

USE OF PLANTS AND DIATOMS FOR NUTRIENT ASSESSMENT IN NORTH TEMPERATE DEPRESSIONAL WETLANDS

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EXECUTIVE SUMMARY

The goals of this study were to assess the effects of land use and nutrients on primary producers in isolated, northern, temperate, depression wetlands. An advantage to using plants and algae in developing nutrient criteria for wetlands is that these taxa often respond directly to nutrient additions.

For plants, we sampled a total of 50 wetlands from 2003 – 2004. At each site, we collected surface water samples to be analyzed for: total phosphorus (TP), total Kjeldahl nitrogen (TKN), chloride, conductivity, alkalinity (total CaCO_3), biological oxygen demand (BOD), dissolved silica, total sulfate, and pH. The composite chemical index (CCI; representing the combined measures of total nitrogen, twice total phosphorus, and the log-transformation of chloride) was also determined for each site. We characterized 12 attributes of the plant community: total dry biomass, total stem density, stem height, richness, presence of native and non-native taxa, presence of turbidity-tolerant species, presence of native sedge species, absolute cover, mean coefficient of conservatism value (C-value), floristic quality index (FQI) and the Wisconsin Wetland Plant Biotic Index (PBI). Plant attributes were analyzed across chemical gradients using regression analysis and among land use classifications using ANOVA.

Nutrient concentrations across the 50 sites ranged from 0.02 - 12.9 mg/L for TP, and 0.32 - 9.28 mg/L for TKN. Mean concentrations for agricultural sites were the highest for TP and TKN (1.65 and 3.52, respectively), followed by urban (0.18 and 1.67), and then reference sites (0.10 and 1.42). TP, TKN, chloride, conductivity, and CCI varied significantly among land use classifications.

Significant negative relationships were found between both TKN and TP concentration and species richness and number of sedge species. Number of native species decreased with TP. Species richness, # native species, and # native sedge species were inversely related to overall nutrient concentration (TKN + TP). Chloride concentration was negatively related to PBI, and positively related to total mean biomass. CCI was negatively related to both richness and sedge species, likely due to these variables' strong relationships with TKN and TP. Duckweed root length appeared to be negatively correlated with BOD and total phosphate, but variation in chemical concentration explained only 7 (BOD) and 10 (TP) percent of the variation in mean *L. minor* root length.

Given the limitations associated with relating one-time sample nutrient concentrations to plant responses, we also evaluated 12 different attributes of the macrophyte community relative to land use classification. Land use classification had a significant effect on # invasive species, total mean biomass, mean stem height of all measured species, mean # of turbidity-tolerant species, mean C value, and mean PBI score. On average, urban-impacted wetlands exhibited the highest values for exotics, biomass, and stem height; agricultural areas hosted the greatest number of turbidity-tolerant species. Conversely, metrics positively related to increasing ecological integrity (the mean C value and PBI score) were highest for reference wetlands. Of the community attributes studied, the 9-metric PBI proposed by Lillie et al. (2002) shows the strongest and most clear association with land use. We recommend using this index as the best indicator of land use effects on northern depression wetlands.

For diatoms we used 80 samples. These samples were from 3 distinct datasets covering the time period 1996, 2001-03, and 2003. The diatom community in surface sediment samples were examined. Sites were segregated into wetland type into depressional, riverine, and lacustrine. They were further segregated by land use into reference, agricultural, and urban. Surface water samples were also collected for many of the chemical variables in the plant portion of the study. The most useful variables were total phosphorus, total Kjeldahl nitrogen, pH, chloride, and conductivity. Exploratory community analysis found that only lacustrine sites significantly differed from other wetland types. As with the plant community, nutrients were a driving variable organizing the diatom community. Land use was a significant determinant in nutrient levels in the wetlands with reference sites having the lowest concentrations.

Six kinds of diatom based metrics were calculated and evaluated for inclusion in the multimetric diatom biotic index. The metrics were 1) community metrics-diversity and dominance; 2) siltation metric; 3) van Dam et al. (1994) metrics-pH, halophils, saprobity, trophic state, moisture; 4) morphological guilds; 5) number of genera; 6) number of species. The final multimetric index (Northern Wetland Diatom Biotic Index, NWDBI) is a sum of scores from six different metrics. Each metric was scored on a scale of 1 to 5, so the maximum possible NWDBI score was 30 and the minimum possible score was 6. The six metrics are halophils, trophic state, monoraphids, *Eunotia incisa*, *Gomphonema parvulum*, and *Pinnularia mesolepta*. The NWDBI scores from the reference sites were used to set narrative ratings. The ratings are excellent, very good, good, fair, poor and very poor. The agricultural sites ranged from fair to very poor while the urban sites ranged from poor to very poor.

Both the plant and diatom communities were equally good at assessing depressional wetlands. These communities were sensitive to land use surrounding the wetlands. Reference sites generally exhibited the best water quality. This is especially true for trophic indicators such as phosphorus and nitrogen. Both the PBI and NWDBI are recommended for evaluation of northern temperate depressional wetlands.

INTRODUCTION

This study builds upon work conducted under previous USEPA Wetland Grants (#CD985491-01-0 and #CD975115-01-0) that resulted in the development of a biological index and classification system for southern Wisconsin wetlands using plant and diatom communities (Lillie 2000 and Lillie et al. 2002). The purpose of this study was to assess the effect of land use alterations and nutrients on select aspects of plant and algae communities in north temperate depressional wetlands as part of the EPA Nutrient Criteria Development Grant Program.

Background

As the rate and magnitude of environmental change in aquatic ecosystems becomes increasingly directed by anthropogenic influences, there is a need to quantify levels of human disturbance and associated ecological shifts. The Wisconsin Department of Natural Resources is charged with developing and implementing water quality standards for all state waters. In doing so, the Department has established a long history of protecting and managing the quality of Wisconsin's vast water resources, including wetlands, for the benefit of state citizens and visitors, as well as maintaining diverse aquatic ecosystems. Since pre-settlement times, Wisconsin has lost approximately half of its original wetland acreage (5 million acres remaining). Loss of wetland area incurs the loss of many "ecosystem services" provided by wetlands (Zedler 2003), including hydrologic transfers, biogeochemical transformations, primary productivity, decomposition, habitat provision, flood control and nutrient and waste water assimilation; these functions are impaired by high levels of human disturbance (Richardson, 1994). Thus, the Wisconsin DNR recognizes the importance of quantifying the response of wetlands to anthropogenically-driven changes in land use patterns.

The goals of this study were to assess the effects of land use and nutrient inputs on primary producers in isolated, northern, temperate, depressional wetlands. An advantage in using plants and algae in developing nutrient criteria for wetlands is that these taxa often respond directly to nutrient additions. We have developed such an index for hardwater depressional wetlands in southeastern Wisconsin (Lillie 2000 and Lillie et al. 2002). In this study, we examined these indices and other community attributes in softwater wetlands, such as those found in northern Wisconsin, the Upper Peninsula of Michigan, and northern Minnesota (i.e., U.S. EPA nutrient ecoregion VIII, as delineated by Omernik et al. (2000)). The wetland sites assessed in this study are mapped in Figure 1. The macrophyte study includes data collected in 2003 and 2004. The diatom analysis was conducted using data gathered from various sites in 1996, as well the Bad River locations sampled from 2001 to 2003.

For plants, measurements in addition to species composition, such as biomass, stem densities, and plant height may show obvious responses to nutrient additions and were incorporated in our overall sampling scheme. For diatoms, other studies of softwater ponds and wetlands found *Eunotia* to be the dominant genus (Gaiser & Johansen 2000, Garrison 2003, Garrison in prep.), while this genus was a minor component of the diatom community in the Southern Wisconsin Till Plains wetland study.

Because methodologies differed for assessing plant or algal communities, we describe complete information for each taxa group (methods, results, and discussion) in the following separate sections: I. Plants and II. Diatoms.

