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**THE IMPACT OF WORCESTER LANDFILL
ON THE MARSHALL BROOK ECOSYSTEM
IN ACADIA NATIONAL PARK**

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ABSTRACT

The Marshall Brook system in the southern part of Acadia National Park was investigated for adverse impacts from Worcester Landfill at several sites and in the receiving waters of Bass Harbour Marsh.

The leachate from Worcester Landfill on the upper portion of the watershed is directly impacting the aquatic life in the stream. High levels of ammonia, sufficient to cause acute mortality in laboratory animals, were found in the rills draining the landfill and in the arm of Marshall Brook immediately downstream of the leachate point. Toxicity tests of serial dilution of the leachate and control water from Marshall Brook showed reduction in survival and reproduction in laboratory tests with fish and invertebrates. Assessment of the representative biological community in Marshall Brook revealed a reduction in the density of diatoms in the periphyton community and an increase in species richness and diversity; an increase in the macroinvertebrate density with a reduction in diversity; and extirpation of brook trout and American eel and possible replacement by four-spined stickleback in the reach immediately downstream from the leachate source. Closure of the landfill, mitigation of the ammonia concentrations, and monitoring of the stream are the recommended courses of action.

Assessment of the reported high levels of algal growth in Bass Harbour Marsh revealed very high levels of phosphorus which were not related to chemical constituents from the Worcester Landfill.

RELATIVE TO WHAT!

INTRODUCTION

This report covers the assessment of two environmental problems in the southern portion of Acadia National Park, Mount Desert Island, Maine. The first problem is estimation of impact of leachate from Worcester Landfill on the aquatic community in Marshall Brook. Worcester Landfill occupies the lower half of the only gravel pit on Mount Desert Island (Figure 1). The site has been a dump since the mid-1930's when it was used as a refuse depot by a nearby Civilian Conservation Corps camp. Marshall Brook was once considered the best sea-run brook trout in the island (Les Smith, personal communication). Reported reduction of the fish community in Marshall Brook indicated that there was a potential toxic component of the discharge from two man-made leachate rills draining the landfill as well as several seeps downstream.

Following a request by Acadia National Park, Hansen (1980) identified the source of the leachate and the potential toxic agents. His report lists concentrations of un-ionized ammonia high enough to be toxic to fish, depressed levels of dissolved oxygen, potentially toxic levels of heavy metals and high levels of chemical oxygen demand present in water samples from the two leachate rills. Gross analysis of the benthic invertebrate community collected on plated samplers at two stations on Marshall Brook below the leachate rills showed a decrease in diversity, elimination of all members of Plecoptera, and an increase in the density of Chironomidae relative to other stations and unaffected reaches of the stream.

In a subsequent study Soukup and Mitchell (1981) confirmed high levels of un-ionized ammonia coming from the landfill leachate rill. In a third assessment Gerber (1982) analyzed leachate from the landfill and

found high levels of ammonia, phosphorus, chloride, iron, and chemical oxygen demand. Gerber found that the leachate had the potential to travel north through the ground water towards Long Pond in addition to impacting Marshall Brook in the south. A final study by Soukup, Mitchell and Johnson (1984) again found high levels of dissolved inorganic constituents particularly ammonia and nine volatile organic contaminants at levels of less than 1.0 ug/L.

The second environmental problem involves reports by the local populace over the past several years that the open water portion of Bass Harbour Marsh has become increasingly affected by mid-summer growths of nuisance algae. Because this marsh receives water from Marshall Brook, is bordered by the Tremont Landfill, and receives tidal flush from the towns of Bernard and Bass Harbour, there is opportunity for nutrient addition from several of these sources.

In order to provide management oriented information to Acadia National Park a study was undertaken by personnel from National Park Service, North Atlantic Regional Office, Boston; University of Maine, Orono; U.S. Environmental Protection Agency Region I, Boston and N.P.S. Water Resources Division, Colorado State University, Fort Collins.

The objectives of this study include: 1) characterization of the chemical constituents in the leachate from Worcester Landfill, 2) assessment of the effects of the landfill leachate on aquatic life both in laboratory toxicity studies, and assessment of the representative algal, invertebrate and fish community present in Marshall Brook, and 3) assessment of the nature and concentration of nutrients entering Bass Harbour Marsh.

MATERIALS AND METHODS

Water Sampling and Analysis

Two sets of water samples were collected for chemical analysis. On June 10, 1986, personnel from Acadia National Park and the U.S. Environmental Protection Agency Regional Office in Boston collected water samples from several places in the vicinity of the Worcester Landfill and on Marshall Brook. Site I on Marshall Brook upstream of any landfill leachate influence, SWH-2B and SWH-4B the west and east leachate rills draining the landfill proper, and Site II and Site V on Marshall Brook downstream from the leachate rills (Fig. 2).

Additional water samples were collected by investigators from the University of Maine on July 18, August 13, September 5 and October 6 at nine different sites (Fig. 2): Site I East Fork Marshall Brook upstream of the landfill, Site II East Fork Marshall Brook downstream of landfill, Site III West Fork of Marshall Brook, Site IV Lurvey Brook, Site V Marshall Brook upstream of confluence with Lurvey Brook, Site VI Lurvey Brook upstream of confluence with Marshall Brook, Site VII Marshall Brook before entering Bass Harbour Marsh, Site VIII open water of Bass Harbour Marsh, and Site IX unnamed arm of Bass Harbour Marsh at Tremont Landfill.

Dissolved oxygen, water temperature and discharge were determined in the field. The water samples taken by NPS/EPA personnel were analyzed at the U.S. Environmental Protection Agency Laboratory, 60 Westview St., Lexington MA 02174 for purgeable organics, selected heavy metals, several water quality parameters, (Federal Register 1984).

The samples collected by the University of Maine were analyzed by the Plant and Soil Analytical Laboratory, 407 Deering Hall, University of

Maine at Orono for pH, specific conductivity, total phosphorus, total nitrogen and ammonia nitrogen.

Biological Samples

The benthic macroinvertebrate community was assessed using collections from Hester-Dendy multiple plate samplers introduced into the streams at Sites I-VII. The periphyton community was assessed using collection from four-inch diameter clay flower pots inverted in the stream at Sites I-IX. Both sets of substrates were introduced into the stream on July 8 and collected and reintroduced to the stream on August 13, September 5 and a final collection made on October 6. This sampling time interval is optimal in allowing adequate colonization and measurement of diversity (Roby et al., 1978).

The insect community was enumerated by personnel at the Department of Entomology, University of Maine, except for individuals of the family Chironomidae which were enumerated by Dipteran Enterprises, Champaign, Illinois. The diatom component of the periphyton community was enumerated by NPS personnel at Colorado State University.

On July 24, 1985, fish collections were made using electro-fishing along similar 100-meter reaches in Marshall and Lurvey Brooks at Sites II and IV and for 10 meters at Sites V and VI.

The toxicity of water from the two leachate rills was assessed in the U.S. EPA Lexington Laboratory. Acute toxicity was measured in static tests for the Daphnid, Daphnia pulex and fathead minnow, Pimephales promelas (Committee on Methods, 1975) on water from the leachate rills (Sites SWH-2B, SWH-4B) in serial dilutions with water from upstream (Site I). Chronic toxicity was measured using the zooplankton Ceriodaphnia

reticulata, survival and reproduction over a seven-day period in the static mode with renewal of test water on the third and fifth day (Mount and Norberg, 1984).

Because changes in community structure is a complex phenomenon, data on the diatoms enumerated in the periphyton community and insects from the multiplate samplers were treated with several community analysis schemes to test for the effects of the leachate on the biological community. Diversity was measured as species richness, Shannon's formula, Simpson's formula; similarity was assessed with Jaccard's similarity, and percent similarity (Washington, 1984).

In addition, the coefficient of community change was calculated as:

$$\frac{(T_i/T_o) (S_i/S_o) (S_i/T_i)^{1/2}}{(S_o/T_o)^{1/2}}$$

where

T_o = total number of individuals in community o,

T_i = total number of individuals in community i,

S_o = number of species in community o,

S_i = number of species in community i.

RESULTS

Chemical

The analysis of the purgeable organic compounds from water collected from the two leachate rills analyzed by the Lexington EPA Laboratory showed none of the common priority pollutants (Table 1). Other organic compounds detected at low levels in the eastern leachate rill (Site SWH-4B) included acetone, and ethyl ether, both common industrial and domestic solvents, and tetrahydrofuran, a solvent used in high tech and plastic manufacturing industries (Tables 1, 2). None of these compounds is known to be toxic at the levels found in the analysis. Acetone and ethyl ether have high vapor pressures and are readily biodegradable in natural ecosystems; tetrahydrofuran is allowed by F.D.A. in food containers (Windholz et al., 1983).

The analysis of heavy metals in water taken at Sites I and II and in the leachate rills, showed high levels of iron, however, the other metals were found at acceptably low levels (Table 3). It appears that while iron is present in the landfill leachate it is also present in high levels upstream, indicating that the majority of the iron may be due to natural background. The June water collection by the EPA also included several other water quality determinations (Table 4). Total Kjeldahl nitrogen, ammonia nitrogen, and nitrate-nitrite all indicate that the east leachate rill (SWH-4B) is the heaviest contributor to nitrogen loading with a secondary source in the west leachate rill (SWH-2B). The presence of phenols in the leachate indicates that anaerobic conditions may be playing a role in the transformation and transport of organic compounds normally sorbed onto soils and clays (Sawhney and Kozloski, 1984).

Concentrations of ammonia persisted downstream as far as Site II at levels known to be toxic to salmonids (U.S.E.P.A., 1985).

The samples taken by the University of Maine and analyzed for several water quality variables indicated that ammonia was highest at Site II, with elevated levels formed at Sites V, VII and VIII (Table 5). Ammonia nitrogen was presented in amounts known to be acutely toxic to aquatic life in Marshall Brook at Site II and persisted in concentrations downstream at Site V high enough to have known chronic effects on the fry of salmonids in laboratory studies (Rice and Bailey, 1980).

Total phosphorus was somewhat elevated at Site II by leachate from the landfill, but was highest at Sites VIII and IX in Bass Harbour Marsh. The pattern of concentrations indicates that the high level of phosphorus in the main body of the marsh was not due to leachate from either the Worcester or Tremont Landfill. A process of elimination implies that the nutrients may be coming from Bass Harbour. Also the conductivity of the water indicates that water in the marsh, Site VIII, had a high concentration of sea water. The levels of phosphorus are indicative of highly eutrophic conditions (Carlson, 1977) and deserve further investigation to determine the exact source and magnitude of input. Specific conductivity in the fresh water part of Marshall Brook was also highest at Site II followed by Sites V and VII reflecting the contribution of dissolved contaminants from the Worcester Landfill. Dissolved oxygen values at Site II appeared to be slightly depressed relative to other similar sites in Marshall and Lurvey Brook (Table 6).

