

Plant, Invertebrate, and Fish Sampling of Northern Lake Huron Bioreserve Marshes - 1996 Growing Season

Prepared by Thomas M. Burton, based on data from Joe Gathman, Donna Kashian, Brian Keas, and Sam Riffell, November 30, 1996.

Plants - Plant communities were sampled during the last week of July, 1996, by Dennis Albert, Anne Vaara, and Tom Burton with help, at times, from other MSU graduate students and some local High School students. Transects were set up using the same transects used for invertebrate sampling whenever possible for Duck Bay, Prentiss Bay, Cedarville Bay, Mackinac Bay, Mismar Bay, and the wetlands on the western side of St. Martin's Bay. Transects generally extended from the shoreline out past the last points used for invertebrate sampling. Three quadrats were sampled at each point along the transects with sampling points selected from 20 - 50 m apart so as to describe each vegetation zone of the marsh. Stem counts were made of all emergent plants and percent cover was recorded for all species of floating leaved and submersed plants present in the quadrats. All plant species encountered were identified to species level by Dennis Albert and Anne Vaara, either on-site or from specimens collected and identified later. Sediments for each point were described using cores extracted from the marsh near the sampling point. Water depth was also recorded for each sampling point. Anne Vaara is summarizing these data, and general summaries will be distributed as soon they are received from Anne.

Invertebrates - In May, invertebrates from Mismar, Mackinac, Cedarville, Prentiss and St. Martin's Bay were sampled by towing a sled mounted sampler through the water at various water depths in the marsh. Some of the sediments were still frozen and the emergent plants had not emerged above the water at this time. Cores were taken where possible but emphasis was on the sled mounted sampler. The sled sampling collected large numbers of invertebrates, especially Corixidae, Chironomidae, Amphipoda and zooplankton but also included a wide variety of other taxa. The initial listing of families of invertebrates collected is attached.

Invertebrates were sampled from Duck Bay, Cedarville Bay, Mackinac Bay, Mismar Bay, and St. Martin's Bay from single transects extending from the edge of standing water out into the marsh until water greater than 1 m deep was encountered in June, July, and August using a standard number of sweep net samples and core samples. Invertebrates have been picked from almost all of the sweep net samples. Picking of the core samples is in progress. Donna Kashian has made progress with identification of invertebrates from Cedarville and Mackinac Bays, and her master lists are attached. Identification of specimens from other Bays has lagged behind, since all other graduate students are spending lots of time as teaching assistants. We have begun to send specimens to Pat Hudson for identification. A list of taxa identified as of 10/31/96 is attached. Sam Riffell has identified most of the Odonates, and a preliminary checklist is attached.

Sam Riffell has written up his preliminary analysis of the distribution of midges with distance from the shore line, and this is attached.

Fish in Emergent Marshes - Fish were sampled using 2-3 fyke nets set in the marshes for one night each in June, July and August. This level of sampling is only sufficient to get at use of marshes by fish that are likely present in large numbers. Many young of the year (YOY) travel in schools, and either none or many are caught. Data on the commonly caught species (more than 10 specimens) from each marsh are attached. Large numbers of young of the year yellow perch were caught in Mackinac Bay in July, in Duck Bay in June and July, and modest numbers were caught in Cedarville Bay in July. A few specimens were

caught in Mackinac Bay, Cedarville Bay, and St. Martin's Bay in August. No yellow perch were caught in Mismar or Prentiss Bay marshes. Data on fish from all the marshes suggested that one or more of these marshes had large numbers of young of the year yellow perch, brown bullhead, largemouth bass, bowfin, and pearl dace in them on at least one date, suggesting that these marshes may be significant nursery areas for these species. The partially isolated shallow waters of the St. Martin's Bay marsh sampled contained large numbers of small species such as spottail and emerald shiners, pearl dace, brassy minnows, and banded killifish as well as substantial numbers of northern pike young of the year. These partially isolated backwater marshes may be critical areas for such species. An interesting observation is the lack of large numbers of carp and gizzard shad caught in these marshes. This is in marked contrast to similar sampling from Saginaw Bay marshes.

