C. demersum</u>	---	1.867	5.6	---	1.76	2.4667
<u>P. crispus</u>	2.8	0.933	---	---	---	---
<u>P. filliformis</u>	---	4.53	13.6	---	---	0.133
<u>V. americana</u>	125.2	85.2	51.2	79.2	2.0	78.0
			46.0	2.0		42.0

(Table 14 cont.)

Species	Sample Replication	Mean	Sample Replication	Mean	Sample Replication	Mean
9/29						
<u>A. canadensis</u>	9.2	2.3				
<u>C. demersum</u>	13.6	1.64	0.2	0.84	0.26	
<u>P. crispus</u>	0.72	0.18				
<u>P. filliformis</u>	28.0	7.0	6.0	6.0	1.5	
<u>P. zosteriformis</u>	8.4	2.1				
<u>V. americana</u>	296.8	147.5	58.4	7.6	5.2	26.2
10/13						
<u>A. canadensis</u>	2.0	0.8	0.4	0.8	0.4	0.4
<u>C. demersum</u>	4.0	4.3	1.2			0.3
<u>P. filliformis</u>	0.4	3.8	30.0	1.6	1.2	8.2
<u>V. americana</u>	24.4	6.6	6.8	3.2	62.0	18.0
10/27						
<u>A. canadensis</u>	0.96	288.0	43.66			
<u>C. demersum</u>	1.2	8.8	13.2	0.88		0.22
<u>N. flexilis</u>			2.44			0.61
<u>P. crispus</u>	1.16	0.44	0.4			
<u>P. strictifolius</u>					2.12	0.53
<u>V. americana</u>	12.0	1.48	6.47	2.6		0.65
11/10						
<u>A. canadensis</u>	16.0	1.04	105.6	5.707		35.2
<u>C. demersum</u>	5.2	15.6	51.2	6.933		17.07
<u>P. crispus</u>	0.4			0.133		
<u>P. filliformis</u>	0.52			0.413	4.8	1.6
<u>V. americana</u>					0.04	0.013

Table 15. Summary of benthic invertebrate biomass (g/m<sup>2</sup>) and numbers of individuals (of each taxon) as collected from Lake Onalaska at harvest site I (Schafer's Landing), 1979. Numbers of individuals are given in Parentheses.

Collection Date & Species	Control		Experimental		Mean
	Sample Replications	Mean	Sample Replications	Mean	
7/14					
<u>Aseillus</u> sp.	-----	0.0172(86)	-----	0.0387(129)	0.0065
<u>Caenis</u> sp.	-----	-----	-----	0.043(43)	0.0287
<u>Chilopoda</u>	0.043(43)	-----	-----	0.043(86)	0.0072
<u>Chironomidae</u>	0.129(86)	0.344(172)	0.043(86)	0.0215(86)	0.0186
<u>Heliosoma</u> sp.	-----	-----	-----	0.0886(43)	0.0014
<u>Helobdella</u> sp.	-----	-----	-----	0.0129(129)	0.0115
<u>Hyalella azteca</u>	-----	-----	-----	0.043(258)	0.0072
<u>Hydroptilidae</u>	-----	-----	-----	0.043(86)	0.00072
<u>Nematoda</u>	-----	0.0129(43)	-----	0.043(43)	0.0289
<u>Oligochaeta</u>	0.688(602)	0.301(43)	0.129(172)	0.516(473)	0.2795
<u>Palpomyia</u> sp.	-----	-----	-----	0.043(86)	0.00072
<u>Physa</u> sp.	-----	-----	-----	0.043(43)	0.0502
<u>Polycentropus</u> sp.	-----	-----	-----	0.086(129)	0.0215
<u>Sphaeriidae</u>	-----	-----	-----	-----	0.0072
<u>Valvata</u> sp.	-----	0.172(43)	-----	0.0086(43)	0.0014

(Table 15 cont.)

Species	Sample Replication	Mean	Sample Replication	Mean
7/28				
<u>Amnicola</u> sp.	0.0559(43)	0.0186	0.0817(43)	0.1634
<u>Aseillus</u> sp.	0.1806(559)	0.0602	0.0688(86)	0.0416
Chironomidae	0.0473(43)	0.0158	-----	-----
<u>Helobdella</u> sp.	0.1376(301)	0.0602	0.0731(86)	0.0358
<u>Hyalella</u> azteca	0.2236(1720)	0.1763	0.2537(1978)	0.1104
<u>Limnophora</u> sp.	0.344(172)	0.1147	-----	-----
<u>Oligochaeta</u>	0.086(215)	0.258	0.2967(215)	0.2049
<u>Orthotrichia</u> sp.	0.0301(43)	0.010	-----	-----
<u>Palpomyia</u> sp.	-----	-----	-----	0.0315
<u>Paraponyx</u> sp.	0.086(43)	0.0287	-----	-----
<u>Planorbula</u> sp.	-----	-----	0.2666(86)	0.0889
Sphaeridae	0.1118(86)	0.0530	0.0903(86)	0.0702
<u>Succinea</u> <u>rutosa</u>	-----	-----	0.0817(43)	0.0545
8/11				
<u>Amnicola</u> sp.	-----	0.0143	-----	-----
<u>Aseillus</u> sp.	-----	0.0143	0.0215(43)	0.0072
Chironomidae	-----	-----	0.043(86)	0.0143
<u>Helobdella</u> sp.	-----	0.0573	0.086(86)	0.043
<u>Hyalella</u> azteca	0.043(215)	0.086	0.086(301)	0.0502
Nematoda	0.172(215)	0.0573	-----	-----
<u>Oligochaeta</u>	0.559(344)	0.3153	0.86(516)	0.3583
<u>Palpomyia</u> sp.	-----	0.0143	-----	-----
Trichoptera	-----	-----	0.043(43)	0.0143