Laboratory

The acute bioassay results for waters taken from the west leachate

rill (Site SWH-2B) showed no acute toxicity. Water taken from the east leachate rill (Site SWH-4B) was very toxic. The LC 50's (lethal concentration killing 50 percent of test animals) expressed in terms of percent of landfill leachate/stream water was 35.4 percent (29.4-42.5 95 percent confidence limits) for Daphnia pulex and 15.6 percent (16.0-18.9 percent) for Pimephales promelas (Table 7). The no-effect level for both organisms was 25 percent and <10 percent respectively.

Chronic toxicity was determined using seven-day reproduction and survival test with Ceriodaphnia reticulata (table 8). Water from Site I was used as a control and as dilution water with water from Site II in Marshall Brook as exposure media. All Ceriodaphnia reticulata were killed with the 50 percent dilutions; at 30 percent dilution mortality was reduced, but there was a diminished reproductive ratio relative to the control. The 10 percent, 3 percent and 1 percent treatments and water from Site V had reproductive ratios equal to or greater than the control. The no-effect level for survival was 3 percent. There was a slight reduction in survival of the Ceriodaphnia in water taken at Site V relative to survival of those in water upstream from the leachate rills.

Stream Community Assessment

Three components of the biological community were assessed for differences due to effects of the leachate from the Worcester Landfill in Marshall Brook system. The diatom portion of the periphyton community and the macroinvertebrates were treated to a comprehensive community analysis that included diversity and similarity analysis. Because the fish community consisted of only three species, simpler comparisons were made.

Diatoms. The density of the diatoms in the periphyton was found to be reduced at Site II relative to the diatom community at similar representative stream Sites I, III and V. Site IV also had lower density at one date perhaps due to the impact or runoff from the Seal Cove Road immediately upstream. The lower density at Site II was accompanied by higher species richness and higher diversity values on all but one date relative to Sites I, III, and IV (Table 9). These changes implicate reduction in a dominant set of species in the diatom community due to exposure to the leachate from the landfill. Ammonia in laboratory tests has been shown to be inhibitory to photosynthesis of genera of diatoms found in Marshall Brook samples at the concentrations of ammonia found in Marshall Brook (Admiraal, 1977). The pattern of densities and diversities did not reveal relative community changes elsewhere associated with potential impacts.

The similarity between the diatom communities was compared at selected pairs of sites to test the differences due to the landfill leachate. This analysis revealed that there was less similarity in different components of the diatom community among different branches of Marshall Brook, Sites I, III and IV than within a single tributary, Sites I and II, irrespective of the input the landfill leachate.

Macroinvertebrates. The density of the total number of invertebrates was greater at Site II on all collecting dates than at Site I, Site II and for two of three dates at Site IV. Analysis of density at further downstream Sites V, VI and VII and species richness at all comparable sites downstream revealed no pattern that could be associated with impact from Worcester Landfill.

Diversity was lower at two dates on Site II relative to Sites I, III and IV on the August and September collection dates and similar on the October collection dates. These October collections followed heavy precipitation due to a hurricane crossing the island. This increased the stream discharge in the following weeks and could have reduced differences among the different sites. Comparisons of diversity at Sites V, VI and VII revealed no pattern that could be associated with impact from the leachate from Worcester Landfill. Analysis of similarity coefficients showed no persistent trend that could be associated with impact of the Worcester Landfill in the macroinvertebrate community.

Fish. The fish collected in two tributaries of Marshall Brook showed the most pronounced differences associated with the leachate from the Worcester Landfill. Four reaches of the streams were compared. In the 100m reach on Lurvey Brook at Site IV, brook trout and American eels were collected but not four-spined stickleback (Table 13). The 100m reach beginning at Site II just downstream of the leachate rill had only four-spined stickleback. Just above the confluence of the two streams there were brook trout and American eel found in both but four-spined stickleback found only in Marshall Brook.

Two factors are potentially affecting the differential pattern in fish distribution. Trout are among the most sensitive aquatic organisms to ammonia toxicity (Jones, 1948; Rice and Bailey, 1980; U.S. EPA, 1985). The values of un-ionized ammonia found at Site II would have had acute lethal effects on fish in the laboratory. In addition to the acute effects, long-term chronic effects of ammonia occur in trout at one-fifth the concentrations causing short-term acute toxicity. Brook trout are

therefore in the class of organisms that exhibits the most sensitivity to ammonia and, given the measured concentrations, one would expect their absence in the affected portion of Marshall Brook. The response of American eel to ammonia does not appear in the literature.

The second potential reason for the differences in the fish of the two streams is the potential attractiveness of Marshall Brook to the four-spined stickleback. Jones (1948) studied the behavioral reactions of several species of fish to ammonia, among them the three-spined stickleback. In the experimental laboratory conditions, the stickleback showed an attraction for waters with ammonia concentrations. The threespined stickleback is in the same family as the four-spined and is similar in several aspects of natural history (Eddy, 1957). It is possible that the four-spined stickleback is not only more tolerant of ammonia than the brook trout and American eel but actually may have an affinity for ammonia-rich waters.

DISCUSSION AND CONCLUSION

The leachate from Worcester Landfill is directly impacting the aquatic life in the stream. High levels of ammonia sufficient to cause acute mortality in laboratory animals were found in the rills draining the landfill and in the arm of Marshall Brook immediately downstream of the leachate point. Toxicity tests of serial dilution of the leachate and control water from Marshall Brook showed reduction in survival and reproduction in laboratory tests with fish and invertebrates. Assessment of the representative biological community in Marshall Brook revealed a reduction in the density of diatoms in the periphyton community and an increase in species richness and diversity; an increase in the macroinvertebrate density with a reduction in diversity, and extirpation of brook trout and American eel and possible replacement by four-spined stickleback in the reach immediately downstream from the leachate source. Closure of the landfill, mitigation of the ammonia concentrations and monitoring of the stream are the recommended courses of action.

Assessment of the reported high levels of algal growth in Bass Harbour Marsh revealed very high levels of phosphorus which were not related to chemical constituents from the Worcester Landfill.

The chemical, laboratory and stream community analyses presented in this report can serve as base line information for future studies and monitoring programs. Properly designed studies could determine either the success of mitigating actions on the Worcester Landfill or the continued impacts of the landfill leachate on Marshall Brook.

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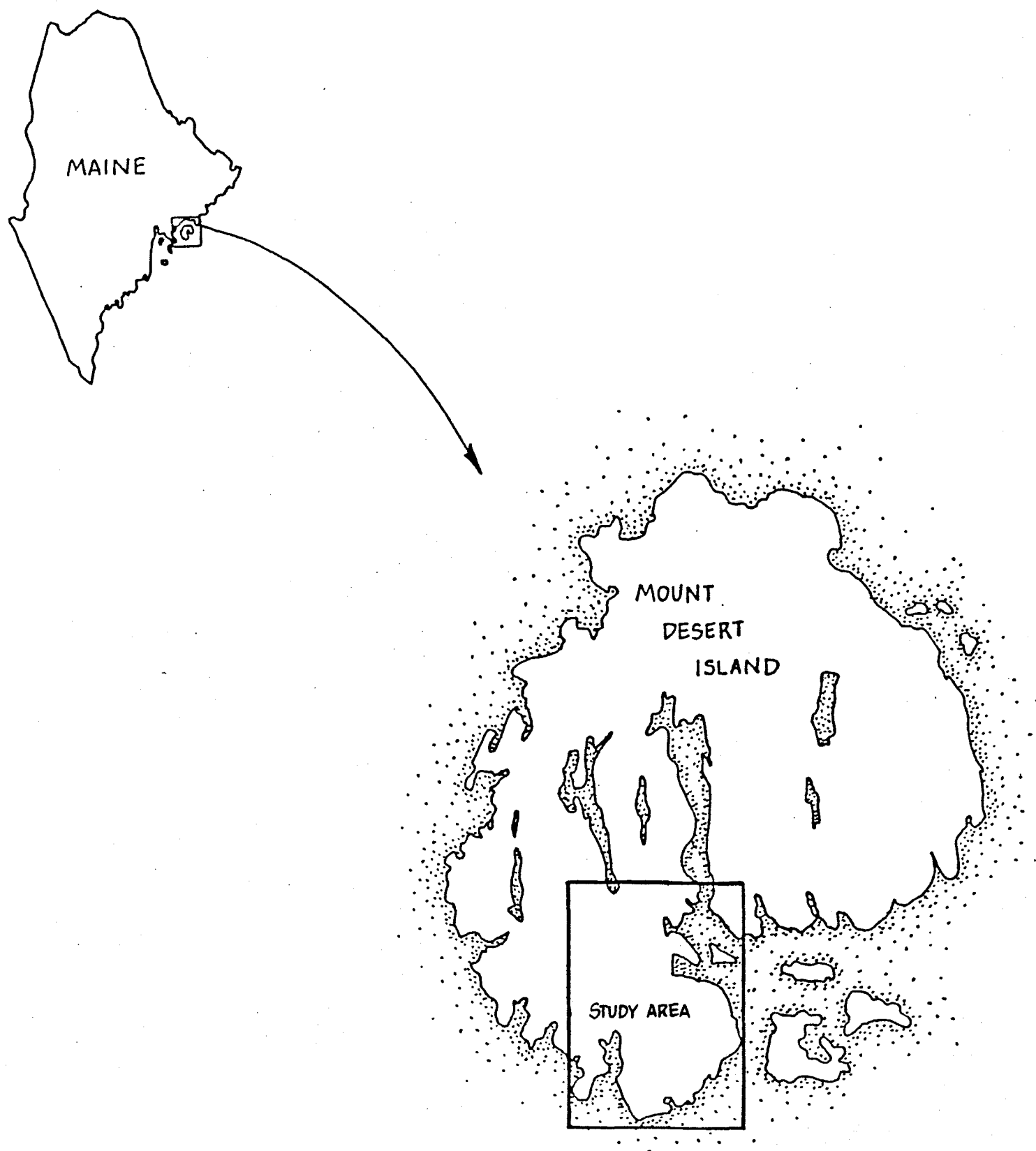