I. PLANTS

METHODS

Site Selection

All study sites were selected from Wisconsin's nutrient ecoregion VIII, which includes approximately the northern third of the state. This portion of the state generally possesses waters that are relatively low in calcium and are classified as softwater. The wetlands were divided into 3 classes based upon local land use, including reference, urban, or agricultural. It was expected that land use would affect nutrient levels within these wetlands, resulting in a gradient across which we might evaluate community shifts in plants. We attempted to reduce extraneous physical variability associated with wetlands of different classes by carefully selecting our study sites based on the criteria depicted in Figure 2. Acceptable study sites were small, long-duration, depressionnal wetlands of the aquatic bed, emergent, or forested classes (per Cowardin et al. 1979 definition), and isolated from larger hydrologic systems. Final site selection was made according to water level, landowner cooperation and sample balance between land use categories.

Wetland Site Assessments and Surface Water Chemistry

We made on-site land use assessments of the area within 100 meters of the perimeter of each waterbody. This information was used to place each wetland along a human disturbance gradient according to its dominant land use type, resulting in an ultimate classification of each wetland as an agricultural, urban or reference site. We collected data on apparent water color, substrate type (e.g. peat, organic, etc) and visually estimated percent cover of emergent, submergent, and floating leaf plants. See Appendix 1 for site assessment data sheets for each site.

Water chemistry samples were collected with 10% repetition prior to each macrophyte survey in order to limit any substrate disturbance that might affect the samples. Water samples were analyzed for total phosphorus (TP), total Kjeldahl nitrogen (TKN), chloride, conductivity, alkalinity (total CaCO₃), biological oxygen demand (BOD), dissolved silica, total sulfate, and pH. All water chemistry analyses were conducted by the Wisconsin State Laboratory of Hygiene. We used nutrient (N and P) and chloride levels to calculate Lillie's (2002) surrogate for human disturbance level, the composite chemical index (CCI; representing the combined measures of total nitrogen, twice total phosphorus, and the log-transformation of chloride).

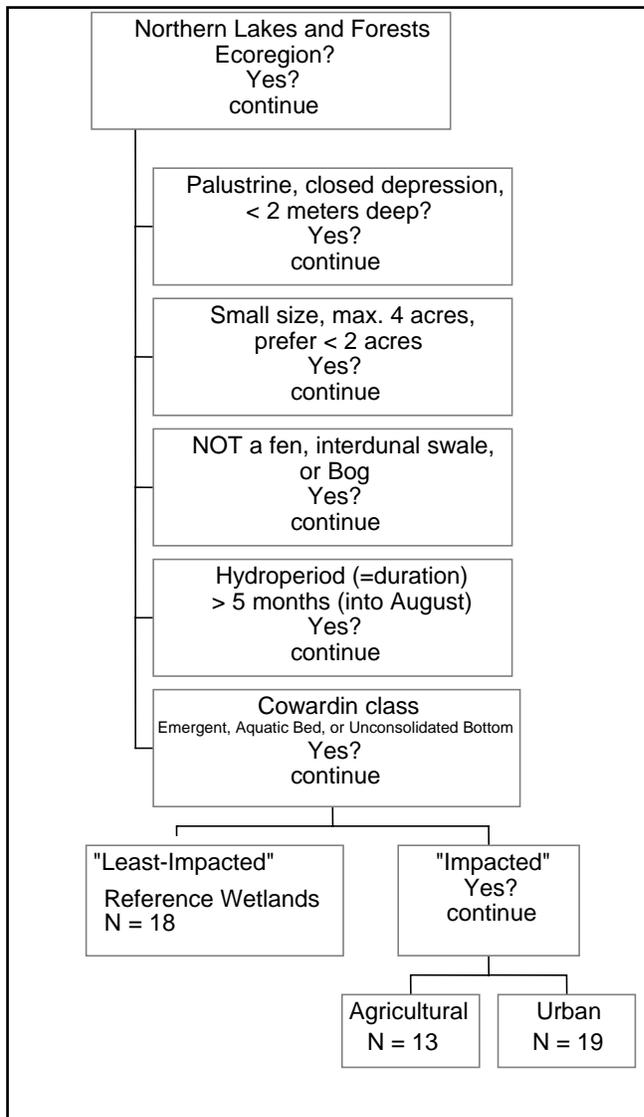


Figure 2. Site selection flowchart for macrophyte sites.

Macrophyte Sampling

The macrophyte community at each site was evaluated during midsummer for the following potential metrics: total dry biomass, total stem density, stem height, richness, presence of native and non-native taxa, presence of turbidity-tolerant species, presence of native sedge species, absolute cover, mean coefficient of conservatism value (C-value; Bernthal (2003)), floristic quality index (FQI; Nichols (1999))¹ and the Wisconsin Wetland Plant Biotic Index (PBI; Lillie et al. (2002)).

¹ The Floristic Quality Index (FQI) (Swink and Wilhelm 1994, Nichols 1999) was designed to provide a relatively rapid assessment of how closely the aquatic vegetation in a given area matches that of undisturbed conditions¹. The FQI takes into account species richness of the assemblage of aquatic plants in a lake and the sensitivity of each individual plant species to environmental conditions, such as turbidity, substrate preferences, rooting strength, primary means of reproduction, and tolerance to water drawdown (Nichols 1999).

For a given site, the FQI is calculated as:

Macrophytes were surveyed using two independent sampling methods. The first method was used to generate information on plant community dominance and to calculate the PBI by evaluating % cover and frequency of occurrence of all species. Three transects were oriented to trisect the wetland, with 6 quadrats set at equal distances along each transect. The first quadrat was fixed at the shallower of either 60 cm or maximum depth; the last was placed at the water's edge (entirely within water). The percent cover assessment method follows that which was outlined by Daubenmire (1959) and employed by Lillie et al. (2000). We used this dataset to generate PBI and a species list for each wetland, including the number of native and non-native species. PBI was calculated using 9 metrics from the percent cover data following the procedure outlined by Lillie *et al.* (2002).

A second line-transect method was used to evaluate: biomass, stem density, stem height, and # sedge species. Transects were established at five randomly selected points along the periphery of the wetland with measurements taken in quadrats (ranging in size from 0.01-0.25 m²) located 1) adjacent to the water's edge and landward to measure emergent vegetation (0 cm depth), 2) at 25 cm depth, and 3) at 60 cm depth (2004 only). Stem density (stems/m²) was estimated using a count of the emergent stems in each quadrat. To estimate average stem height (cm), we measured the 5 tallest specimens growing in and near each shoreline quadrat. Some discretion was afforded the researcher as to which species and which plants were selected. However, an effort was made to measure the most cosmopolitan of species, allowing for a meaningful comparison between sites. The biomass within each quadrat was then harvested. Biomass collected in the field was sorted by species and dried for 3 days at 60° C and subsequently weighed (g m⁻²). Data from both survey methods were combined to generate the number of turbidity-tolerant species, mean C, and to calculate the FQI.

To analyze the effect of nutrient concentration (and BOD) (Elster et al. 1995) on Lemnaceae root length, 25 specimens of *Lemna minor* were collected from the 30 wetlands in which it was present. Root length of each specimen was measured in the lab using metric calipers.

Plant identification was performed in the field when the species was known with certainty. In cases where there was doubt about the identification of a plant, a voucher specimen was collected for later identification in the lab with a taxonomic key or in particularly difficult cases, by plant taxonomist Dr. R. Freckmann of the UW-Stevens Point Robert W. Freckmann Herbarium.

Data Analysis

Community attributes were tested for significant differences using multiple statistical tests. Water chemistry was compared to land use type using ANOVA, and to individual metrics by the regression of a log transformation of the environmental variable (x) on the metric value (y). The relationship between duckweed root length and total phosphate or BOD was also examined

$$FQI = (\bar{C})(\sqrt{N}), \text{ where}$$

N = the total number of native species, and

\bar{C} = the average coefficient of conservatism. Conservatism is defined as the estimated probability that a plant is likely to occur in a landscape that is believed to be relatively unaltered from presettlement conditions (Nichols 1999). Conservatism values, ranging from 0 (most tolerant) to 10 (most sensitive), were assigned to 1788 species native to Wisconsin in Bernthal (2003). Mean C is determined by dividing the sum of coefficient of conservatism values for all native species by the total number of native species.

using regression analyses. In order to elucidate the overall vegetative response to variation in environmental conditions as reflected by the water chemistry variables, a canonical ordination method (CCA) described by Ter Braak (1996) was conducted using the Daubenmire percent cover data. Percent values were transformed using the arc-sine square-root transformation, and environmental variables were log-transformed ($x+1$).