Qualitative Assessment of Results - Based on field observations and preliminary results, I offer the following comments regarding importance of findings to conservation goals of the northern Lake Huron project.

The Great Lakes coastal marshes of the Northern Lake Huron Bioreserve are among the most pristine and least disturbed marshes in the Great Lakes and offer the best hope of describing baseline conditions for undisturbed, coastal marshes in the Great Lakes. I base this on:

- (a) the large numbers of *Hexagenia* mayflies that emerge from the nearshore areas near the wetlands (these mayflies are sensitive indicators of pollution);
- (b) the almost complete absence of carp in these wetlands;
- (c) the clarity of the water in these wetlands and the associated well developed, highly diverse submersed plant flora that characterizes these marshes (this may be partially due to the relative lack of carp in these wetland);
- (d) the large numbers and apparent high diversity of Chironomidae and other invertebrates (Swarms of Chironomidae were so numerous that a net was required in certain areas of the marshes at certain times to keep from breathing them in) ;
- (e) the presence of sensitive species of plants such as wild rice even if this species is not very common (for comparison, wild rice was common in Saginaw Bay according to original survey notes but is now absent from there);
- (f) the limited numbers of zebra mussels and the relatively uncommon occurrence of other exotic species such as purple loosestrife and common carp;
- (g) the very large number of tadpoles observed in these wetlands, especially in the Mackinac Bay marsh, indicating healthy populations of frogs and toads in the area;
- (h) the high diversity of substrates represented in these marshes (compared to the very sandy substrates that characterized fringing wetlands in Saginaw Bay);
- (i) the number of nesting eagles, ospreys and other top fish predators in this area.

Surprising findings are summarized in my notes above indicating why I think these marshes are relatively pristine. I also was surprised at catching YOY yellow perch in these marshes, since we had not found them in our 3 year study of Saginaw Bay marshes (Saginaw Bay is or has been known for its yellow perch fishery in the past just as is true of this area).

Coordination enriched our work through getting to know some of the other investigators and some of the local people. I think that it is important to be able to talk about the entire set of studies when answering questions from local people.

Relationship with TNC - TNC staff were very helpful in introducing us to local people, in making arrangements for lodging, in letting us know when we were doing things that might have caused problems with local citizens, and in working to get us involved with local students. Of course, funding and housing arrangements were critical to us in being able to do this research.

Nature Conservancy Project									
Sled samples—May, 1996									
	MiSled1	MiSled2	MiSled3	MiSled4	PrSled2	MaSled1	MaSled2	SMSled1	SMSled3
Diptera									
Chironomidae	81	65	29	277	13	51	28	113	54
Ceratopogonidae	1	2	1	33	3	2	1	41	1
Simuliidae	7	0	0	0	0	0	0	0	0
Culicidae	2	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0	1
unidentified	1	0	0	0	0	0	1	2	1
Ephemeroptera									
Baetiscidae	0	0	0	0	0	0	0	0	1
Leptophlebiidae	1	0	0	0	0	0	0	0	0
Ephemerellidae	3	0	0	0	0	0	0	0	1
Caenidae	25	38	0	47	0	4	0	3	7
Baetidae	0	5	0	0	1	1	0	0	0
Lepidoptera	0	0	0	0	0	2	0	0	0
Hemiptera									
Corixidae	10	86	11	1	50	0	0	1	28
Gerridae	0	0	2	0	0	0	0	1	0
Nepidae	0	0	1	0	0	0	0	0	0
unidentified	1	0	0	0	0	0	0	0	1
Odonata									
Aeschnidae	0	0	0	0	0	0	0	1	0
Corduliidae	1	0	0	0	0	0	0	0	0
Libellulidae	0	0	0	0	0	0	0	1	0
Coenagrionidae	7	2	3	0	2	0	0	10	12
unidentified	0	0	0	3	0	2	0	0	0
Collembola	0	7	3	0	0	0	0	17	0
Coleoptera	0	7	1	0	0	0	0	1	0
Plecoptera-Taeniopterygidae	0	0	0	0	0	0	0	0	1
Trichoptera									
Limnephilidae	3	0	0	1	8	0	0	2	1
Hydroptilidae	2	0	0	0	0	0	0	0	0
unidentified	5	13	16	0	0	3	2	0	0
Crustacea									
Amphipoda	42	24	4	4	20	5	2	1	1
Isopoda	9	12	0	1	0	0	4	2	0
zooplankton	42	13	7	25	73	37	7	15	31
Hydracarina	1	0	0	1	1	0	0	1	54
Hydra	0	0	0	1	52	0	0	0	0
Nematoda	15	8	1	13	2	20	13	0	8
Annelida									
Hirudinea	0	0	0	0	1	0	0	0	0
Oligochaeta	0	15	0	0	0	13	14	0	28
Gastropoda									
Physidae	0	0	0	0	0	1	0	9	0
Lymnaidae	0	2	1	0	0	0	0	16	0
Planorbidae	0	0	1	16	14	0	0	32	0
Ancylidae	0	2	0	0	0	0	0	0	0
unidentified	4	0	0	0	0	0	0	0	0
Bivalvia -Spaeriidae	0	0	0	11	0	0	0	26	0
Araneae(spiders)	0	6	1	0	0	0	0	2	0
Fish	0	2	1	1	4	0	0	0	0