FIGURE 1. LOCATION OF STUDY AREA

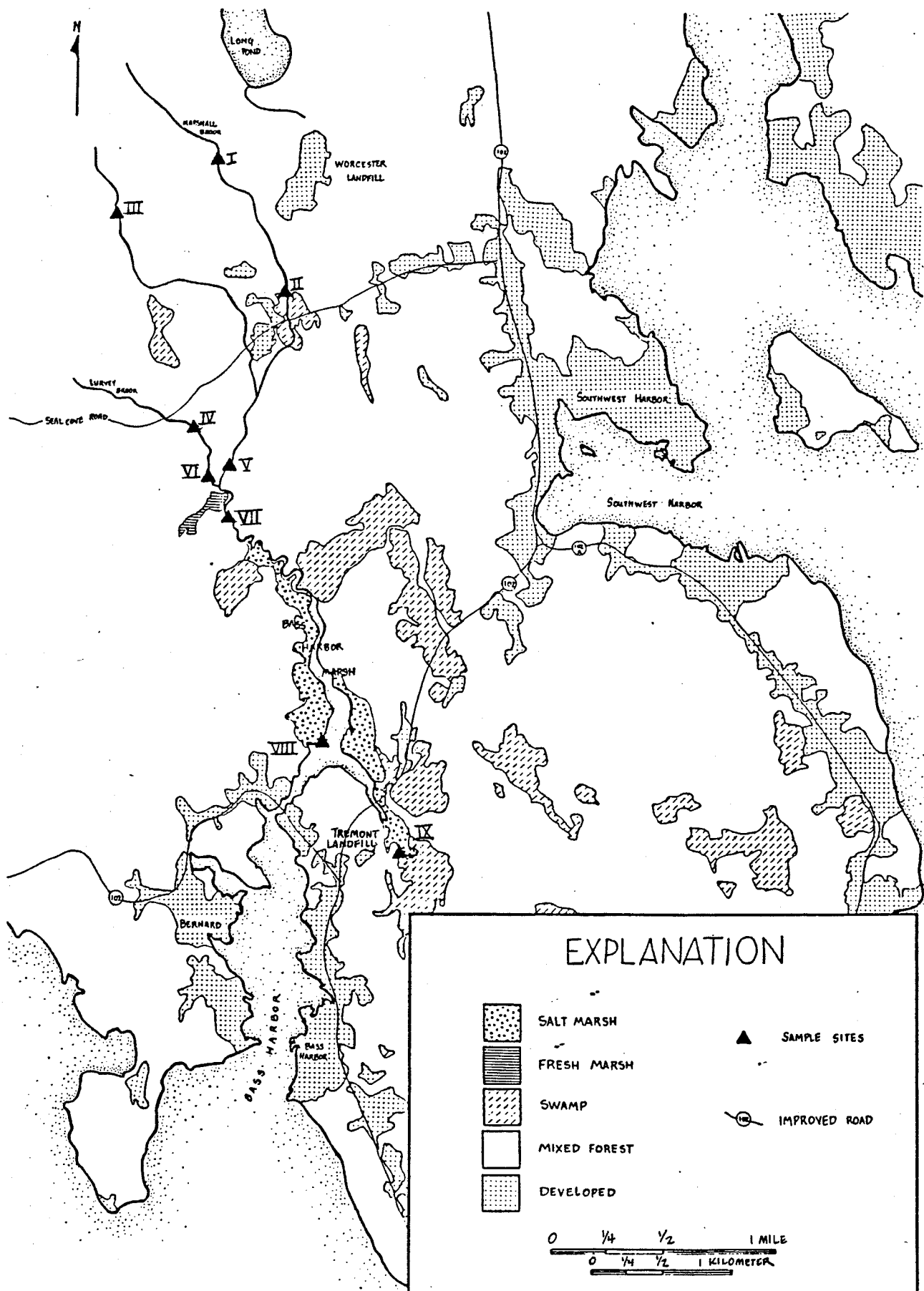


FIGURE 2. LOCATION OF SITES WITHIN STUDY AREA.

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Table 1. EPA analysis of purgeable organics from the east and west leachate rills Worcester Landfill.

Compound	Concentration (g/L)	Detection Limit (g/L)
Chloromethane	ND	6
Bromomethane	ND	2
Vinyl Chloride	ND	4
Chloroethane	ND	4
Methylene Chloride	2	1
Trichlorofluoromethane	ND	5
1,1-Dichloroethylene	ND	1
1,1-Dichloroethane	ND	1
1,2-Dichloroethylene isomers	ND	1
Chloroform	ND	1
1,2-Dichloroethane	ND	5
1,1,1-Trichloroethane	ND	1
Carbon Tetrachloride	ND	1
Bromodichloromethane	ND	1
1,2-Dichloropropane	ND	1
t-1,3-Dichloropropene	ND	1
Trichloroethylene	ND	1
Dibromochloromethane	ND	1
c-1,3-Dichloropropene	ND	4
1,1,2-Trichloroethane	ND	1
Benzene	ND	2
2-Chloroethylvinyl ether	ND	2
Bromoform	ND	1
Tetrachloroethylene	ND	1
1,1,2,2-Tetrachloroethane	ND	1
Toluene	ND	1
Chlorobenzene	ND	1
Ethylbenzene	ND	1
Acrolein	ND	30
Acrylonitrile	ND	30
<u>Hazardous substances</u>		
Acetone	30	15
Carbon Disulfide	ND	1
2-Butanone	ND	15
vinyl acetate	ND	3
2-Hexanone	ND	3
4-Methyl-2-Pentanone	ND	1
Styrene	ND	2
Xylenes (total)	ND	2

Table 2. Other organics found in east leachate rill and downstream in Marshall Brook.

Compound	SWH-4B	II
Tetrahydrofuran	52 g/L	11 g/L
Ethyl ether	9 g/L	--

Table 3. U.S. EPA analysis of selected metals in the Marshall Brook area.

Sample Site	Cu g/l	Mn g/l	Zn g/l	Cd g/l	Cr g/l	Pb g/l	As g/l	Hg g/l	Fe g/l
SWH-4B	20	300	40	20	10	<100	<4	<0.2	2,700
SWH-4B	20	310	50	10	10	<100	<4	<0.2	3,300
SWH-2B	20	70	20	<10	10	<100	61	<0.2	3,400
II	20	460	50	10	<10	<100	59	<0.2	3,600
I	10	110	40	20	10	<100	64	<0.2	2,600

Table 4. U.S. EPA analysis of selected water quality variables in Marshall Brook area.

Sample	TKN	NH ₃ -N	NO ₂ -NO ₃	TP	BOD ₅	CN	Phenols
Site	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	g/l
SWH-4B	295	135	2.40	0.15	17	0.01	4.4
SWH-4B	151	120	2.40	0.06	19	0.01	11.1
SWH-2B	5.0	4.5	0.21	0.18	2	<0.01	<4
II	111	106	12.50	0.09	88	0.03	<4
I	0.4	0.3	0.5	0.31	5	<0.01	<4

TKN = Total Kjeldahl Nitrogen

TP = Total Phosphorus

CN = Cyanide

Table 5. Analyses of water samples from the Marshall Brook area of Mount Desert Island, Maine collected during 1985. Analyses performed in the Plant and Soil Analytical Laboratory, 407 Deering Hall, University of Maine at Orono.

Site	Date	pH	Specific conductivity mho/cm	Total phosphorus mg/L	Ammonia nitrogen mg/L	Unionized ammonia mg/L
I	7/18	6.55	5.1	0.021	<0.1	
	8/13	6.63	5.3	0.022	<0.05	
	9/5	5.38	5.5	<0.002	<0.05	
	10/6	6.17	5.26	0.017	<0.05	
II	7/18	7.99	53.7	0.085	16.0	0.45891
	8/13	7.91	66.0	0.053	79.0	1.5800
	9/5	7.45	16.8	0.186	3.8	0.02805
	10/6	7.68	36.2	0.150	12.5	0.12446
III	7/18	6.33	5.4	<0.005	<0.1	
	8/13	6.3	5.6	0.010	0.09	
	9/5	5.45	5.2	<0.002	<0.05	
	10/6	6.11	5.79	0.017	0.05	
IV	7/18	6.45	5.4	0.045	<0.1	
	8/13	6.53	6.8	0.020	<0.05	
	9/5	4.54	5.2	0.068	<0.05	
	10/6	5.39	5.26	0.059	<0.05	
V	7/18	7.41	10.0	0.040	0.27	0.00287
	8/13	6.99	11.0	0.035	0.30	0.00102
	9/5	6.5	7.9	0.085	0.31	0.00027
	10/6	5.29	10.3	0.049	0.70	0.00003
VI	7/18	5.92	4.6	0.060	<0.1	
	8/13	6.02	5.2	0.016	<0.05	
	9/5	5.01	4.9	0.065	<0.05	
	10/6	6.13	5.26	0.087	<0.05	
VII	7/18	6.91	7.3	0.048	0.12	0.00052
	8/13	7.18	8.7	0.041	0.18	0.00121
	9/5	5.94	6.2	0.057	0.14	0.00003
	10/6	5.63	10.8	0.104	0.28	0.00003
VIII	7/18	8.37	3290.4	0.93	<0.1	
	8/13	8.67	2120.0	0.553	<0.05	
	9/5	6.53	204.0	0.532	0.24	0.00024
	10/6	6.53	3860.0	2.30	0.08	
IX	7/18	6.90	703.5	0.43	<0.1	
	8/13	5.18	35.0	0.203	<0.05	
	9/5	4.38	12.5	0.102	<0.05	
	10/6	7.88	3860.0	0.166	<0.05	

Table 6. Stream Characteristics of sites sampled in the Marshall Brook area of Mount Desert Island, Maine in 1985.

Site	Date	Dissolved Oxygen (PPM)	Water Temp. (°C)	Velocity (cm/sec)	Depth (cm)	Width (cm)	Discharge (m ³ /sec)
I	7/18	10.0	15.0	3.0	12.9	130.0	0.004
	8/13	10.4	13.0	4.6	12.0	140.0	0.006
	9/5	11.2	13.5	13.7	19.0	175.0	0.036
	10/6	11.4	11.5	9.14	13.0	187.0	0.018
II	7/18	8.2	16.2	9.1	6.8	81.0	0.004
	8/13	8.8	13.5	9.1	6.5	68.0	0.004
	9/5	11.0	13.2	18.3	15.0	140.0	0.034
	10/6	9.1	11.0	9.14	13.0	150.0	0.016
III	7/18	9.0	18.2	11.6	10.0	126.0	0.012
	8/13	10.1	15.5	3.0	17.0	180.0	0.007
	9/5	11.8	13.8	15.8	34.0	180.0	0.007
	10/6	12.9	12.0	19.8	29.0	242.0	0.111
IV	7/18	9.6	15.5	18.3	4.0	40.0	0.002
	8/13	10.4	14.0	5.3	7.0	170.0	0.005
	9/5	12.0	14.0	28.9	18.0	195.0	0.091
	10/6	12.1	12.0	19.8	13.3	189.0	0.036
V	7/18	9.0	21.0	3.0	60.0	274.3	0.045
	8/13	9.4	18.0	3.0	53.0	320.0	0.046
	9/5	12.0	15.0	20.4	76.0	335.3	0.470
	10/6	11.4	13.0	7.62	63.0	579.1	0.250
VI	7/18	8.8	25.0	0.61	66.0	548.6	≤0.020
	8/13	10.8	20.0	3.0	56.0	487.7	0.076
	9/5	12.2	15.5	12.2	75.0	579.1	0.477
	10/6	11.9	14.0	4.57	57.0	320.0	0.075
VII	7/8	9.0	24.5	0.61	45.0	1463.0	≤0.036
	8/13	9.0	21.0	3.0	64.0	1280.0	0.224
	9/5	12.2	15.7	12.2	62.0	1219.2	0.828
	10/6	11.8	14.5	3.05	42.0	1280.0	0.148
VIII	7/18	8.8	27.0				
	8/13	7.0	28.0				
	9/5	9.6	17.5				
	10/6	9.4	20.0				
IX	7/18	7.2	28.0				
	8/13	7.2	26.0				
	9/5	13.4*	19.5				
	10/6	9.1	19.0				

*This value seems high but I have no explanation.