(Table 15 cont.)

9/1	Sample Replications		Mean	Sample Replications		Mean
<u>Amnicola</u> sp.	0.086(43)	-----	0.030	0.0215(43)	-----	0.0072
<u>Asellus</u> sp.	0.086(172)	0.0215(43)	0.0358	-----	-----	-----
Chilopoda	-----	0.0086(43)	0.0029	-----	-----	-----
Chironomidae	-----	-----	-----	-----	0.043(129)	0.0143
<u>Enallagma</u> sp.	0.0129(43)	-----	0.0043	-----	-----	-----
<u>Gyraulus</u> sp.	-----	0.0172(86)	0.0057	0.043(43)	-----	0.0143
<u>Helobdella</u> sp.	0.086(86)	-----	0.0287	-----	-----	-----
<u>Hyallorella azteca</u>	0.258(2365)	-----	0.086	-----	0.0086(43)	0.0258(86)
<u>Illinoebdella</u> sp.	0.344(43)	-----	0.1147	-----	-----	-----
Nematoda	-----	-----	-----	0.0215(86)	-----	0.0072
<u>Oligochaeta</u>	0.301(215)	0.086(43)	0.2293	-----	0.301(301)	0.172(172)
<u>Palpomyia</u> sp.	-----	0.043(43)	0.0143	-----	0.0172(43)	0.0057

Table 15 cont.)

Collection date & species	Sample Replications		Mean	Sample Replications		Mean
9/15						
<u>Amnicola</u> sp.	-----	-----	-----	0.043(43)	-----	0.0143
<u>Aseillus</u> sp.	0.129(43)	-----	0.043	-----	-----	-----
<u>Chaoborus</u> sp.	-----	0.0172(43)	0.0057	-----	-----	-----
<u>Chilopoda</u>	-----	-----	-----	-----	0.086(43)	0.129(86)
<u>Chironomidae</u>	-----	-----	-----	0.215(43)	0.043(43)	0.0717
<u>Dasyheilla</u> sp.	-----	-----	-----	-----	0.086(43)	0.086
<u>Glossiphonia</u> sp.	-----	0.516(43)	0.172	-----	-----	0.0573
<u>Helobdella</u> sp.	0.043(43)	-----	0.0143	0.043(43)	-----	-----
<u>Hyalella azteca</u>	0.043(215)	0.0215(86)	0.0215	0.215(258)	0.0344(215)	0.0143
<u>Oligochaeta</u>	-----	0.129(43)	0.043	0.258(86)	0.817(129)	0.0975
<u>Palpomyia</u> sp.	-----	0.043(43)	0.0143	-----	-----	0.3583
9/29						
<u>Aseillus</u> sp.	-----	-----	-----	-----	0.043(43)	0.0226
<u>Chilopoda</u>	-----	-----	-----	0.043(43)	-----	0.0108
<u>Chironomidae</u>	0.215(559)	0.129(86)	0.086	0.086(43)	-----	0.0344
<u>Helobdella</u> sp.	0.086(129)	-----	0.0215	-----	-----	-----
<u>Hyalella azteca</u>	0.129(602)	0.048(516)	0.076	-----	0.043(344)	0.0538
<u>Leptocerus</u> sp.	-----	0.086(129)	0.0215	-----	-----	-----
<u>Nymphula</u> sp.	-----	0.086(43)	0.0215	-----	-----	-----
<u>Oligochaeta</u>	-----	0.989(215)	0.4515	0.387(129)	0.043(43)	0.3333
<u>Sphaerium</u> sp.	-----	-----	-----	0.043(43)	-----	0.0108