RESULTS

Site Descriptions

We sampled a total of 50 wetlands from 2003 – 2004 (Figure 1). Selected wetlands were relatively small, ranging from fractions of an acre to 10 acres; with the majority skewed toward the low end of the range. All wetlands were persistent through the drought year of 2003, and as such were considered long-duration. From our on-site assessments, wetlands were classified according to their dominant land use type. Our final sample set included 18 reference, or undisturbed wetlands, 13 wetlands in agricultural areas, and 19 wetlands that we classified as urban-impacted. Site descriptions and county locations can be found in Appendix 1.

Water Chemistry

Nutrient concentrations across the 50 sites ranged from 0.02 - 12.9 mg/L for total phosphorus, and 0.32 - 9.28 mg/L for total Kjeldahl nitrogen. Mean concentrations for agricultural sites were the highest for TP and TKN (1.65 and 3.52, respectively), followed by urban (0.18 and 1.67), and then reference sites (0.10 and 1.42). Within a given category, we encountered a broad range of nutrient concentrations (Fig. 3).

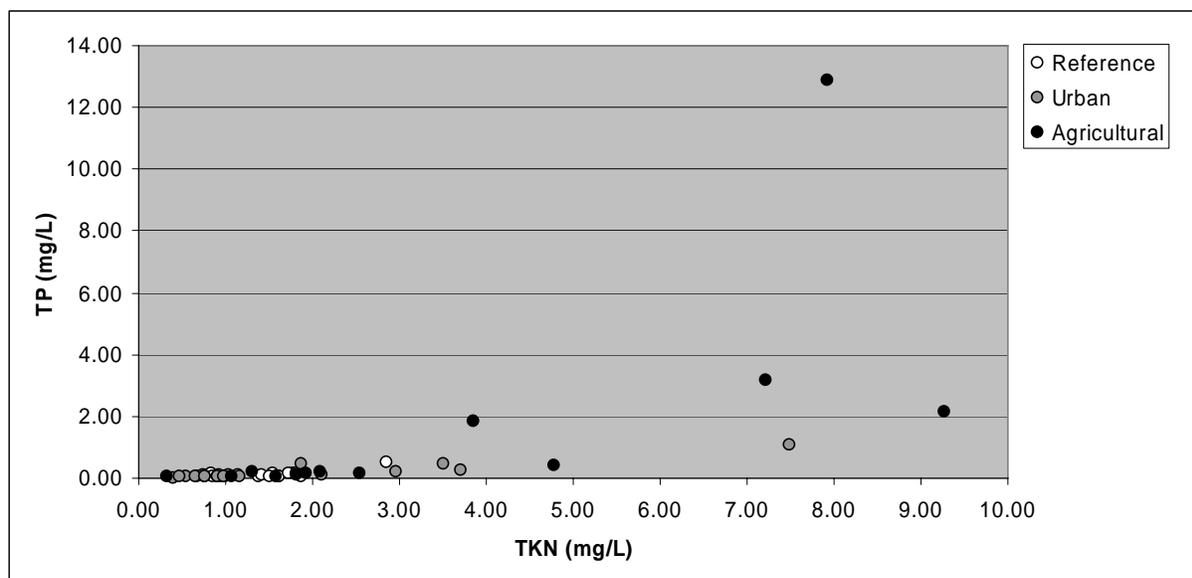


Figure 3. Total Kjeldahl nitrogen versus total phosphorus in wetland sites sampled for plants in 2003 and 2004 in reference, urban, or agricultural landscapes.

Mean values for all chemical analyses are reported in Table 1. When compared to the reference values, agricultural sites returned higher values for all significant tests (total phosphorus, total nitrogen, chloride, conductivity, and CCI). Urban sites scored higher than agricultural areas for chloride concentration and the closely related estimate of conductivity.

Table 1. Water chemistry results for sampled wetlands (means + 95% CI). An asterisk (*) indicates a significant effect of land use as determined by ANOVA ($P < 0.05$), with maximum values indicated in bold. .

Chemistry	Wetland Type						Significance
	Reference		Agricultural		Urban		
Total P (mg/L)	1.10	<u>+0.05</u>	1.65	<u>+2.13</u>	0.18	<u>+0.12</u>	*
TKN (mg/L)	1.42	<u>+0.26</u>	3.52	<u>+1.76</u>	1.67	<u>+0.84</u>	*
Cl (mg/L)	1.80	<u>+1.62</u>	5.82	<u>+5.89</u>	30.10	<u>+21.96</u>	*
Conductivity (umhos/cm)	48.39	<u>+24.91</u>	109.69	<u>+57.95</u>	146.42	<u>+70.96</u>	*
Alkalinity (mg CaCO ₃ /L)	19.89	<u>+13.14</u>	39.69	<u>+24.08</u>	20.74	<u>+8.94</u>	ns
BOD (mg/L)	4.05	<u>+1.36</u>	7.23	<u>+5.95</u>	6.28	<u>+4.88</u>	ns
Dissolved N (mg/L)	0.00	<u>+0</u>	0.17	<u>+0.35</u>	0.02	<u>+0.025</u>	ns
Dissolved silica (mg/L)	1.61	<u>+1.11</u>	3.60	<u>+3.60</u>	3.03	<u>+2.27</u>	ns
Total Sulfate (mg/L)	2.22	<u>+1.50</u>	2.59	<u>+3.03</u>	1.97	<u>+1.74</u>	ns
pH	6.58	<u>+0.47</u>	6.99	<u>+0.35</u>	6.53	<u>+0.41</u>	ns
CCI (TKN + 2P +log ₁₀ Cl)	1.59	<u>+0.56</u>	7.46	<u>+5.53</u>	3.24	<u>+0.99</u>	*

We used canonical correspondence analysis (CCA) to determine the strength of the influence of these environmental variables on vegetation (measured by mean % cover) at the study sites. Figure 4 shows the distribution of all sites with respect to the environmental variables. The length of the axis indicates the strength of the influence of that particular variable, and each wetland is situated according to the gradients defined by those axes. The figure shows TKN, chloride, conductivity, and alkalinity concentration to strongly influence %vegetative cover. Eliminating some of confounding variables and re-running the analysis to consider vegetative changes only with respect to TKN, chloride, conductivity, and alkalinity returned the results depicted in Figure 5. Notice that urban sites are positively correlated with chloride level, and negatively correlated with TKN. The inverse relationship holds for agricultural areas which tend to be restricted to low levels of chloride. Reference sites are generally clustered around low to intermediate levels of both attributes.