Table 7. Toxicity of water from leachate rills, Worcester
Landfill (EPA tests).

	LC50	No Effect
Site SWH-2B		
Daphnid	>100%	100%
Fathead Minnow	>100%	100%
Site SWH-4B		
Daphnid	35.4	25
Fathead Minnow	15.6	<10

Table 8. Seven-day young production and survival for Ceriodaphnia exposed to leachate contaminated Marshall Brook water, Southwest Harbor, Maine (U.S. EPA Lab.).

Station	Mean Young/Female	Percent Survival		
		Day-3	Day-5	Day-7
Site I (Control)	11.8	100	100	100
Site II (50%) ^a	0.0 ^b	0	0	0
Site II (30%) ^a	1.6 ^b	90	70	70
Site II (10%) ^a	19.9 ^b	90	90	90
Site II (3%) ^a	21.2 ^b	100	100	100
Site II (1%) ^a	12.6	80	80	80
Site V	16.9	80	70	70

a = Diluted V/V with Site I water

b = Significantly different from the control at the 5% level based on a modified Dunnett's test.

Table 9. Acadia - diatoms community analysis: diversity.

Site	Date	Density ind/cm ²	Species Richness	H'	D
I	8/13	1.28x10 ⁶	55	2.193	0.822
	9/5	8.6x10 ⁶	55	2.198	0.843
	10/6	1.15x10 ⁶	56	2.970	0.823
II	8/13	5.5x10 ⁵	63	3.597	0.526
	9/5	7.3x10 ⁵	83	3.970	0.976
	10/6	7.0x10 ⁵	75	3.656	0.950
III	10/6	1.1x10 ⁶	18	1.220	0.481
IV	9/5	7.9x10 ⁵	43	3.093	0.936
	10/6	5.0x10 ⁵	49	3.180	0.927
V	8/13	3.3x10 ⁶	61	3.567	0.961
	9/5	5.3x10 ⁶	41	3.093	0.936
	10/6	3.3x10 ⁶	67	3.648	0.958
VI	8/13	2.2x10 ⁶	73	3.905	0.971
	9/5	2.9x10 ⁶	68	3.705	0.956
	10/6	3.8x10 ⁶	60	3.600	0.960
VII	8/13	2.2x10 ⁶	64	3.725	0.972
	9/5	6.3x10 ⁶	49	3.088	0.933
	10/6	8.4x10 ⁶	38	2.769	0.874
VIII	8/13	5.5x10 ⁶	43	2.925	0.905
IX	8/13	7.5x10 ⁶	38	2.922	0.925

H' is Shannon-Weiner diversity

D is Simpson's diversity (see Washington, 1984).

Table 10. Acadia - diatoms community analysis: similarity.

Site	Date	J (Pooled)	B (Pooled)	CCC (Pooled)
I:II	8/13	26.8	0.430	0.532
	9/5	26.5	0.544	0.792
	10/6	26.8	0.483	0.421
(Dropped replicate #2 from Site #2 10/6 for this analysis to equal replicates from Site #1)				
I:III	10/6	17.3	0.505	0.592
(Dropped replicate #2 from Site #1 10/6 for this analysis to equal replicates from Site #3)				
I:IV	9/5	22.0	0.549	0.822
	10/6	30.1	0.453	0.435
(Dropped replicate #1 from Site #1 9/5 for this analysis to equal replicates from Site #4)				
V:VI	8/13	23.8	0.477	0.415
	9/5	20.1	0.467	0.570
	10/6	32.7	0.434	0.255
V:VII	8/13	29.6	0.539	0.330
	9/5	22.2	0.395	0.320
	10/6	22.1	0.567	0.488
(Dropped replicate #1 from Site #5 10/6 for this analysis to equal replicates from Site #7)				
VI:VII	8/13	29.1	0.494	0.216
	9/5	22.2	0.414	0.558
	10/6	18.0	0.462	0.621
(Dropped replicate #1 from Site #6 10/6 for this analysis to equal replicates from Site #7)				

(-- = only one replicate; value same as pooled).

J is Jaccard's coefficient.

B is Pinkhom and Pearson's similarity.

CCC is coefficient of community change (see Washington, 1984).

Table 11. Acadia - macroinvertebrates community analysis: diversity.

Site	Date	Density	Species Richness	H'	D
I	8/13	195	24	2.257	0.848
	9/5	145	22	2.507	0.893
	10/6	169	16	2.056	0.832
II	8/13	411	23	1.649	0.643
	9/5	413	17	1.754	0.718
	10/6	218	23	2.271	0.854
III	8/13	77	21	1.940	0.683
	9/5	279	12	1.884	0.762
	10/6	73	15	2.179	0.854
IV	8/13	121	22	2.360	0.859
	9/5	128	16	2.239	0.855
	10/6	298	20	2.031	0.817
V	8/13	101	17	2.226	0.865
	9/5	78	21	2.615	0.916
	10/6	52	9	1.304	0.593
VI	8/13	166	20	1.136	0.394
	9/5	13	6	1.671	0.858
	10/6	58	8	2.172	0.422
VII	8/13	81	19	2.353	0.873
	9/5	28	14	2.434	0.925
	10/6	305	14	0.686	0.272

H' is Shannon-Weiner diversity

D is Simpson's diversity (see Washington, 1984).

Table 12. Macroinvertebrates community analysis: similarity.

Sites	Date	J	B	CCC
I:II	8/13	31.9	0.548	0.58
	9/5	23.0	0.272	0.40
	10/6	20.5	0.622	0.60
I:III	8/13	48.1	0.383	0.54
	9/5	21.7	0.284	0.55
	10/6	22.5	0.428	0.51
I:IV	8/13	17.3	0.240	0.56
	9/5	18.4	0.408	0.60
	10/6	19.4	0.450	0.57
V:VI	8/13	21.6	0.326	0.61
	9/5	18.5	0.346	0.30
	10/6	17.6	0.825	0.63
V:VII	8/13	13.8	0.555	0.55
	9/5	17.1	0.351	0.45
	10/6	13.0	0.374	0.29
VI:VII	8/13	30.7	0.605	0.60
	9/5	15.0	0.570	0.40
	10/6	13.6	0.423	0.31

J is Jaccard's coefficient.

B is Pinkhom and Pearson's similarity.

CCC is coefficient of community change (see Washington, 1984).

Table 13. Fish census versus Marshall and Lurvey Brook, July 24, 1985.

	Brook Trout	American Eel	Stickleback
Marshall Brook			
Site II (100 m)			
Number	0	0	46
Mean length (cm)			3.5
S.D.			0.2
Site V (10 m)			
Number	1	2	6
Mean length (cm)	15.2	10.9	3.4
S.D.			0.9
Lurvey Brook			
Site IV (100 m)			
Number	18	9	0
Mean length (cm)	8.3	14.3	
S.D.	2.0	5.8	
Site VI (10 m)			
Number	2	2	
Mean length (cm)	14.4	23.6	0
S.D.	5.1	2.3	

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[illegible]

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	SITE REPLICATE	1	2	3	4	5	6	7	8	9
		1	1	1	1	1	1	1	1	1
Cocconeis										
placentula var. euglypta		0	0	0	0	3	5	7	0	0
placentula var. lineata		0	0	0	0	0	0	0	0	0
scutellum var. minor		0	0	0	0	0	0	0	0	0
scutellum var. parva		0	0	0	0	0	0	0	0	0
scutellum var. scutellum		0	0	0	0	0	0	0	0	0
Cyclotella										
meneghiniana var. meneghiniana		0	0	0	0	0	0	0	0	0
stelligera var. stelligera		0	0	0	0	1	1	0	0	0
striata var. bipunctata		0	0	0	0	0	4	15	0	0
Cymbella										
amphicephala var. amphicephala		4	0	0	0	0	0	0	0	0
angustata var. angustata		0	6	0	0	0	0	0	0	0
aspera var. aspera		0	0	0	0	1	0	0	0	0
lunata var. lunata		3	0	0	0	6	7	0	0	0
microcephala var. microcephala		0	2	0	0	0	0	0	0	0
minuta var. minuta		0	4	0	0	0	2	0	0	0
minuta var. pseudogracilis		0	0	0	0	0	0	0	0	0
minuta var. silesiaca		0	5	0	0	1	17	0	0	0
naviculiformis var. naviculiformis		1	0	0	0	0	0	0	0	0
norvegica var. norvegica		0	0	0	0	0	0	0	0	0
perpusilla var. perpusilla		0	0	0	0	0	0	0	0	0
pusilla var. pusilla		0	0	0	0	0	0	0	0	0
unknown sp. A-1		0	0	0	0	0	0	0	0	0
Diatoma										
anceps var. anceps		0	0	0	0	0	0	0	0	0
hiamale var. mesodon		2	3	0	0	0	0	0	0	0
Diploneis										
bombus var. bombus		0	0	0	0	0	0	0	0	0
domblittensis var. domblittensis		0	0	0	0	0	0	0	0	0
elliptica var. elliptica		0	0	0	0	0	0	0	0	0
Entomoneis										
paludosa var. paludosa		0	0	0	0	0	0	0	0	0
paludosa var. subsalina		0	0	0	0	0	0	0	0	0
Epithemia										
adnata var. minor		0	0	0	0	0	0	0	0	0
Eunotia										
arcus var. arcus		0	0	0	0	0	0	0	0	0
curvata var. curvata		6	10	0	0	8	11	15	0	0
diodon var. diodon		0	0	0	0	0	0	0	0	0
exigua var. compacta		0	0	0	0	0	0	0	0	0
exigua var. exigua		285	30	0	0	9	11	3	0	0
fallax var. fallax		0	0	0	0	0	3	0	0	0