Nature Conservancy Project							
Core samples--May, 1996							
	SMCore3	PrCore2	MiCore3	MiCore2	MiCore1	PrCore1	MiCore4
Diptera							
Chironomidae	3	13	52	18	4	7	17
Ceratopogonidae			2			1	
Ephemeroptera							
Caenidae				3	1		
unidentified							2
Trichoptera							
unidentified			3	1		1	1
Crustacea							
Amphipoda			2	7	1	1	
Isopoda			1		1		
zooplankton	4	27	29	45	23	13	22
Nematoda	7	10	1	9	7	1	2
Annelida							
Oligochaeta	1	3	4	3	1	1	2
Gastropoda							
Planorbidae		1	1				
Ancyliidae				1			
Bivalvia							
Spaeriidae			1				
Tardigrada							1

Bay: ~~MacKinnon~~ Cedarville Master list

Sample type: Dip net Sled Core # Station #: Sorted/ID by: Donna Kashlan
 Collection date: Subsample: Other:
 Water depth: Water temp.: Air temp.:

TAXA

			Number of individuals	Note
INSECTA				
Diptera				
	Pelecorhynchidae	<i>Glutops spp.</i>		
	Ceratopogonidae	<i>Bezzia or Palpomyia spp.</i>	6	
		<i>Pobezzia spp.</i>		
		<i>Alluadomyia spp.</i>	1	
		<i>Musidae or Ephydriidae s</i>	2	
Chironomidae				
	Orthoclad/Chironomini		437	
	Corynoneura		36	
	Tanytarsini		65	
	Tanypodinae		58	
Ephemeroptera				
	Baetidae			
	unknown		2	
		<i>Pseudocentroptiloides</i>		
		<i>Callibaetis spp.</i>	2	
	Baetiscidae			
	Metretropodidae	<i>Siphloplecton spp.</i>		
	Caenidae	<i>Caenis spp.</i>	1	
	Ephemerellidae	<i>Eurylophella spp.</i>		
	Ephemeridae	<i>Hexaginia limbada</i>		
Hemiptera				
	Belostomatidae			
	Corixidae			
	unknown (imm.)			
	Gerridae			
	Notonectidae			
Lepidoptera				
	Pyralidae	<i>Acentria spp.</i>	2	
	Cosmopterigidea			
Odonata				
	Anisoptera			
	Aeshnidae			
	Corduliidae	<i>Epiterra spp.</i>	1	
		<i>Epiterra spp.</i>	1	
	Gomphidae			
	Libellulidae			
	Zygoptera			