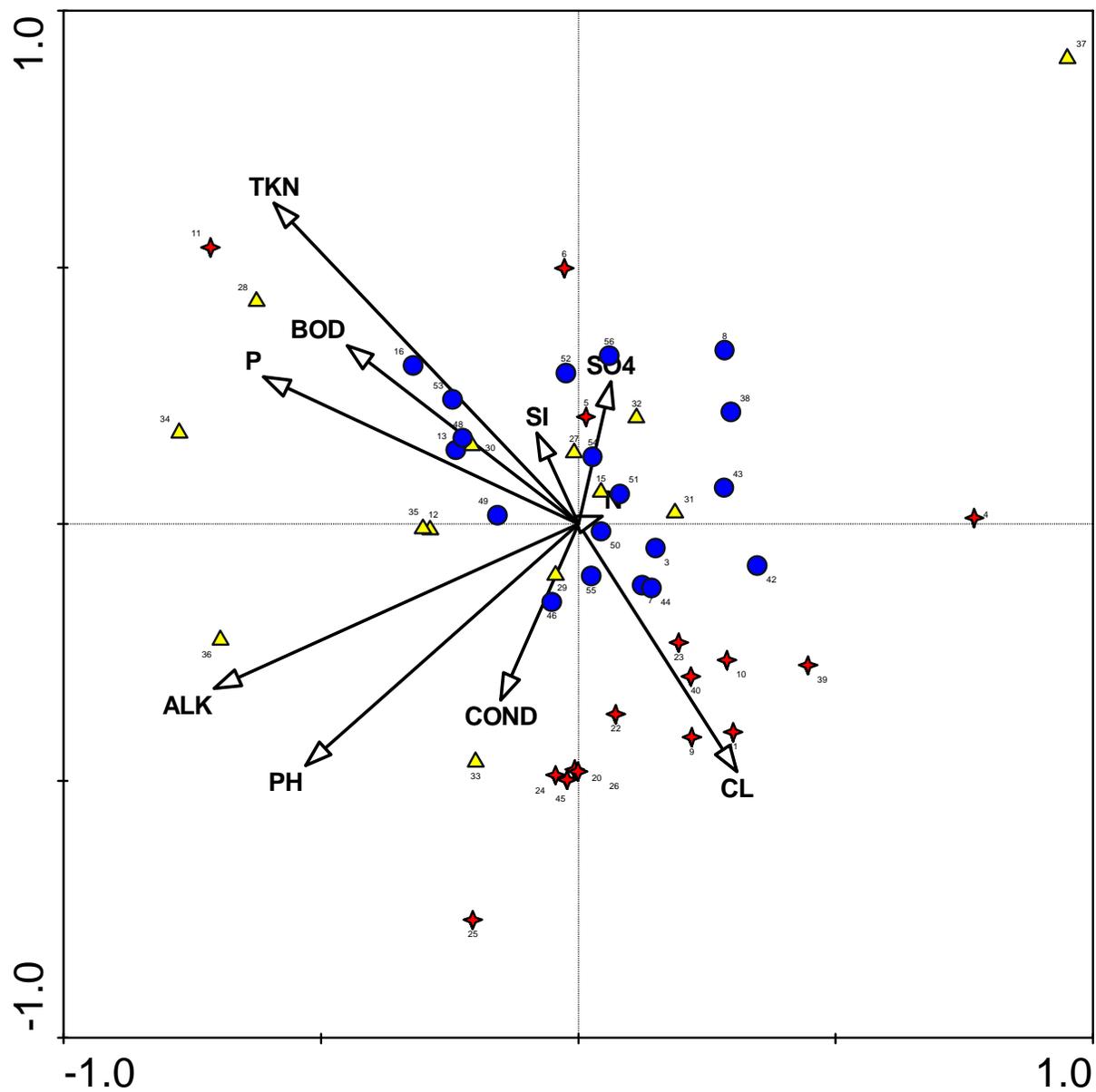


Figure 4. CCA plot showing the influence of all environmental variables on the plant communities (% cover of all species) of all wetland study sites. Length of arrows indicates strength of influence; land use type is indicated by symbols, with circles, triangles, and stars representing reference, agricultural, and urban sites, respectively. Outliers include an area that receives sewage effluent (37) and an urban bog (4).

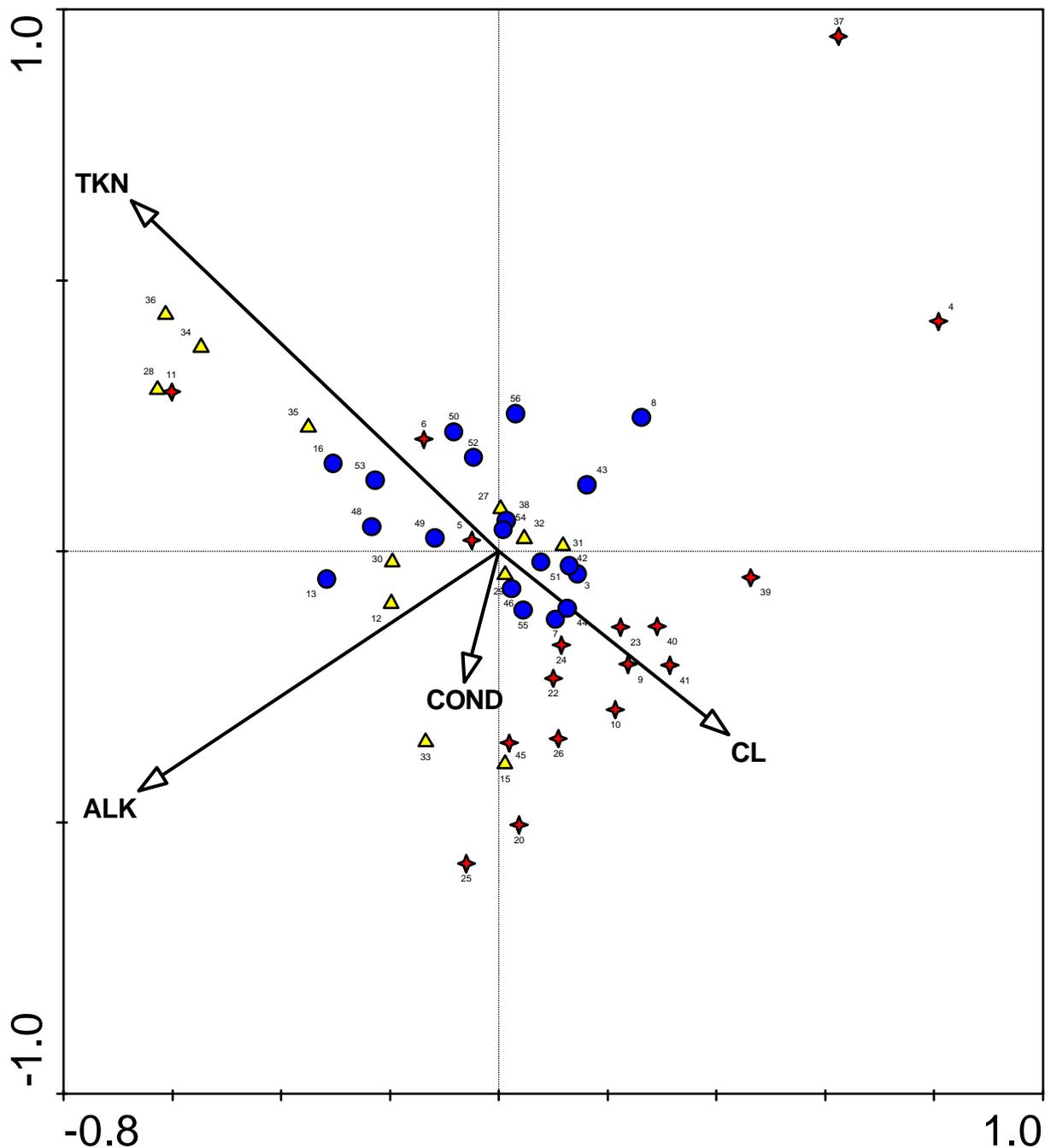


Figure 5. CCA plot showing the influence of selected environmental variables on the plant communities (% cover of all species) of all wetland study sites. Length of arrows indicates strength of influence; land use type is indicated by circles, triangles, and stars representing reference, agricultural, and urban sites, respectively. Note clustering of land use types according to chloride and TKN levels. Outliers include an area that receives sewage effluent (37) and an urban bog (4).

Due to the land use trends exhibited by the CCA, mean chemistry values were individually evaluated by land use type using ANOVA. As expected, total phosphorus ($P = 0.041$), TKN ($P = 0.0068$), chloride ($P = 0.0204$), conductivity ($P = 0.027$) as well as the composite chemical index ($P = 0.0192$) varied significantly among land use classifications (Fig 6).