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	SITE REPLICATE	1	2	3	4	5	6	7	8	9
		1	1	1	1	1	1	1	1	1
Eunotia										
flexuosa var. flexuosa		0	3	0	0	2	0	0	0	0
incisa var. incisa		21	10	0	0	0	0	0	0	0
maior var. maior		0	0	0	0	0	0	0	0	0
maior var. ventricosa		0	0	0	0	0	0	0	0	0
meisteri var. meisteri		0	0	0	0	4	8	5	0	0
microcephala var. microcephala		2	1	0	0	0	10	7	0	0
monodon var. maior		0	0	0	0	0	0	2	0	0
monodon var. monodon		0	0	0	0	0	2	0	0	0
naegelii var. naegelii		2	0	0	0	16	2	7	0	0
parallela var. parallela		0	3	0	0	0	10	0	0	0
pectinalis var. recta		0	0	0	0	0	0	0	0	0
pectinalis var. minor		2	7	0	0	2	0	11	0	0
pectinalis var. minor form impressa		0	3	0	0	0	0	0	0	0
pectinalis var. pectinalis		8	3	0	0	16	18	9	0	0
perpusilla var. perpusilla		5	0	0	0	0	0	9	0	0
polydentula var. polydentula		0	0	0	0	0	0	0	0	0
praerupta var. bidens		0	0	0	0	0	8	3	0	0
praerupta var. monodon form polaris		0	0	0	0	0	0	0	0	0
praerupta var. praerupta		0	0	0	0	0	13	20	0	0
pseudopectinalis var. pseudopectinalis		0	0	0	0	0	0	2	0	0
rhomboideae var. rhomboideae		19	4	0	0	16	21	13	0	0
septentrionalis var. septentrionalis		0	0	0	0	0	0	2	0	0
serra var. serra		0	0	0	0	0	0	0	0	0
sudetica var. sudetica		0	0	0	0	0	0	0	0	0
tenella var. tenella		19	5	0	0	7	16	3	0	0
trinacria var. trinacria		0	0	0	0	0	0	0	0	0
trinacria var. undulata		0	0	0	0	0	0	0	0	0
vanheruckii var. inflata		0	0	0	0	2	0	0	0	0
vanheurckii var. intermedia		0	0	0	0	0	0	0	0	0
vanheurckii var. vanheurckii		0	0	0	0	0	5	0	0	0
Fragilaria										
bicapitata var. bicapitata		0	0	0	0	0	4	0	0	0
brevistriata var. brevistriata		0	0	0	0	0	0	0	0	0
capucina var. capucina		0	6	0	0	0	0	8	0	0
capucina var. mesolepta		0	0	0	0	0	0	0	0	0
constricta form stricta		0	0	0	0	0	0	0	0	0
construens var. binodis		0	0	0	0	0	0	0	0	0
construens var. construens		0	0	0	0	4	0	0	0	0
construens var. subsalina		0	0	0	0	0	0	0	0	0
construens var. venter		6	38	0	0	15	13	17	0	0
lata var. lata		0	0	0	0	0	9	0	0	0

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	SITE REPLICATE	1	2	3	4	5	6	7	8	9
		1	1	1	1	1	1	1	1	1
Fragilaria										
leptostauron var. leptostauron		0	0	0	0	0	0	0	0	0
parasitica var. parasitica		0	0	0	0	0	0	0	0	0
pinnata var. pinnata		0	0	0	0	0	0	0	0	0
vaucheriae var. truncata		0	0	0	0	0	0	0	0	0
vaucheriae var. vaucheriae		0	0	0	0	47	2	27	0	0
virescens var. elliptica		3	0	0	0	13	0	0	0	0
virescens var. exigua		0	0	0	0	8	24	39	0	0
virescens var. subsalina		0	0	0	0	0	0	0	0	0
virescens var. virescens		6	6	0	0	1	4	7	0	0
Frustulia										
rhomboides var. rhomboides		0	0	0	0	0	0	0	0	0
rhomboides var. saxonica		6	3	0	0	0	6	6	0	0
rhomboides var. viridula		0	1	0	0	0	0	0	0	0
vulgaris var. vulgaris		0	0	0	0	0	2	0	0	0
Gomphonema										
acuminatum var. elongatum		0	0	0	0	0	0	0	0	0
affine var. affine		0	0	0	0	0	0	0	0	0
affine var. insigne		0	0	0	0	0	6	0	0	0
angustatum var. angustatum		0	15	0	0	6	2	10	0	0
angustatum var. citra		0	0	0	0	5	7	6	0	0
angustatum var. productum		0	7	0	0	0	0	0	0	0
dichotomum var. dichotomum		0	0	0	0	0	0	0	0	0
gracile var. gracile		0	4	0	0	0	0	0	0	0
intricatum var. intricatum		0	0	0	0	0	2	0	0	0
olivaceoides var. densistriata		0	0	0	0	0	0	0	0	0
parvulum var. parvulum		0	9	0	0	0	0	0	0	0
truncatum var. capitatum		0	0	0	0	0	0	0	0	0
Gyrosigma										
obscurum var. obscurum		0	0	0	0	0	0	7	0	0
Melosira										
ambigua var. ambigua		0	0	0	0	0	0	0	0	0
distans var. alpigena		7	8	0	0	4	5	4	0	0
distans var. distans		0	0	0	0	0	0	0	0	0
granulata var. granulata		0	0	0	0	0	0	0	0	0
islandica var. islandica		0	0	0	0	0	0	0	0	0
italica var. italica		0	0	0	0	0	0	0	0	0
lirata var. lirata		0	0	0	0	0	0	0	0	0
lirata var. perglabra		6	0	0	0	4	0	0	0	0
Meridion										
circulare var. capitata		0	0	0	0	0	2	0	0	0
circulare var. circulare		0	3	0	0	0	0	0	0	0
circulare var. constrictum		2	6	0	0	2	0	1	0	0

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SITE	1	2	3	4	5	6	7	8	9
REPLICATE	1	1	1	1	1	1	1	1	1

Navicula

radiosa var. radiosa	0	0	0	0	2	0	4	0	0
rhynchocephala var. rhynchocephala	0	0	0	0	0	0	0	0	0
schmassmannii var. schmassmannii	0	0	0	0	0	0	0	0	0
secura var. secura	0	1	0	0	0	0	0	0	0
seminulum var. intermedia	0	0	0	0	0	0	0	0	0
seminulum var. seminulum	0	0	0	0	2	0	0	0	0
sohrensii var. capitata	0	0	0	0	0	0	0	0	0
sohrensii var. muscicola	0	0	0	0	0	0	1	0	0
sohrensii var. sohrensii	0	12	0	0	0	4	0	0	0
subatomoides var. subatomoides	0	0	0	0	0	0	0	0	0
subseminulum var. subseminulum	0	0	0	0	0	0	0	0	0
subtilissima var. subtilissima	0	0	0	0	0	4	0	0	0
tantula var. tantula	0	0	0	0	0	0	0	0	0
tenelloides var. tenelloides	0	0	0	0	0	0	0	0	0
tongatensis var. tongatensis	5	0	0	0	0	0	0	0	0
unknown sp. A-1	0	0	0	0	0	0	0	0	0
unknown sp. A-2	0	0	0	0	0	0	0	0	0
unknown sp. A-3	0	1	0	0	0	0	0	0	0
unknown sp. A-4	0	0	0	0	0	0	0	0	0
unknown sp. A-5	0	0	0	0	0	0	0	0	0
unknown sp. A-7	0	0	0	0	0	0	0	0	0
unknown sp. A-8	0	0	0	0	0	0	0	0	0
unknown sp. A-9	0	0	0	0	0	0	0	0	0
variostrata var. variostrata	0	0	0	0	0	0	0	0	0
ventralis form simplex	0	0	0	0	0	0	0	0	0

Neidium

affine var. amphirhynchus	0	0	0	0	0	0	0	0	0
affine var. cyclonicum	0	0	0	0	0	0	0	0	0
bisulcatum var. bisulcatum	0	0	0	0	0	0	0	0	0
hercynicum var. hercynicum	0	0	0	0	0	0	2	0	0
iridis var. amphigomphus	2	0	0	0	0	5	0	0	0

Nitzschia

communis var. communis	0	6	0	0	0	0	0	0	0
commutata var. commutata	0	66	0	0	2	0	0	0	0
dissipata var. dissipata	1	4	0	0	5	3	3	0	0
fonticola var. fonticola	0	0	0	0	3	0	0	0	0
frustulum var. frustulum	3	2	0	0	2	0	0	0	0
frustulum var. subsalina	2	2	0	0	0	6	0	0	0
ganderscheimiensis var. ganderscheimiensis	0	0	0	0	0	9	0	0	0

MARSHALL BROOK PROJECT DIATOMS

SITE	1	2	3	4	5	6	7	8	9
REPLICATE	1	1	1	1	1	1	1	1	1

Nitzschia								
ganderscheimiensis var. tenuitostriis	0	5	0	0	0	0	0	0
gracile var. gracile	0	0	0	0	0	0	0	0
hybrida var. hybrida	0	0	0	0	0	9	2	0
ignorata var. ignorata	0	0	0	0	0	0	0	0
kutzingiana var. kutzingiana	0	0	0	0	8	0	10	0
linearis var. linearis	0	0	0	0	0	3	2	0
obtusa var. scalpelliformis	0	0	0	0	0	15	9	0
palea var. palea	2	33	0	0	2	0	4	0
parvula var. parvula	0	0	0	0	0	0	0	0
plana var. fennica	0	0	0	0	0	0	0	0
plana var. plana	0	0	0	0	0	7	4	0
rosenstockii var. rosenstockii	0	0	0	0	0	0	0	0
thermalis var. minor	0	0	0	0	7	0	0	0
triblionella var. victoriae	0	0	0	0	0	0	0	0
Pinnularia								
abaujensis var. abaujensis	0	0	0	0	0	3	0	0
abaujensis var. linearis	0	0	0	0	0	0	0	0
abaujensis var. subundulata	0	0	0	0	0	0	0	0
biceps var. biceps	0	4	0	0	0	0	0	0
biceps form petersenii	0	0	0	0	0	0	0	0
braunii var. braunii	0	0	0	0	0	0	2	0
divergens var. parallela	0	0	0	0	0	0	0	0
divergentissima var divergentissima	0	0	0	0	0	0	0	0
globiceps var. krookei	0	0	0	0	1	0	0	0
intermedia var. intermedia	0	0	0	0	0	0	0	0
interrupta var. interrupta	0	0	0	0	0	0	2	0
legumen var. legumen	0	0	0	0	0	0	0	0
leptosoma var. leptosoma	0	9	0	0	4	0	0	0
maior var. maior	0	6	0	0	0	0	0	0
mesogongyla var. mesogongyla	0	0	0	0	0	0	0	0
mesolepta var. mesolepta	0	2	0	0	0	0	0	0
microstauron var. microstauron	0	0	0	0	0	1	0	0
nodosa var. nodosa	0	0	0	0	0	0	0	0
obscura var. obscura	0	0	0	0	0	0	0	0
rupestris var. rupestris	0	0	0	0	0	0	0	0
stomatophora var. stomatophora	0	0	0	0	0	0	0	0
subcapitata var. subcapitata	4	9	0	0	0	3	3	0
viridis var. viridis	0	0	0	0	0	0	0	0
Plagiotropis								
lepidoptera var. lepidoptera	0	0	0	0	0	0	0	0