	Coenagrionidae	<i>Ischnura verticalis</i>	24		
		<i>Coenagrion or enallaga spp.</i>			
		<i>Amphiagrion spp.</i>	2		
	Lestidae				
Trichoptera					
	Helicopsychidae				
	Hydroptilidae	<i>Agraylea spp.</i>			
		<i>Oxyethira spp.</i>			
	Leptoceridae				
		<i>Oectis spp</i>	1		
	Limnephilidae				
	Phryganeidae	<i>Agrypnia spp.</i>	1		
	unknown (imm)				
Coleoptera					
	Gyrinidae	<i>Gyrinus spp.</i>			
CRUSTACEA					
Amphipoda					
	Gammaridae	<i>Gammarus</i>			
	Hyalellidae	<i>Hyalela azteca</i>			
Isopoda					
	Asellidae	<i>Asellus</i>			
ANNELIDA					
Hirudinea					
Oligochaeta					
	Tubificidae				
	Naididae				
BIVALVIA					
	Sphaeriidae				
GASTROPODA					
	Ancylidae				
	Hydrobiidae				
	Lymnaeidae				
	Physidae				
	Planorbidae				
	Valvatidae				
CLADOCERA					
COPEPODA					
HYDRACORINA					
NEMATODA					
OSTRACODA					
TURBELLARIA					

Bay: Mackinac		Master list			
Sample type:	Dip net Sled Core #	Station #:	Sorted/ID by: Donna Kashian		
Collection date:		Subsample:	Other:		
Water depth:		Water temp.:	Air temp.:		
TAXA					
		Number of individuals			Note
INSECTA					
Diptera					
	Pelecorhynchidae	<i>Glutops spp.</i>	1		
	Ceratopogonidae	<i>Bezzia or Palpomyia spp.</i>	1		
		<i>Pobezzia spp.</i>	1		
		<i>Alluadomyia spp.</i>	1		
Chironomidae					
	Orthoclad/Chironomini		79		
	Corynoneura		53		
	Tanytarsini		53		
	Tanypodinae		18		
Ephemeroptera					
	Baetidae				
	unknown		1		
		<i>Pseudocentropiloides</i>	1		
	Baetiscidae				
	Metretropodidae	<i>Siphloplecton spp.</i>	1		
	Caenidae	<i>Caenis spp.</i>	28		
	Ephemerellidae	<i>Eurylophella spp.</i>	1		
	Ephemeridae	<i>Hexaginia limbada</i>	1		
Hemiptera					
	Belostomatidae				
	Corixidae				
	unknown (imm.)		1		
	Gerridae				
	Notonectidae				
Lepidoptera					
	Pyralidae				
	Cosmopterigidea		1		
Odonata					
	Anisoptera				
	Aeshnidae				
	Corduliidae				
	Gomphidae				
	Libellulidae				
	Zygoptera				
	Coenagrionidae	<i>Ischnura verticalis</i>	2		
		<i>Coenagrion or enallaga s</i>	1		
	Lestidae				

Trichoptera					
	Helicopsychidae				
	Hydroptilidae	<i>Agraylea spp.</i>	5		
		<i>Oxyethira spp.</i>	2		
	Leptoceridae				
	Limnephilidae				
	Phryganeidae	<i>Agrypnia spp.</i>	1		
	unknown (imm)		1		
Coleoptera					
	Gyrinidae	<i>Gyrinus spp.</i>	1		
CRUSTACEA					
Amphipoda					
	Gammaridae	<i>Gammarus</i>			
	Hyalellidae	<i>Hyalela azteca</i>			
Isopoda					
	Asellidae	<i>Asellus</i>			
ANNELIDA					
Hirudinea					
Oligochaeta					
	Tubificidae				
	Naididae				
BIVALVIA					
	Sphaeriidae				
GASTROPODA					
	Ancylidae				
	Hydrobiidae				
	Lymnaeidae				
	Physidae				
	Planorbidae				
	Valvatidae				
CLADOCERA					
COPEPODA					
HYDRACORINA					
NEMATODA					
OSTRACODA					
TURBELLARIA					