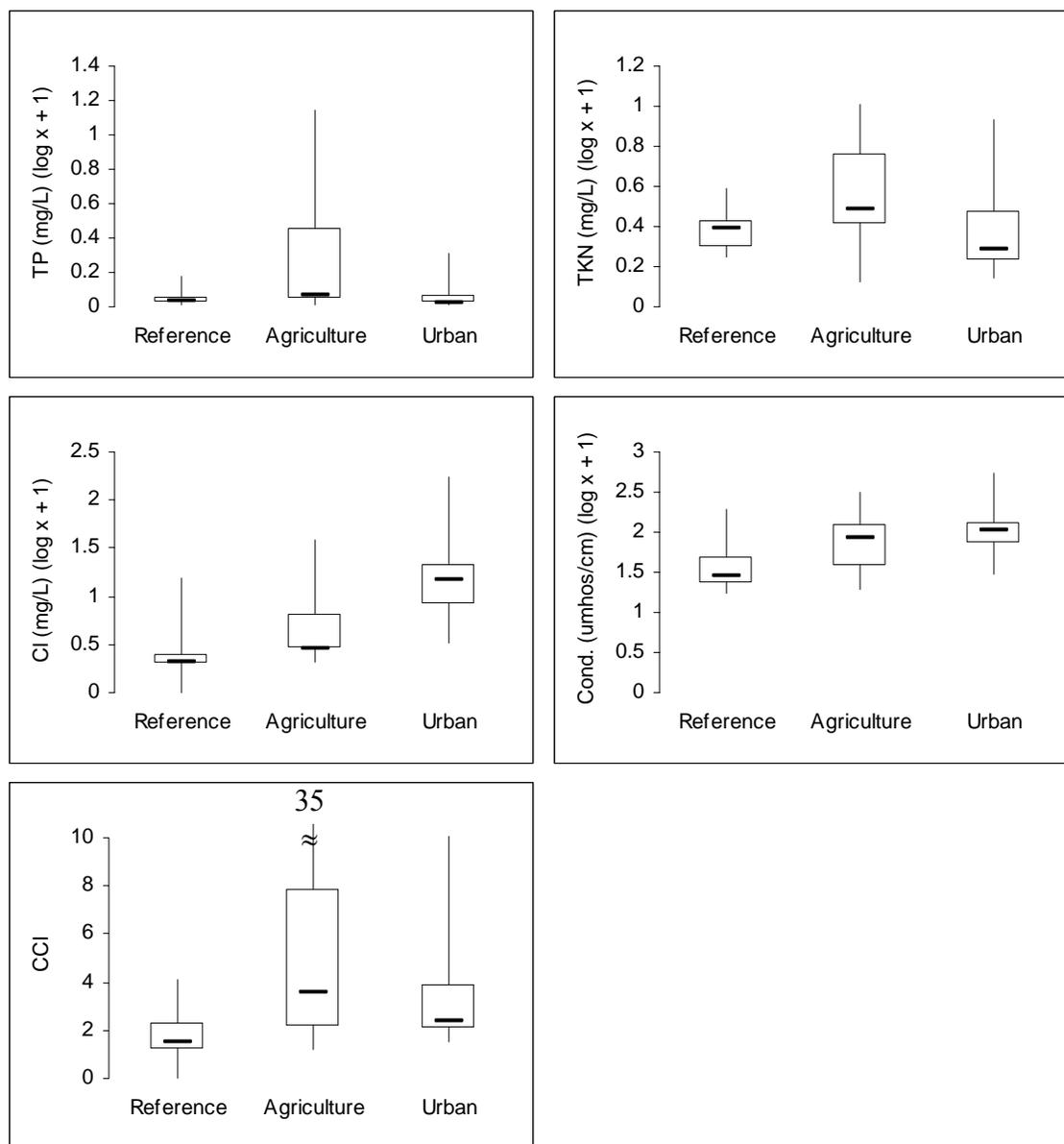


Figure 6. Box plots of all chemical attributes (from Table 1) which varied significantly by land use ($P < 0.05$). Values for the agricultural sites were in all cases higher than those for reference sites.

Since the CCI has essentially two components - nutrients (P and N) and chloride - and given the opposition between these two factors as illustrated by the CCA, we directly plotted the comparison in attempt to delineate several smaller groups of wetlands with similar chemical

attributes. The relationship depicted in Figure 6 follows the pattern reported by Lillie et al. (2002). Low nutrient sites tended to display high chloride concentrations, and vice versa (Fig. 7).

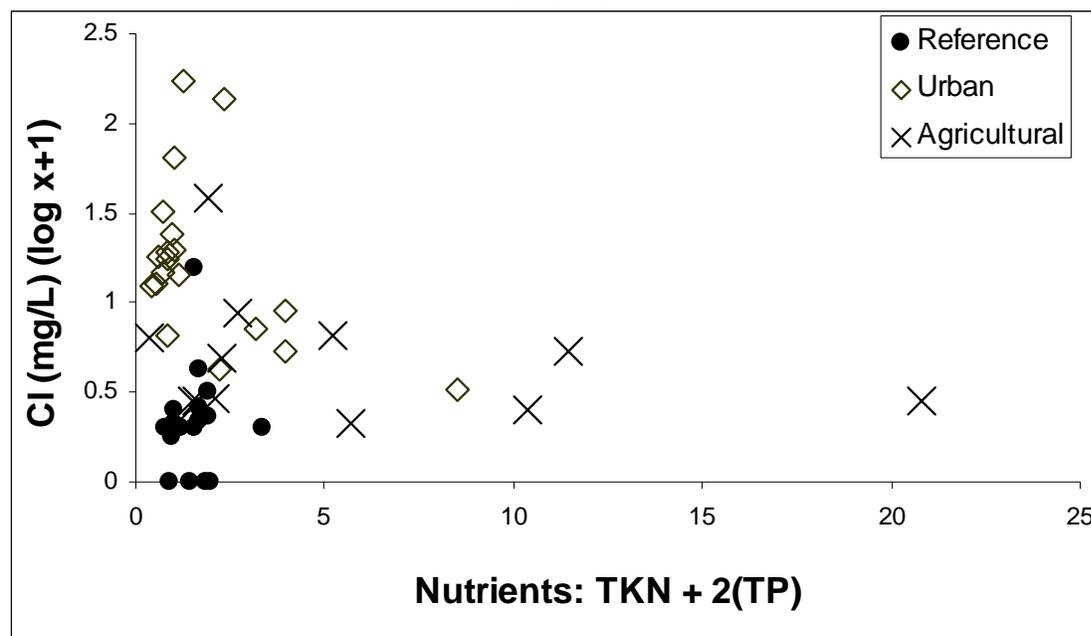


Figure 7. Relationship between nutrients (N & P) and chloride concentration.

Macrophytes

Over the entire study, we identified a compiled list of 118 positively identified individual species. Each species is listed in Table 2 by both scientific and common name. Three of the metrics we calculated required us to classify certain species as exotic, turbidity-tolerant, or sedge species of the family Cyperaceae. These classifications are noted where appropriate. The relative frequency values for all taxa encountered during the Daubenmire survey are listed in Table 3. Where plants were found, *Lemna minor* was most frequently encountered free-floating taxon. The most frequent submerged, floating leaf, and emergent taxa were *Potamogeton pusillus*, *Typha latifolia*, and *Nymphaea odorata*, respectively.

Table 2. List of all sampled taxa. E=exotic, TT=turbidity-tolerant, S=sedge.

Taxon	Common Name		Taxon	Common Name	
<i>Acer saccharum</i>	Sugar maple		<i>Leersia oryzoides</i>	Rice-cut grass	
<i>Acorus calamus</i>	Sweet-flag	E	<i>Lemna minor</i>	Lesser duckweed	
<i>Agrostis gigantea</i>	Red top		<i>Lemna trisulca</i>	Forked duckweed	
<i>Alisma plantago-aquatica</i>	Water plantain		<i>Lotus coriculata</i>	Bird's-foot trefoil	
<i>Alopecurus aequalis</i>	Short-awned foxtail		<i>Lycopus uniflorus</i>	Northern water-horehound	
<i>Ambrosia artemisifolia</i>	Common ragweed		<i>Lysimachia quadrifolia</i>	Narrow-leaved loosestrife	
<i>Andromeda glaucophylla</i>	Bog rosemary		<i>Lysimachia terrestris</i>	Swamp candles	
<i>Aster lanceolatus</i>	Aster		<i>Lysimachia thrysiflora</i>	Swamp Loosestrife	
<i>Penthorum sedoides</i>	Ditch stonecrop		<i>Lythrum salicaria</i>	Purple loosestrife	
<i>Betula papyrifera</i>	Paper birch		<i>Mentha arvensis</i>	Wild mint	