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

AUGUST 13 1986 COLLECTIONS

SITE REPLICATE	1	2	3	4	5	6	7	8	9
	1	1	1	1	1	1	1	1	1
Pleurosigma									
angulatum var. angulatum	0	0	0	0	0	0	0	0	0
elongatum var. elongatum	0	0	0	0	0	0	0	0	0
Stauronies									
anceps var. anceps	1	0	0	0	0	0	0	0	0
anceps var. gracilis	0	0	0	0	2	0	2	0	0
fluminea var. fluminea	0	2	0	0	0	0	0	0	0
livingstonii var. livingstonii	0	0	0	0	0	0	0	0	0
phoenicenteron var. gracilis	0	0	0	0	0	0	0	0	0
phoenicenteron var. phoenicenteron	1	1	0	0	0	0	0	0	0
smithii var. smithii	0	0	0	0	0	0	0	0	0
stodderi var. stodderi	0	0	0	0	0	0	0	0	0
thermicola var. thermicola	0	0	0	0	0	0	0	0	0
Stenopterobia									
intermedia var. intermedia	0	1	0	0	0	1	0	0	0
Surirella									
angustata var. angustata	0	23	0	0	0	2	0	0	0
delicatissima var. delicatissima	0	0	0	0	0	4	0	0	0
ovata var. ovata	0	0	0	0	0	4	0	0	0
pyriformis var. pyriformis	0	0	0	0	0	0	0	0	0
Synedra									
amphicephala var. amphicephala	2	0	0	0	0	0	0	0	0
delicatissima var. delicatissima	1	0	0	0	0	0	0	0	0
hyperboreae var. hyperboreae	0	0	0	0	0	0	0	0	0
incisa var. incisa	0	0	0	0	0	0	0	0	0
minuscule var. minuscule	4	8	0	0	33	0	4	0	0
pulchella var. lacerata	0	0	0	0	5	2	20	0	0
radians var. radians	0	0	0	0	3	0	0	0	0
rumpens var. familiaris	0	0	0	0	0	0	0	0	0
rumpens var. rumpens	0	0	0	0	19	2	13	0	0
tabulata var. tabulata	0	0	0	0	0	0	0	0	0
ulna var. ulna	0	0	0	0	14	0	0	0	0
Tabellaria									
fenestrata var. linearis	3	1	0	0	8	12	2	0	0
flocculosa var. flocculosa	17	7	0	0	14	52	24	0	0

SEPTEMBER 5 1986 COLLECTIONS

	SITE	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
	REPLICATE	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Achnanthes																			
affinis var. affinis		0	0	3	7	0	0	0	0	11	0	0	0	8	0	0	0	0	0
austriaca var. helvetica		9	4	21	9	0	0	4	0	0	0	10	0	17	0	0	0	0	0
biasolettania var. biasolettania		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
detha var. detha		3	4	3	1	0	0	8	0	6	0	12	0	6	0	0	0	0	0
didyma var. didyma		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
harveyi var. harveyi		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hauckiana var. hauckiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
kryophila var. kryophila		0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0
lanceolata var. dubia		0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
lanceolata var. lanceolata		0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
lanceolata var. rostrata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
levanderi var. levanderi		0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
linearis var. linearis		0	3	0	8	0	0	0	0	12	0	3	0	3	0	0	0	0	0
linearis var. pusilla		0	0	18	8	0	0	0	0	53	0	29	0	6	0	0	0	0	0
marginulata var. marginulata		8	6	4	0	0	0	0	0	3	0	10	0	0	0	0	0	0	0
minutissima var. cryptocephala		2	0	0	0	0	0	0	0	33	0	0	0	38	0	0	0	0	0
minutissima mar. minutissima		9	8	18	25	0	0	0	0	61	0	8	0	2	0	0	0	0	0
saxonica var. saxonica		0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
sublaevis var. crassa		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subsalsa var. subsalsa		0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
suchlandtii var. suchlandtii		0	0	1	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0
unknown sp. A-1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-2		0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-3		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-4		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
wellsiae var. wellsiae		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipleura																			
rutilans var. rutilans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphora																			
coffeiformis var. coffeiformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis																			
serians var. brachysira		1	0	4	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
vitrea var. lanceolata		0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
vitrea var. vitrea		4	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Asterionella																			
ralfsii var. ralfsii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis																			
bacillum var. bacillum		2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ventricosa var. alpina		0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Cocconeis																			
disculus var. disculus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pediculus var. pediculus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MARSHALL BROOK PROJECT DIATOMS

SEPTEMBER 5 1986 COLLECTIONS

[illegible]

SEPTEMBER 5 1986 COLLECTIONS

[illegible]

SEPTEMBER 5 1986 COLLECTIONS

	SITE	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
	REPLICATE	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Fragilaria																			
leptostauron var. leptostauron		0	0	0	1	0	0	0	0	5	0	0	0	0	0	0	0	0	0
parasitica var. parasitica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pinnata var. pinnata		0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
vaucheriae var. truncata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
vaucheriae var. vaucheriae		0	0	1	0	0	0	0	0	25	0	0	0	67	0	0	0	0	0
virescens var. elliptica		0	6	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
virescens var. exigua		9	0	0	3	0	0	1	0	2	0	38	0	57	0	0	0	0	0
virescens var. subsalina		0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
virescens var. virescens		9	6	3	3	0	0	19	0	0	0	5	0	0	0	0	0	0	0
Frustulia																			
rhomboides var. rhomboides		0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rhomboides var. saxonica		3	4	3	1	0	0	18	0	0	0	7	0	2	0	0	0	0	0
rhomboides var. viridula		1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
vulgaris var. vulgaris		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema																			
acuminatum var. elongatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
affine var. affine		0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
affine var. insigne		5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
angustatum var. angustatum		0	0	8	17	0	0	1	0	3	0	4	0	19	0	0	0	0	0
angustatum var. citra		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
angustatum var. productum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dichotomum var. dichotomum		0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
gracile var. gracile		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
intricatum var. intricatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
olivaceoides var. densistriata		0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
parvulum var. parvulum		0	0	6	3	0	0	0	0	0	0	6	0	0	0	0	0	0	0
truncatum var. capitatum		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Gyrosigma																			
obscurum var. obscurum		0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
Melosira																			
ambigua var. ambigua		0	9	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
distans var. alpigena		38	19	8	21	0	0	12	0	3	0	0	0	1	0	0	0	0	0
distans var. distans		0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
granulata var. granulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
islandica var. islandica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
italica var. italica		0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
lirata var. lirata		0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0
lirata var. perglabra		0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meridion																			
circulare var. capitata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
circulare var. circulare		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
circulare var. constrictum		4	0	9	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MARSHALL BROOK PROJECT DIATOMS

	SITE	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
	REPLICATE	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
		0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	1	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
a		0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
s		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ima		2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
a		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	59	0	0	0	0	0
s		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coneiformis		0	1	1	1	0	0	3	0	1	0	1	0	0	0	0	0	0	0
		0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
tocephala		2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ta		0	0	2	7	0	0	0	0	0	0	0	0	3	0	0	0	0	0
cillima		0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
s		10	2	5	4	0	0	4	0	0	0	8	0	2	0	0	0	0	0
ensis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ndica		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
erens		4	0	0	2	0	0	10	0	0	0	1	0	0	0	0	0	0	0
		0	0	7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
ata		0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ostrata		0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
s		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	1	0	9	0	0	1	0	0	0	0	0	2	0	0	0	0	0
a		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ensis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0</													

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

SEPTEMBER 5 1986 COLLECTIONS

	SITE REPLICATE	1 1	1 2	2 1	2 2	3 1	3 2	4 1	4 2	5 1	5 2	6 1	6 2	7 1	7 2	8 1	8 2	9 1	9 2
Navicula																			
radiosa var. radiosa		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rhychocephala var. rhychocephala		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
schmassmannii var. schmassmannii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
secura var. secura		3	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
seminulum var. intermedia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
seminulum var. seminulum		1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
sohrensii var. capitata		0	0	0	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0
sohrensii var. muscicola		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sohrensii var. sohrensii		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subatomoides var. subatomoides		0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subseminulum var. subseminulum		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subtilissima var. subtilissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tantula var. tantula		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tenelloides var. tenelloides		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tongatensis var. tongatensis		5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-1		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-2		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-4		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-5		0	0	5	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-7		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-8		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-9		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
variostrata var. variostrata		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ventralis form simplex		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium																			
affine var. amphirhynchus		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
affine var. cyclonicum		0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
bisulcatum var. bisulcatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hercynicum var. hercynicum		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
iridis var. amphigomphus		0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia																			
communis var. communis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
commutata var. commutata		0	0	35	44	0	0	0	0	0	0	1	0	0	0	0	0	0	0
dissipata var. dissipata		0	2	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0
fonticola var. fonticola		0	0	4	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
frustulum var. frustulum		10	0	2	8	0	0	0	0	4	0	2	0	2	0	0	0	0	0
frustulum var. subsalina		0	6	5	6	0	0	0	0	0	0	8	0	0	0	0	0	0	0
ganderscheimiensis var. ganderscheimiensis		0	0	5	8	0	0	0	0	0	0	5	0	1	0	0	0	0	0

SEPTEMBER 5 1986 COLLECTIONS

[illegible]

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

SEPTEMBER 5 1986 COLLECTIONS

	SITE REPLICATE	1 1	1 2	2 1	2 2	3 1	3 2	4 1	4 2	5 1	5 2	6 1	6 2	7 1	7 2	8 1	8 2	9 1	9 2
Pleurosigma																			
angulatum var. angulatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
elongatum var. elongatum		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Stauronies																			
anceps var. anceps		3	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
anceps var. gracilis		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
fluminea var. fluminea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
livingstonii var. livingstonii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
phoenicenteron var. gracilis		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
phoenicenteron var. phoenicenteron		0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
smithii var. smithii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stodderi var. stodderi		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
thermicola var. thermicola		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenopterobia																			
intermedia var. intermedia		3	2	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0
Surirella																			
angustata var. angustata		0	0	11	9	0	0	0	0	0	0	5	0	0	0	0	0	0	0
delicatissima var. delicatissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ovata var. ovata		0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
pyriformis var. pyriformis		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Synedra																			
amphicephala var. amphicephala		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
delicatissima var. delicatissima		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hyperboreae var. hyperboreae		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
incisa var. incisa		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
minuscule var. minuscule		0	0	3	11	0	0	0	0	20	0	0	0	3	0	0	0	0	0
pulchella var. lacerata		0	0	0	0	0	0	0	0	0	0	3	0	45	0	0	0	0	0
radians var. radians		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. familiaris		2	0	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. rumpens		0	0	0	1	0	0	0	0	8	0	5	0	27	0	0	0	0	0
tabulata var. tabulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ulna var. ulna		0	0	1	4	0	0	1	0	2	0	1	0	0	0	0	0	0	0
Tabellaria																			
fenestrata var. linearis		0	0	6	1	0	0	0	0	0	0	7	0	0	0	0	0	0	0
flocculosa var. flocculosa		10	23	18	10	0	0	7	0	7	0	20	0	11	0	0	0	0	0