(Table 15 cont.)  
Collection date  
& species

	Sample Replications			Mean	Sample Replications			Mean
10/13								
<u>Amnicola</u> sp.	-----	0.989(645)	-----	0.2473	-----	-----	-----	-----
<u>Asellus</u> sp.	0.215(172)	0.172(129)	0.043(86)	0.2363	-----	0.301(774)	0.0753	0.0753
<u>Centropilum</u> sp.	-----	-----	-----	-----	-----	0.043(43)	0.0108	0.0108
Chironomidae	-----	0.086(86)	-----	0.0538	0.043(43)	0.043(129)	0.0215	0.0215
<u>Enallagma</u> sp.	-----	0.043(43)	-----	0.0108	-----	0.043(43)	.0108	.0108
<u>Helobdella</u> sp.	-----	-----	-----	-----	0.086(86)	-----	0.0215	0.0215
<u>Hyalella azteca</u>	0.129(731)	0.387(2107)	0.043(215)	0.215	0.043(387)	0.043(129)	0.1505	0.1505
<u>Leptocerus</u> sp.	-----	-----	-----	-----	-----	.043(43)	0.0108	0.0108
Nematoda	-----	-----	-----	-----	-----	-----	0.0215	0.0215
<u>Oecetis</u> sp.	-----	0.301(129)	-----	0.0753	-----	-----	-----	-----
<u>Oligochaeta</u>	0.172(129)	1.376(516)	-----	0.387	-----	0.516(172)	0.129	0.129
<u>Paraponyx</u> sp.	-----	0.086(43)	-----	0.0215	-----	-----	-----	-----
<u>Pisidium</u>	-----	0.043(43)	-----	0.0108	-----	-----	-----	-----
10/27								
<u>Asellus</u> sp.	-----	0.086(86)	-----	0.0215	0.645(215)	0.129(43)	0.2365	0.2365
Chironomidae	0.043(258)	0.043(86)	-----	.0215	0.086(43)	-----	0.1075	0.1075
<u>Enallagma</u> sp.	0.172(43)	-----	-----	0.0431	-----	-----	-----	-----
<u>Helobdella</u> sp.	0.172(172)	-----	-----	0.0431	-----	0.172(86)	.0431	.0431
<u>Hyalella azteca</u>	0.258(860)	0.731(2322)	0.086(387)	0.3988	0.172(860)	0.301(1591)	0.2903	0.2903
<u>Neophylax</u> sp.	-----	-----	-----	-----	-----	.043(43)	0.0108	0.0108
<u>Neureclipsis</u> sp.	-----	-----	-----	-----	0.086(43)	-----	0.0215	0.0215
<u>Oecetis</u> sp.	-----	-----	-----	-----	0.086(86)	-----	0.0215	0.0215
<u>Oligochaeta</u>	-----	-----	-----	-----	.989(86)	-----	0.2473	0.2473
<u>Palpomyia</u> sp.	0.043(86)	-----	-----	0.0108	-----	-----	-----	-----
<u>Phya</u> sp.	0.344(43)	-----	-----	0.086	-----	-----	-----	-----
<u>Succinea rutosa</u> sp.	1.247(172)	-----	-----	0.3118	-----	-----	-----	-----



Table 16. Summary of benthic invertebrate biomass (g/m<sup>2</sup>) and numbers of individuals (of each taxon) as collected from Lake Onalaska at harvest site II (Rosebud Island), 1979. Numbers of individuals are given in parentheses.

Collection date & species 7/14	Control		Experimental		
	Sample Replications	Mean	Sample Replications	Mean	
<u>Aseillus</u> sp.	-----	-----	0.086(387)	-----	0.0287
<u>Caenis</u> sp.	-----	-----	0.0043(43)	-----	0.0014
<u>Chironomidae</u>	0.0086(43)	0.473(172)	0.043(86)	0.774(1204)	0.2723
<u>Helobdella</u> sp.	-----	0.043(43)	-----	-----	-----
<u>Hyalella azteca</u>	0.043(258)	0.086(731)	-----	-----	-----
<u>Illinobdella</u> sp.	-----	-----	0.43(86)	-----	0.1433
<u>Oligochaeta</u>	-----	-----	-----	0.129(258)	0.043
<u>Palpomyia</u> sp.	-----	-----	-----	0.043(215)	0.0143
<u>Viviparus</u> sp.	0.043(43)	0.172(215)	-----	0.129(86)	0.043
7/28					
<u>Aseillus</u> sp.	0.0129(43)	-----	-----	0.0043(43)	0.0014
<u>Chironomidae</u>	0.0258(215)	0.215(215)	0.387(172)	0.5481(516)	0.9231
<u>Gyraulus</u> sp.	-----	-----	0.0215(43)	-----	-----
<u>Helobdella</u> sp.	-----	-----	-----	0.0516(86)	0.0172
<u>Hyalella azteca</u>	0.043(43)	0.0301(86)	0.086(473)	0.2236(2107)	0.1233
<u>Oligochaeta</u>	0.086(301)	0.043(172)	-----	0.0516(43)	0.043
<u>Palpomyia</u> sp.	-----	-----	-----	0.0344(86)	0.0272
<u>Sphearidae</u>	-----	-----	-----	0.0516(86)	0.0172