<i>Betula pumila</i>	Bog birch		<i>Mimulus ringens</i>	Monkey-flower	
<i>Bidens cernuus</i>	Nodding beggar-tick		<i>Nasturtium officinale</i>	Watercress	
<i>Bidens connata</i>	Purple-stem beggar-tick		<i>Najas flexilis</i>	Bushy pondweed	
<i>Bidens frondosus</i>	Common beggar-tick		<i>Nuphar variegata</i>	Spatterdock	
<i>Brasenia schreberi</i>	Watershield	T	<i>Nymphaea odorata</i>	White water lily	T
<i>Calamagrostis canadensis</i>	Bluejoint grass		<i>Onoclea sensibilis</i>	Sensitive fern	
<i>Calla palustris</i>	Wild calla		<i>Phalaris arundinacea</i>	Reed canary grass	
<i>Callitriche palustris</i>	Common water-starwort		<i>Poa pratensis</i>	Kentucky bluegrass	
<i>Carex comosa</i>	Bristly sedge	S	<i>Polygonum amphibium</i>	Water smartweed	T
<i>Carex diandra</i>	Bog paniced sedge	S	<i>Polygonum arenastrum</i>	Door-yard smartweed	
<i>Carex hystericina</i>	Bottlebrush sedge	S	<i>Polygonum pensylvanicum</i>	Pennsylvania knotweed	
<i>Carex lacustris</i>	Common lake sedge	S	<i>Polygonum persicaria</i>	Heart's-ease	E
<i>Carex lasiocarpa</i>	Narrow-leaved wooly sedge	S	<i>Polygonum punctatum</i>	Dotted smartweed	
<i>Carex oligosperma</i>	Few-seeded hop sedge	S	<i>Polygonum sagittatum</i>	Arrow-leaved tear-thumb	
<i>Carex retrorsa</i>	Deflexed bottlebrush sedge	S	<i>Potamogeton epihydrous</i>	Ribbon-leaved pondweed	
<i>Carex sp. In ovales tribe</i>	Oval sedge	S	<i>Potamogeton gramineus</i>	Variable-leaved pondweed	
<i>Carex stricta</i>	Common tussok sedge	S	<i>Potamogeton natans</i>	Floating-leaf pondweed	
<i>Carex utriculata</i>	Common yellow sedge	S	<i>Potamogeton oakesianus</i>	Oake's pondweed	
<i>Carex vesicaria</i>	Blister sedge	S	<i>Potamogeton pusillus</i>	Small pondweed	
<i>Ceratophyllum demersum</i>	Coontail	T	<i>Potamogeton vaseyi</i>	Vasey's pondweed	
<i>Chamadaphne calyculata</i>	Leather-leaf		<i>Ranunculus aquatilis</i>	White water crowfoot	T
<i>Chara braunii</i>	Muskgrass		<i>Ranunculus pennsylvanicus</i>	Bristly buttercup	
<i>Cicuta bulbifera</i>	Bublet water-hemlock		<i>Rhynchospora alba</i>	White beak-rush	
<i>Comarum palustre</i>	Marsh cinquefoil		<i>Rumex crispus</i>	Curly dock	E
<i>Drosera rotundifolia</i>	Round-leaved sedge		<i>Sagittaria latifolia</i>	Common arrowhead	T
<i>Dulichium arundinaceum</i>	Pond sedge	T	<i>Stuckenia pectinata</i>	Sage pondweed	T
<i>Eleocharis obtusa</i>	Blunt spike-rush	S	<i>Salix petiolaris</i>	Medow willow	
<i>Eleocharis palustris</i>	Common spike-rush	S	<i>Scheuchzeria palustris</i>	Arrow-grass	
<i>Elodea canadensis</i>	Common Waterweed	T	<i>Utricularia vulgaris</i>	Common bladderwort	
<i>Elytrigia repens</i>	Creeping quack grass	E	<i>Vallisneria americana</i>	Water-celery	T
<i>Epilobium ciliatum</i>	American willow-herb		<i>Verbena hastata</i>	Blue vervain	
<i>Epilobium leptophyllum</i>	American marsh willow-herb		<i>Veronica perigrinia</i>	Neckweed	
<i>Fragaria vesca</i>	Woodland strawberry		<i>Wolffia columbiana</i>	Watermeal	
<i>Glyceria borealis</i>	Northern mannagrass		<i>Zannichellia palustris</i>	Horned pondweed	
<i>Glyceria canadensis</i>	Rattlesnake mannagrass		<i>Schoenoplectus tabernaemontani</i>	Soft-stem bulrush	
			<i>Schoenoplectus subterminalis</i>	Water bulrush	
<i>Glyceria grandis</i>	Reed mannagrass		<i>Scirpus atrocinctus</i>	Black-girdled wool-grass	
<i>Gratiola neglecta</i>	Clammy hedge-hyssop		<i>Scirpus cyperinus</i>	Woll-grass	
<i>Hypericum boreale</i>	Northern St. John's wort		<i>Scutellaria galericulata</i>	Common skullcap	
<i>Impatiens capensis</i>	Orange jewelweed	E	<i>Scutellaria lateriflora</i>	Blue skullcap	

<i>Juncus brevicaudatus</i>	Narrow-panicle rush		<i>Sium suave</i>	Water parsnip	
<i>Juncus effusus</i>	Common rush				
<i>Spirodela polyrrhiza</i>	Giant duckweed		<i>Solidago canadensis</i>	Canadian golden rod	
<i>Stachys tenuifolia</i>	Smooth hedge-nettle		<i>Solidago gigantea</i>	Giant goldenrod	
<i>Triadenum fraseri</i>	Bog St. John's wort		<i>Sparganium americanum</i>	American bur-reed	
<i>Trifolium repens</i>	White clover	E	<i>Sparganium angustifolium</i>	Narrow-leaved bur-reed	
<i>Typha angustifolia</i>	Narrow-leaved cat-tail	E	<i>Sparganium emersum</i>	Narrow-leaved bur-reed (2)	
<i>Typha latifolia</i>	Broad-leaved cat-tail		<i>Sparganium eurycarpum</i>	Giant bur-reed	
<i>Utricularia geminiscopa</i>	Hidden-fruit bladderwort		<i>Spirea tomentosa</i>	Steeplebush	
<i>Utricularia minor</i>	Small bladderwort				

Table 3. Relative frequency values of all taxa encountered during Daubenmire surveys over all sites.

Taxon	Rel. freq.	Taxon	Rel. freq.
<i>Lemna minor</i>	15.21	<i>Ranunculus pensylvanicus</i>	0.40
<i>Potamogeton pussilus</i>	7.89	<i>Gratiola neglecto</i>	0.35
<i>Utricularia vulgaris</i>	5.76	<i>Potamogeton graminous</i>	0.35
Filamentous algae	5.30	<i>Sparganium eurycarpum</i>	0.35
<i>Typha latifolia</i>	3.51	<i>Utricularia minor</i>	0.35
<i>Phalaris arundinacea</i>	3.46	<i>Hypericum boreale</i>	0.29
<i>Carex utriculata</i>	2.88	<i>Carex spp.</i>	0.24
<i>Typha angustifolia</i>	2.36	<i>Carex retrorsa</i>	0.23
<i>Spirodela polyrrhiza</i>	2.3	<i>Elytrigia repens</i>	0.23
<i>Bidnens cernuus</i>	2.19	<i>Epilobium leptophyllum</i>	0.23
<i>Elodea canadensis</i>	2.07	<i>Ranunculus longerostris</i>	0.23
<i>Sagittaria latifolia</i>	1.9	<i>Salix petiolaris</i>	0.23
<i>Calamagrostis canadensis</i>	1.84	<i>Triadenum fraseri</i>	0.23
<i>Riccia fluitans</i>	1.79	<i>Epilobium ciliatum</i>	0.17
<i>Wolffia columbiana</i>	1.79	<i>Onoclea sensibilis</i>	0.17
<i>Eleocharis obtusa</i>	1.67	<i>Polygonum persicaria</i>	0.17
<i>Leersia oryzoides</i>	1.67	<i>Polygonum upland</i>	0.17
<i>Alisma subcordatum trivale</i>	1.61	<i>Potamogeton oakesianus</i>	0.17
<i>Ceratophyllum demersum</i>	1.56	<i>Schoenoplectus subterminalis</i>	0.17
<i>Calla palustris</i>	1.44	<i>Sparganium angustifolium</i>	0.17
<i>Glyceria canadensis</i>	1.32	<i>Trifolium repens</i>	0.17
<i>Glyceria grandis</i>	1.32	<i>Dulichium arundinaceum</i>	0.12
<i>Polygonum punctatum</i>	1.32	<i>Eragrostis spp.</i>	0.12
<i>Sparganium americanum</i>	1.32	<i>Mimulus ringens</i>	0.12
<i>Nymphaea odorata</i>	1.09	<i>Najas flexilis</i>	0.12
<i>Eleocharis palustris</i>	1.04	<i>Polygonum pensylvanicum</i>	0.12
<i>Scirpus cyperinus</i>	0.98	<i>Nasturtium officinale</i>	0.12
<i>Potamogeton epihydrous</i>	0.92	<i>Rumex crispus</i>	0.12
Water fern/moss	0.92	<i>Sparganium emersum</i>	0.12
<i>Brasenia shreberi</i>	0.86	<i>Veronica periginia</i>	0.12
<i>Chamaedaphne callyculata</i>	0.81	<i>Acorus calamus</i>	0.06
<i>Nuphar variegata</i>	0.81	<i>Benthorum sedoides</i>	0.06
<i>Spagnum</i>	0.81	<i>Betula papyrifera</i>	0.06
<i>Lemna trisulca</i>	0.75	<i>Betula pumila</i>	0.06
<i>Polygonum amphibium</i>	0.69	<i>Calitricae verna/palustris</i>	0.06
<i>Galium tinctorum or trifidum</i>	0.63	<i>Callitriche palustris</i>	0.06
<i>Schoenoplectus tabermontii</i>	0.58	<i>Carex stricta</i>	0.06