MARSHALL BROOK PROJECT DIATOMS

SITE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Achnanthes														
affinis var. affinis	0	0	0	6	0	6	0	0	0	0	0	0	0	0
austriaca var. helvetica	7	5	0	3	2	4	0	0	0	0	4	0	10	5
biasolettania var. biasolettania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
detha var. detha	2	11	0	5	3	12	2	0	0	11	6	0	5	18
didyma var. didyma	0	0	0	0	0	0	0	0	0	0	0	0	0	2
harveyi var. harveyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hauckiana var. hauckiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0
kryophila var. kryophila	0	0	0	0	3	7	0	0	0	0	0	0	0	0
lanceolata var. dubia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
lanceolata var. lanceolata	0	0	0	0	0	4	0	0	0	0	0	0	0	3
lanceolata var. rostrata	0	0	0	0	0	3	0	0	0	0	0	0	0	0
levanderi var. levanderi	0	0	0	0	0	0	0	0	0	0	0	0	0	2
linearis var. linearis	0	0	0	13	0	0	0	0	0	0	0	0	2	36
linearis var. pusilla	3	0	0	3	2	11	0	0	0	0	0	0	8	3
marginulata var. marginulata	6	7	0	1	0	6	18	0	0	0	0	0	5	13
minutissima var. cryptocephala	0	0	0	22	0	16	0	0	0	0	6	0	33	34
minutissima mar. minutissima	2	0	0	12	9	21	14	0	0	0	7	0	48	83
saxonica var. saxonica	0	0	0	0	0	2	0	0	0	0	0	0	6	0
sublaevis var. crassa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subsalsa var. subsalsa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
suchlandtii var. suchlandtii	0	0	0	0	0	0	0	0	0	0	0	0	2	0
unknown sp. A-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-4	0	0	0	2	0	0	0	0	0	0	0	0	0	0
wellsiae var. wellsiae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipleura														
rutilans var. rutilans	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphora														
coffeiformis var. coffeiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis														
serians var. brachysira	1	0	0	0	0	3	0	0	0	1	1	0	0	0
vitrea var. lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
vitrea var. vitrea	1	2	0	3	2	0	1	0	0	0	1	0	1	2
Asterionella														
ralfsii var. ralfsii	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis														
bacillum var. bacillum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ventricosa var. alpina	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cocconeis														
disculus var. disculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pediculus var. pediculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0

OCTOBER 6 1986 COLLECTIONS

[illegible]

APPENDIX I
MARSHALL BROOK PROJECT DIATOMS

OCTOBER 5 1986 COLLECTIONS

SITE REPLICATE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
<i>Cocconeis</i>															
<i>placentula</i> var. <i>euglypta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<i>placentula</i> var. <i>lineata</i>	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
<i>scutellum</i> var. <i>minor</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>scutellum</i> var. <i>parva</i>	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>scutellum</i> var. <i>scutellum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cyclotella</i>															
<i>meneghiniana</i> var. <i>meneghiniana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>stelligera</i> var. <i>stelligera</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>striata</i> var. <i>bipunctata</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	7	0
<i>Cymbella</i>															
<i>amphicephala</i> var. <i>amphicephala</i>	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0
<i>angustata</i> var. <i>angustata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>aspera</i> var. <i>aspera</i>	0	0	0	0	0	0	7	0	0	0	0	0	2	7	0
<i>lunata</i> var. <i>lunata</i>	14	2	0	4	0	1	0	0	0	4	0	0	0	0	0
<i>microcephala</i> var. <i>microcephala</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>minuta</i> var. <i>minuta</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
<i>minuta</i> var. <i>pseudogracilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0
<i>minuta</i> var. <i>silesiaca</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>naviculiformis</i> var. <i>naviculiformis</i>	6	1	0	6	0	3	0	0	0	0	0	0	0	0	0
<i>norvegica</i> var. <i>norvegica</i>	0	0	0	2	0	0	0	0	0	6	0	0	0	0	0
<i>perpusilla</i> var. <i>perpusilla</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
<i>pusilla</i> var. <i>pusilla</i>	0	5	0	0	0	0	0	0	0	0	0	0	2	0	0
unknown sp. A-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Diatoma</i>															
<i>anceps</i> var. <i>anceps</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>hiamale</i> var. <i>mesodon</i>	4	2	0	1	0	2	0	0	0	1	0	0	0	0	0
<i>Diploneis</i>															
<i>bombus</i> var. <i>bombus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>domblittensis</i> var. <i>domblittensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>elliptica</i> var. <i>elliptica</i>	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
<i>Entomoneis</i>															
<i>paludosa</i> var. <i>paludosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>paludosa</i> var. <i>subsalina</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Epithemia</i>															
<i>adnata</i> var. <i>minor</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Eunotia</i>															
<i>arcus</i> var. <i>arcus</i>	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
<i>curvata</i> var. <i>curvata</i>	0	19	0	3	10	0	7	0	0	22	23	0	2	4	0
<i>diodon</i> var. <i>diodon</i>	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
<i>exigua</i> var. <i>compacta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>exigua</i> var. <i>exigua</i>	202	205	0	26	19	13	355	0	0	31	24	0	5	0	0
<i>fallax</i> var. <i>fallax</i>	0	3	0	0	0	0	5	0	0	0	0	0	0	0	0

MARSHALL BROOK PROJECT DIATOMS

[illegible]

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

OCTOBER 5 1986 COLLECTIONS

	SITE REPLICATE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Eunotia																
flexuosa var. flexuosa		0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
incisa var. incisa		0	0	0	5	4	0	0	0	0	23	0	0	0	0	0
maior var. maior		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
maior var. ventricosa		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
meisteri var. meisteri		23	15	0	1	2	0	0	0	0	0	8	0	3	0	0
microcephala var. microcephala		8	0	0	6	4	5	0	0	0	17	21	0	0	0	0
monodon var. maior		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
monodon var. monodon		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
naegelii var. naegelii		3	2	0	3	8	3	0	0	0	2	0	0	10	12	0
parallela var. parallela		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pectinalis var. recta		8	3	0	0	0	0	0	0	0	0	8	0	0	0	0
pectinalis var. minor		2	13	0	5	4	2	0	0	0	2	6	0	13	4	0
pectinalis var. minor form impressa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pectinalis var. pectinalis		2	7	0	4	9	9	3	0	0	41	40	0	10	7	0
perpusilla var. perpusilla		3	3	0	0	4	2	2	0	0	12	6	0	0	2	0
polydentula var. polydentula		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
praerupta var. bidens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
praerupta var. monodon form polaris		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
praerupta var. praerupta		0	0	0	0	5	1	0	0	0	12	9	0	0	0	0
pseudopectinalis var. pseudopectinalis		0	2	0	1	1	4	0	0	0	2	0	0	0	2	0
rhomboideae var. rhomboideae		17	16	0	5	0	6	0	0	0	100	116	0	12	4	0
septentrionalis var. septentrionalis		4	2	0	2	8	4	0	0	0	9	2	0	2	3	0
serra var. serra		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sudetica var. sudetica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tenella var. tenella		21	7	0	5	12	1	16	0	0	20	13	0	3	2	0
trinacria var. trinacria		0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
trinacria var. undulata		0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
vanheurckii var. inflata		0	0	0	6	0	6	0	0	0	0	0	0	0	0	0
vanheurckii var. intermedia		0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
vanheurckii var. vanheurckii		19	7	0	0	8	1	54	0	0	12	24	0	5	0	0
Fragilaria																
bicapitata var. bicapitata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
brevistriata var. brevistriata		0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
capucina var. capucina		0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
capucina var. mesolepta		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
constricta form stricta		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
construens var. binodis		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
construens var. construens		0	0	0	0	0	0	0	0	0	0	6	0	9	0	0
construens var. subsalina		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
construens var. venter		0	11	0	22	6	11	0	0	0	1	0	0	34	12	0
lata var. lata		0	0	0	0	0	0	0	0	0	0	3	0	0	1	0

MARSHALL BROOK PROJECT DIATOMS

SITE	6	6	6	7	7	7	8	8	8	9	9	9
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3

[illegible]

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

OCTOBER 5 1986 COLLECTIONS

	SITE REPLICATE	1 1	1 2	1 3	2 1	2 2	2 3	3 1	3 2	3 3	4 1	4 2	4 3	5 1	5 2	5 3
Fragilaria																
leptostauron var. leptostauron		0	0	0	0	0	0	0	0	0	0	0	0	2	2	0
parasitica var. parasitica		0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
pinnata var. pinnata		0	0	0	0	0	0	0	0	0	0	0	0	13	2	0
vaucheriae var. truncata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
vaucheriae var. vaucheriae		0	0	0	0	0	0	0	0	0	0	10	0	18	29	0
virescens var. elliptica		0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
virescens var. exigua		0	8	0	0	0	3	0	0	0	2	4	0	20	13	0
virescens var. subsalina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
virescens var. virescens		9	11	0	9	22	14	0	0	0	31	37	0	0	1	0
Frustulia																
rhomboides var. rhomboides		0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
rhomboides var. saxonica		2	7	0	6	7	3	0	0	0	16	12	0	5	2	0
rhomboides var. viridula		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
vulgaris var. vulgaris		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema																
acuminatum var. elongatum		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
affine var. affine		4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
affine var. insigne		0	0	0	0	2	0	0	0	0	0	0	0	5	0	0
angustatum var. angustatum		0	4	0	12	6	28	0	0	0	0	1	0	16	5	0
angustatum var. citra		0	0	0	0	0	7	0	0	0	0	1	0	0	0	0
angustatum var. productum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dichotomum var. dichotomum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gracile var. gracile		0	0	0	4	0	0	0	0	0	3	0	0	0	0	0
intricatum var. intricatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
olivaceoides var. densistriata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
parvulum var. parvulum		0	0	0	0	1	1	0	0	0	0	0	0	3	2	0
truncatum var. capitatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gyrosigma																
obscurum var. obscurum		0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Melosira																
ambigua var. ambigua		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
distans var. alpigena		15	16	0	29	16	9	1	0	0	1	3	0	7	6	0
distans var. distans		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
granulata var. granulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
islandica var. islandica		0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
italica var. italica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
lirata var. lirata		0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
lirata var. perglabra		3	8	0	0	0	5	0	0	0	0	3	0	0	0	0
Meridion																
circulare var. capitata		0	3	0	0	8	0	0	0	0	4	0	0	0	0	0
circulare var. circulare		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
circulare var. constrictum		3	0	0	9	0	11	1	0	0	0	7	0	4	0	0