Nature Conservancy Project—Taxa list as of 10/31/96			
Insecta	Collembola		Insecta-Odonata
	Coleoptera		(cont'd)
	Chrysomelidae		Libellulidae
	<i>Neohaemonia</i>		<i>Libellula</i>
	<i>Hydrothassa</i>		Coenagrionidae
	Hydrophilidae		<i>Nehalennia</i>
	<i>Tropisternus</i>		<i>Telebasis</i>
	<i>Laccobius</i>		<i>Enallagma hageni</i>
	Carabidae		Ishnura
	Diptera		Plecoptera
	Chironomidae		Taeniopterygidae
	Chironomini		<i>Strophopteryx fasciata</i>
	Orthoclaudiini		Trichoptera
	Tanypodinae		Limnephilidae
	Tanytarsini		<i>Arctopora</i>
	Ceratopogonidae		<i>Halesochila</i>
	<i>Bezzia</i>		<i>Nemotaulis</i>
	Simuliidae		<i>Psychopsyche</i>
	Culicidae		Hydroptilidae
	<i>Wyeomyia</i>	Crustacea	Phryganeidae
	Tipulidae		Leptoceridae
	Ephemeroptera		Amphipoda
	Baetiscidae		Hyalellidae
	<i>Baetisca</i>		<i>Hyalella azteca</i>
	Leptophlebiidae		Gammaridae
	<i>Leptophlebia</i>		<i>Gammarus</i>
	Caenidae		Branchiura
	<i>Caenis</i>		<i>Argulus</i>
	Ephemerellidae		Cladocera
	<i>Ephemerella</i>		Copepoda
	<i>Eurylophella</i>		Isopoda
	<i>Serratella</i>		Asellidae
	Ephemeridae		<i>Asellus</i>
	<i>Hexagenia</i>	Arachnida	<i>Caecidotea</i>
	Heptageniidae		Ostracoda
	Baetidae	Hirudinea	Acari
	Hemiptera	Oligochaeta	Araneae(spiders)
	Corixidae		
	<i>Hesperocorixa minorella</i>		Naididae
	<i>Sigara lineata</i>	Gastropoda	<i>Stylaria</i>
	<i>Sigara macropala</i>		Tubificidae
	<i>Sigara trilineata</i>		Physidae
	<i>Sigara sp.</i>		Lymnaidae
	<i>Trichocorixa</i>		<i>Fossaria</i>
	Gerridae		<i>Stagnicola</i>
	<i>Gerris</i>	Bivalvia	Planorbidae
	Nepidae	Tardigrada	Ancylidae
	<i>Ranatra</i>	Nematomorpha	Spaeriidae
	Lepidoptera	Nematoda	
	Odonata	Hydrzoa	
	Aeshnidae		
	<i>Aeshna</i>		
	Corduliidae		
	Gomphidae		

Table 1. Preliminary checklist of adult Odonata species collected in Lake Huron coastal marshes. List reflects efforts of Burton research group through August 1996. Common names according to the Dragonfly Society of the Americas (*Argia*, August 1996).