<i>Sium suave</i>	0.58	<i>Chara braunii</i>	0.06
<i>Vallisneria americana</i>	0.58	<i>Fragaria vesca</i>	0.06
<i>Glyceria spp.</i>	0.58	<i>Impatiens capensis</i>	0.06
<i>Sparganium spp.</i>	0.53	<i>Lycopus unifloris</i>	0.06
<i>Carex lacustris</i>	0.52	<i>Lysimachia quadrifolia</i>	0.06
<i>Potamogeton spp.</i>	0.52	<i>Mentha arvensis</i>	0.06
<i>Alopecurus aequalis</i>	0.46	<i>Polygonum sagitatum</i>	0.06
<i>Glyceria borealis</i>	0.46	<i>Potamogeton vaseyeyi</i>	0.06
<i>Lysimachia thyriflora</i>	0.46	<i>Salix spp.</i>	0.06
<i>Potamogeton pectinatus</i>	0.46	<i>Scutellaria lateriflora</i>	0.06
<i>Juncus effusus</i>	0.40	<i>Spiraea tomentosa</i>	0.06
<i>Lysimachia terrestris</i>	0.40	<i>Stachys tenuifolia</i>	0.06
<i>Potamogeton natans</i>	0.40	<i>Zannichelia palustris</i>	0.06

Plant Metrics

We evaluated the dependence of each of our response variables on the concentration of individual nutrients (TKN and TP) using regression analyses. Significant ($P < 0.05$) negative relationships were found between both TKN and TP concentration and species richness and number of sedge species. Number of native species decreased with TP (Fig. 8). We also evaluated the vegetative response to a number of compounded chemical concentrations. Species richness, # native species, and # native sedge species were inversely related to overall nutrient concentration (TKN + TP) (Fig. 9). Chloride concentration was negatively related to PBI, and positively related to total mean biomass (Fig.10). Finally the composite chemical index was found to be negatively related to both richness and sedge species, likely due to these variables' strong relationships with TKN and TP (Fig. 11). All of these relationships were found to be significant ($P < 0.05$). However, it is important to note that the r^2 estimate of goodness-of-fit was relatively low in every case, and at best the predicting variable explains only 16.6% of the variability in y .

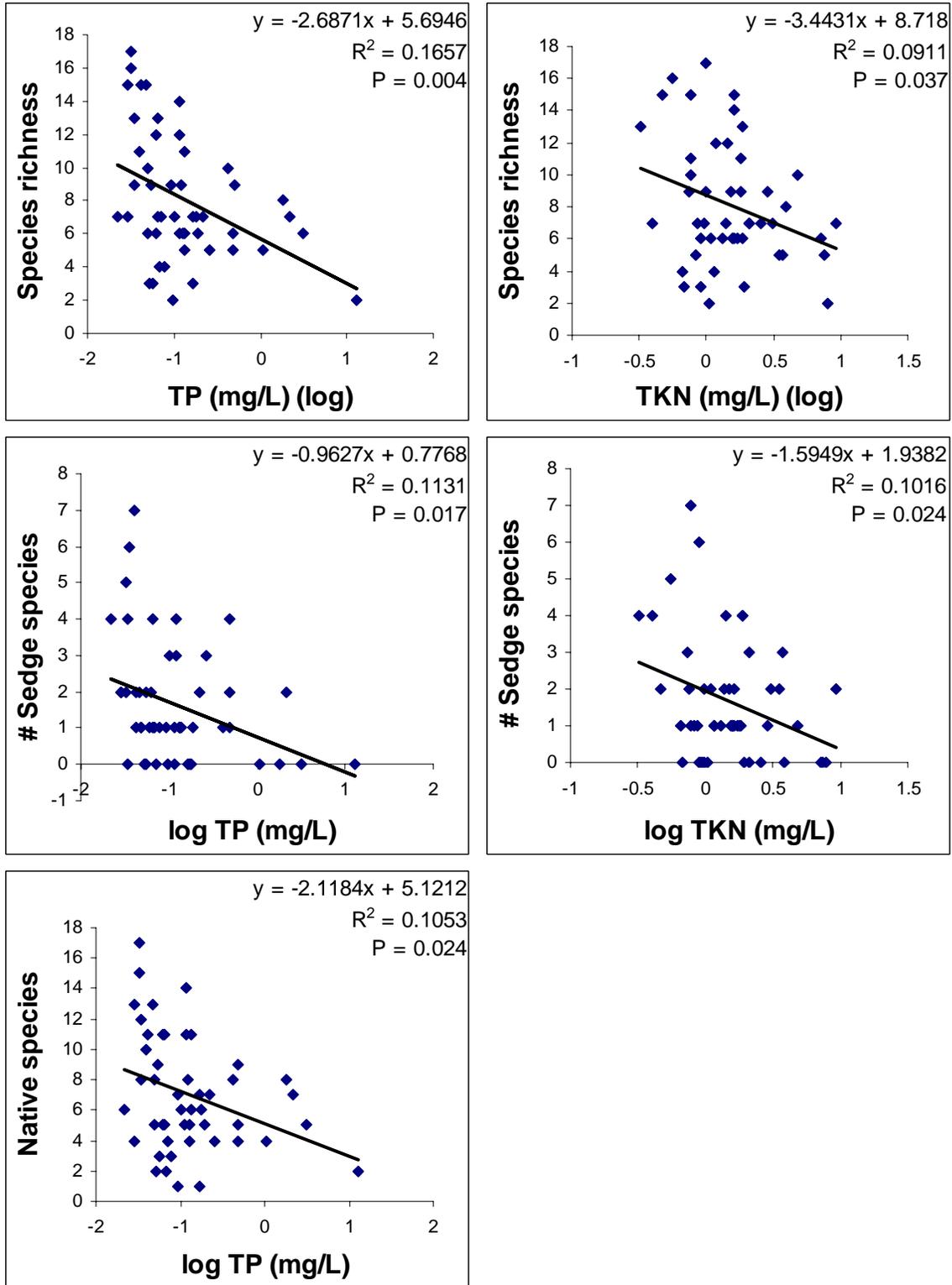


Figure 8. Graphs of the significant regressions ($P < 0.05$) between vegetative attributes and individual nutrients. Associated P and r^2 values are shown. Nutrients were log₁₀-transformed.