MARSHALL BROOK PROJECT DIATOMS

SITE	6	6	6	7	7	7	8	8	8	9	9	9
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3

[illegible]

MARSHALL BROOK PROJECT DIATOMS

[illegible]

MARSHALL BROOK PROJECT DIATOMS

SITE	6	6	6	7	7	7	8	8	8	9	9	9
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3

[illegible]

MARSHALL BROOK PROJECT DIATOMS

	SITE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	
	REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
hocephala assmannii		0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	2	0	0	0	5	0	0	0	4	2	0	0	3	0	
		0	0	0	0	0	0	2	0	0	0	0	0	3	0	0	
ia m		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	2	0	0	0	0	0	0	0	0	5	1	0	
		3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
a s omoides		0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
minulum lissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	1	6	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
oides ensis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	
		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
trata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	10	6	20	0	0	0	0	0	0	0	0	0	
		0	0	0	1	0	0	0	0	0	2	0	0	3	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	0	0	0	2	0	0	0	0	4	7	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
us tum cum		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
a a a m a		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0													

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

OCTOBER 6 1986 COLLECTIONS

SITE REPLICATE	6 1	6 2	6 3	7 1	7 2	7 3	8 1	8 2	8 3	9 1	9 2	9 3
Navicula												
<i>radiosa</i> var. <i>radiosa</i>	0	2	0	0	0	0	0	0	0	0	0	0
<i>rhynchocephala</i> var. <i>rhynchocephala</i>	4	3	0	0	0	0	0	0	0	0	0	0
<i>schmassmannii</i> var. <i>schmassmannii</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>secura</i> var. <i>secura</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>seminulum</i> var. <i>intermedia</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>seminulum</i> var. <i>seminulum</i>	1	0	0	0	0	0	0	0	0	0	0	0
<i>sohrensii</i> var. <i>capitata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>sohrensii</i> var. <i>musciicola</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>sohrensii</i> var. <i>sohrensii</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>subatomoides</i> var. <i>subatomoides</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>subseminulum</i> var. <i>subseminulum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>subtilissima</i> var. <i>subtilissima</i>	0	2	0	0	0	0	0	0	0	0	0	0
<i>tantula</i> var. <i>tantula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>tenelloides</i> var. <i>tenelloides</i>	10	6	0	0	0	0	0	0	0	0	0	0
<i>tongatensis</i> var. <i>tongatensis</i>	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-1	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-2	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-3	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-4	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-5	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-7	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-8	0	0	0	0	0	0	0	0	0	0	0	0
unknown sp. A-9	0	2	0	0	0	0	0	0	0	0	0	0
<i>variostrata</i> var. <i>variostrata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>ventralis</i> form <i>simplex</i>	0	0	0	0	0	0	0	0	0	0	0	0
Neidium												
<i>affine</i> var. <i>amphirhynchus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>affine</i> var. <i>cyclonicum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>bisulcatum</i> var. <i>bisulcatum</i>	0	1	0	0	0	0	0	0	0	0	0	0
<i>hercynicum</i> var. <i>hercynicum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>iridis</i> var. <i>amphigomphus</i>	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia												
<i>communis</i> var. <i>communis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>commutata</i> var. <i>commutata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>dissipata</i> var. <i>dissipata</i>	4	8	0	0	0	0	0	0	0	0	0	0
<i>fonticola</i> var. <i>fonticola</i>	0	6	0	0	0	0	0	0	0	0	0	0
<i>frustulum</i> var. <i>frustulum</i>	6	5	0	5	0	0	0	0	0	0	0	0
<i>frustulum</i> var. <i>subsalina</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>ganderscheimiensis</i> var. <i>ganderscheimiensis</i>	6	19	0	11	0	0	0	0	0	0	0	0

MARSHALL BROOK PROJECT DIATOMS

SITE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

[illegible]

MARSHALL BROOK PROJECT DIATOMS

SITE	6	6	6	7	7	7	8	8	8	9	9	9
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3

[illegible]

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

OCTOBER 5 1986 COLLECTIONS

	SITE REPLICATE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Pleurosigma																
angulatum var. angulatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
elongatum var. elongatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauronies																
anceps var. anceps		0	0	0	0	2	0	0	0	0	0	0	0	1	0	0
anceps var. gracilis		4	0	0	1	3	0	0	0	0	0	0	0	0	0	0
fluminea var. fluminea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
livingstonii var. livingstonii		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
phoenicenteron var. gracilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
phoenicenteron var. phoenicenteron		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
smithii var. smithii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stodderi var. stodderi		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
thermicola var. thermicola		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenopterobia																
intermedia var. intermedia		0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Surirella																
angustata var. angustata		0	0	0	14	39	24	0	0	0	0	0	0	0	0	0
delicatissima var. delicatissima		0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
ovata var. ovata		0	0	0	2	12	0	0	0	0	0	0	0	4	0	0
pyriformis var. pyriformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synedra																
amphicephala var. amphicephala		3	2	0	0	3	0	0	0	0	2	0	0	10	2	0
delicatissima var. delicatissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hyperboreae var. hyperboreae		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
incisa var. incisa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
minuscule var. minuscule		1	2	0	2	0	3	0	0	0	0	0	0	13	8	0
pulchella var. lacerata		0	0	0	0	0	0	0	0	0	5	3	0	3	0	0
radians var. radians		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. familiaris		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. rumpens		4	0	0	5	8	8	0	0	0	7	0	6	17	0	0
tabulata var. tabulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ulna var. ulna		0	0	0	0	2	0	0	0	0	0	0	9	8	0	0
Tabellaria																
fenestrata var. linearis		0	1	0	7	3	7	0	0	0	3	0	5	1	0	0
flocculosa var. flocculosa		14	9	0	9	20	7	5	0	0	12	9	0	5	7	0

APPENDIX I

MARSHALL BROOK PROJECT DIATOMS

OCTOBER 6 1986 COLLECTIONS

	SITE REPLICATE	6 1	6 2	6 3	7 1	7 2	7 3	8 1	8 2	8 3	9 1	9 2	9 3
Pleurosigma													
angulatum var. angulatum		0	0	0	0	0	0	0	0	0	0	0	0
elongatum var. elongatum		0	0	0	0	0	0	0	0	0	0	0	0
Stauronies													
anceps var. anceps		0	0	0	0	0	0	0	0	0	0	0	0
anceps var. gracilis		0	0	0	0	0	0	0	0	0	0	0	0
fluminea var. fluminea		0	0	0	0	0	0	0	0	0	0	0	0
livingstonii var. livingstonii		0	0	0	0	0	0	0	0	0	0	0	0
phoenicenteron var. gracilis		0	0	0	0	0	0	0	0	0	0	0	0
phoenicenteron var. phoenicenteron		0	0	0	0	0	0	0	0	0	0	0	0
smithii var. smithii		2	0	0	0	0	0	0	0	0	0	0	0
stodderi var. stodderi		0	0	0	0	0	0	0	0	0	0	0	0
thermicola var. thermicola		0	0	0	0	0	0	0	0	0	0	0	0
Stenopterobia													
intermedia var. intermedia		0	0	0	0	0	0	0	0	0	0	0	0
Surirella													
angustata var. angustata		0	0	0	0	0	0	0	0	0	0	0	0
delicatissima var. delicatissima		0	2	0	0	0	0	0	0	0	0	0	0
ovata var. ovata		1	0	0	0	0	0	0	0	0	0	0	0
pyriformis var. pyriformis		0	0	0	0	0	0	0	0	0	0	0	0
Synedra													
amphicephala var. amphicephala		3	0	0	0	0	0	0	0	0	0	0	0
delicatissima var. delicatissima		0	0	0	0	0	0	0	0	0	0	0	0
hyperboreae var. hyperboreae		0	0	0	0	0	0	0	0	0	0	0	0
incisa var. incisa		0	0	0	0	0	0	0	0	0	0	0	0
minuscule var. minuscule		0	0	0	5	0	0	0	0	0	0	0	0
pulchella var. lacerata		6	2	0	22	0	0	0	0	0	0	0	0
radians var. radians		0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. familiaris		0	0	0	0	0	0	0	0	0	0	0	0
rumpens var. rumpens		14	0	0	9	0	0	0	0	0	0	0	0
tabulata var. tabulata		0	0	0	0	0	0	0	0	0	0	0	0
ulna var. ulna		0	1	0	0	0	0	0	0	0	0	0	0
Tabellaria													
fenestrata var. linearis		14	2	0	1	0	0	0	0	0	0	0	0
flocculosa var. flocculosa		31	37	0	6	0	0	0	0	0	0	0	0

MARSHALL BROOK PROJECT MACROINVERTEBRATES

[illegible]

MARSHALL BROOK PROJECT MACROINVERTEBRATES

[illegible]

MARSHALL BROOK PROJECT MACROINVERTEBRATES

[illegible]

APPENDIX II

MARSHALL BROOK PROJECT MACROINVERTEBRATES

OCTOBER 6 1988 COLLECTIONS

SITE REPLICATE	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	7	7	7
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	1	2	3
DIPTERA																				
<u>Ormosia</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Pericoma</u>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Probezzia</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Simulium venustum</u>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<u>Tabanus</u>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Chironomidae	79	78	27	62	54	140	5	5	17	25	90	150	3	0	3	10	3	14	7	18
Pupae	0	0	2	7	1	3	1	2	2	1	5	14	0	7	2	0	0	0	0	1
COLEOPTERA																				
<u>Agabus</u>	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Deronectes</u>	3	16	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Halipus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0
<u>Hydrobius</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Hydroporus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<u>Optioservus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Promoresia</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Psephenus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EPHEMEROPTERA																				
<u>Ameletus</u>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
<u>Baetis</u>	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Ephemerella</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Eurylophella</u>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Leptophlebia</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<u>siphonurus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Paraleptophlebia</u>	9	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophebiidae	0	0	1	4	0	0	4	9	2	0	1	2	1	0	0	0	0	0	0	0
Siphonuridae	0	0	0	0	0	0	0	8	13	0	0	0	0	0	0	0	0	0	0	0
PLECOPTERA																				
<u>Leuctra</u>	4	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0
<u>Nemoura</u>	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloroperlidae																				
<u>Alloperla</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	0	0	0	0	0	0	0	0	0	12	25	8	0	0	0	0	0	0	0	0
Nemouridae	0	0	0	0	0	0	0	0	0	18	0	10	0	0	0	0	0	0	0	0
TRICHOPTERA																				
<u>Ceratopsyche</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Frenesia</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Lepidostoma</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Limnephilus</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Molanna</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Oligostomis</u>	0	3	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0

MARSHALL BROOK PROJECT MACROINVERTEBRATES

[illegible]