Species name	Common name	St. Martins	Mismer	Mackinac	Cedarville	Prentiss	Duck
CALOPTERYGIDAE							
BROAD-WINGED DAMSELS							
<i>Calopteryx maculata</i>	Ebony Jewelwing			XXX			
<i>Calopteryx aequibilis</i>	River Jewelwing			XXX			
LESTIDAE							
<i>Lestes disjunctus</i>	Common Spreadwing		XXX				
COENAGRIONIDAE							
POND DAMSELS							
<i>Enallagma hageni/ebrium</i>	Marsh Bluet		XXX				XXX
<i>Ishnura verticalis</i>	Eastern Forktail	XXX	XXX		XXX		XXX
<i>Ishnura</i> sp. (<i>kellcottii</i> ??)	Lilypad Forktail						XXX
<i>Nehalientia irene</i>	Segde Sprite		XXX				
AESHINDAE							
<i>Aeshna constricta</i>	Lance-tipped Darner		XXX				
<i>Aeshna eremita</i>	Lake Darner		XXX				
GOMPHIDAE							
<i>Argomphus cornutus</i>	Horned Clubtail						XXX
<i>Gomphus spicatus</i>	Dusky Clubtail						XXX
MACROMIIDAE							
<i>Macromia illinoensis</i>	Illinois River Cruiser						XXX
CORDULIDAE							
<i>Dorocordulia lepida</i>	Petite Emerald	XXX					
<i>Somatochlora williamsoni</i>	Williamson's Emerald		XXX				

Table 1. Preliminary checklist of adult Odonata species continued.

Species name	Common name	St. Martins	Mismer	Mackinac	Cedarville	Prentiss	Duck
LIBELLULIDAE	SKIMMERS						
<i>Leucorrhinia frigida</i>	Frosted Whiteface			XXX			XXX
<i>Leucorrhinia intacta</i>	Dot-tailed Whiteface	XXX	XXX				
<i>Libellula quadrimaculata</i>	Four-spotted Skimmer			XXX		XXX	
<i>Sympetrum costiferum</i>	Saffron-winged Meadowhawk	XXX	XXX				
<i>Sympetrum vicinum</i>	Yellow-legged Meadowhawk			XXX			

Synopsis of findings from Great Lakes marsh studies, 1996 field season.

I tried to summarize key findings from the preliminary reports submitted. Findings are summarized by research team in alphabetical order. As you read this please remember that this synopsis is provided by a terrestrial ornithologist. Don't hesitate to modify (correct, add, delete) my interpretations at our winter meeting.

1. There is consensus that the marshes are in good to excellent shape except for a small portion of Cedarville Bay (at the boat ramp) and possibly Mackinac Bay, which was characterized as being eutrophic. Cedarville Bay is distinguished from all bays by sewage discharge.
2. There were few carp and relatively small number of zebra mussels (please remember to include maps showing where zebra mussels occurred).
3. Burton: Marshes are "among the most pristine and least disturbed marshes in the Great Lakes"; many mayflies, few carp, good water clarity, many midges, presence of sensitive plant species such as wild rice, few zebra mussels, purple loosestrife, many tadpoles, diverse substrates, many top predators (bald eagle, osprey, fish).
4. Hudson: Hexagenia and Ephemera in good densities (but absent from Cedarville Bay although present nearby at Sheppard Bay), two rare cycloid copepods found (Diacyclops languidoides and D. nearcticus), 12 Chironomid species available to migrating warblers (densities along shoreline as high as 1.7 square inch), wet interphase (where cold ground water meets standing water of the marsh) between upland forest and standing water has a distinctive community of invertebrates.
5. Merritt: At site 1 (peat depositional area): Shredders abundant June-Sept., collectors (mostly Chironomids) lowest numbers in June and peaked during summer through fall, scrapers decreased in July during period of emergence, predators fairly uniform in composition. At site 2 (erosional, sharp slope region): Shredders peaked in August, midges emerged mostly in August, predators fairly uniform in composition. Ratio of invertebrates more exposed to predation by fish and birds greater at site 1 than site 2.
6. Webb: Much spawning activity in the bays and "numerous larval perch populations were found in Cedarville and Mackinac Bays". Many lake herring appear in late fall to spawn. Forage fish (e.g. Fundulus diaphanus, Notropis hudsonicus, Rhinichthys cataractae) appear to have protected nursing areas in marshes. Cedarville and Mackinac Bays with surprisingly similar fauna. Important to look at marshes, and their fauna, in context of open water and onshore processes and dynamics. Suggestion of highest species richness of fish fauna 60 days after ice-out. Considerable variation between bays in in number of fish caught (St. Martin Bay highest), species diversity (Misner Bay lowest).