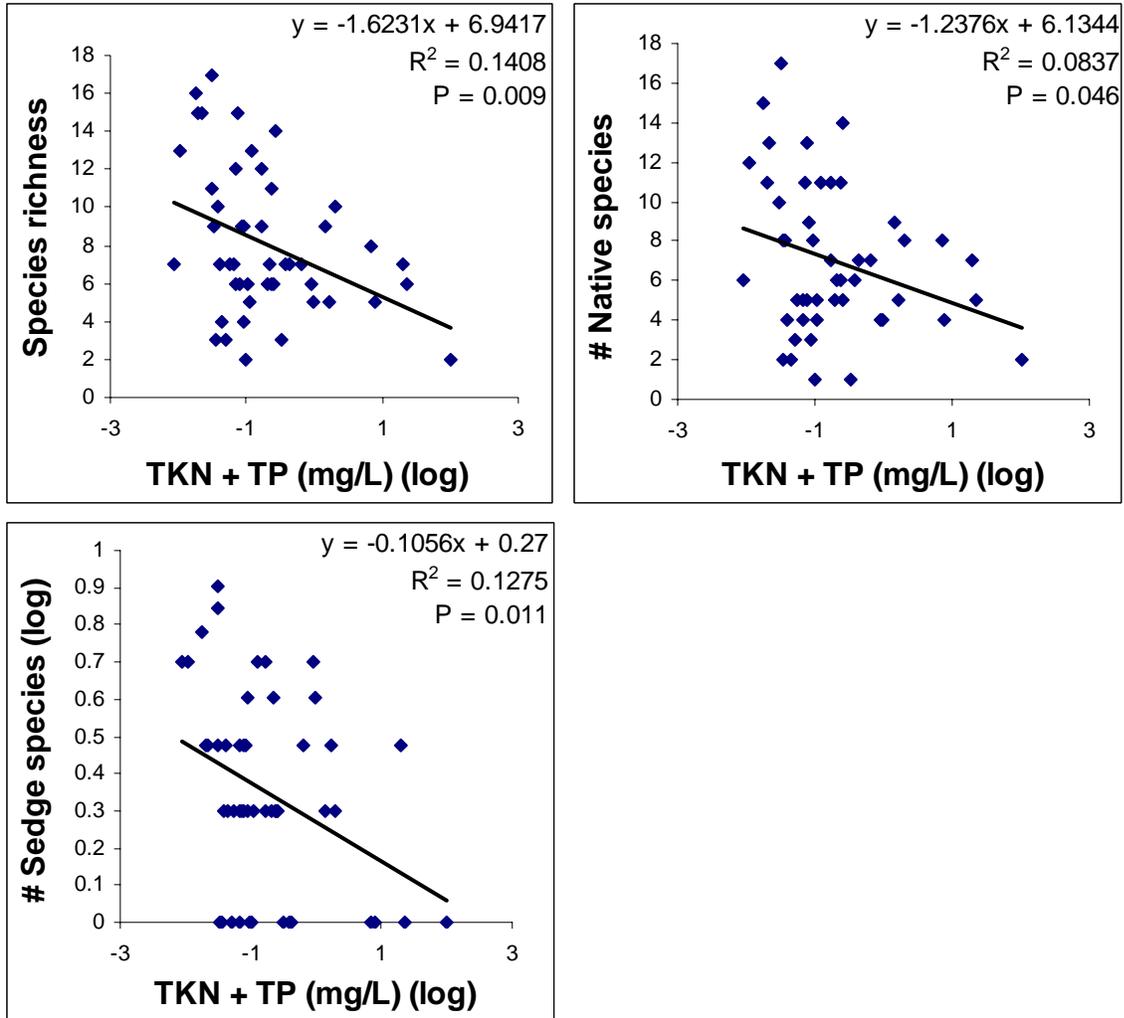


Figure 9. Graphs of the significant regression ($P < 0.05$) between vegetative attributes and combined nitrogen and phosphorus concentration. Associated P and r^2 values are shown. Log transformations performed where indicated on axes.

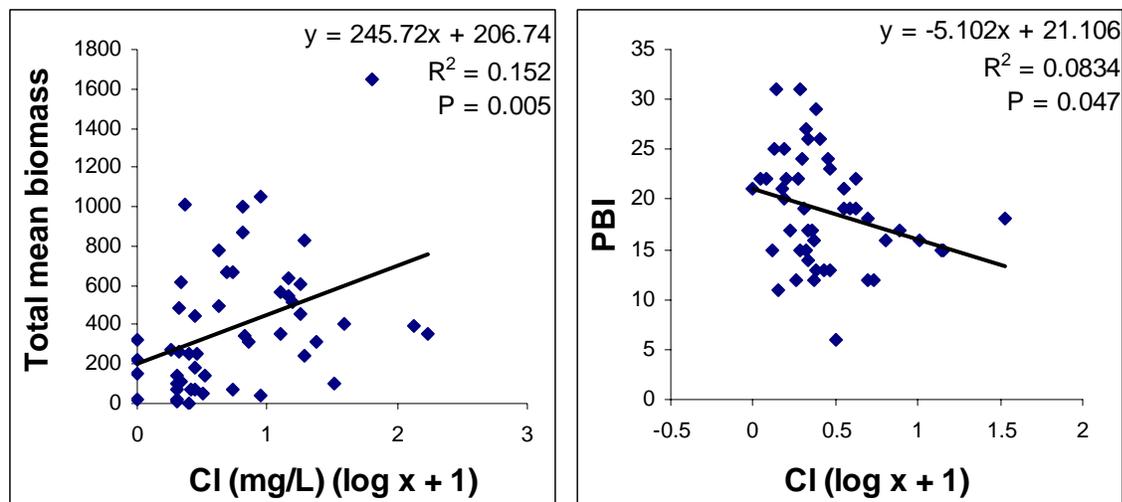


Figure 10. Graphs of the significant regressions ($P < 0.05$) between vegetative attributes and chloride. Associated P and r^2 values are shown. Chloride concentration was \log_{10} -transformed.

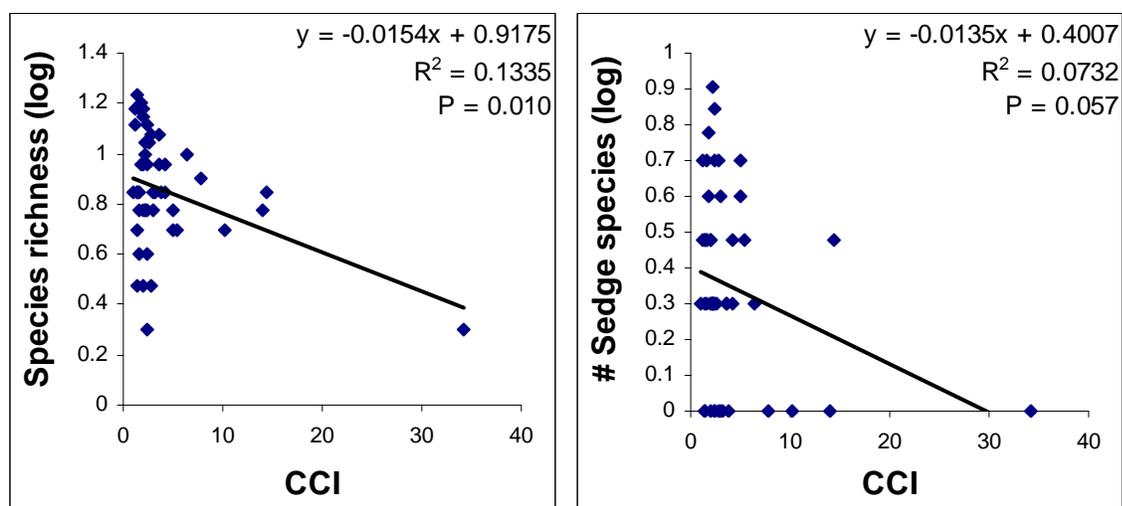


Figure 11. Graphs of the significant regressions ($P < 0.05$) between vegetative attributes and the composite chemical index. Associated P and r^2 values are shown. Y-variables were \log_{10} -transformed

Duckweed root length appeared to be negatively correlated with BOD and total phosphate (Fig. 12). However, coefficients of correlation were relatively small (-0.026 and -0.318 for BOD and TP respectively) and variation in chemical concentration explained only 7 (BOD) and 10 (TP) percent of the variation in mean *L. minor* root length. Neither of the relationships were significant ($P = 0.215$ for BOD and 0.092 for TP) (Fig. 12).

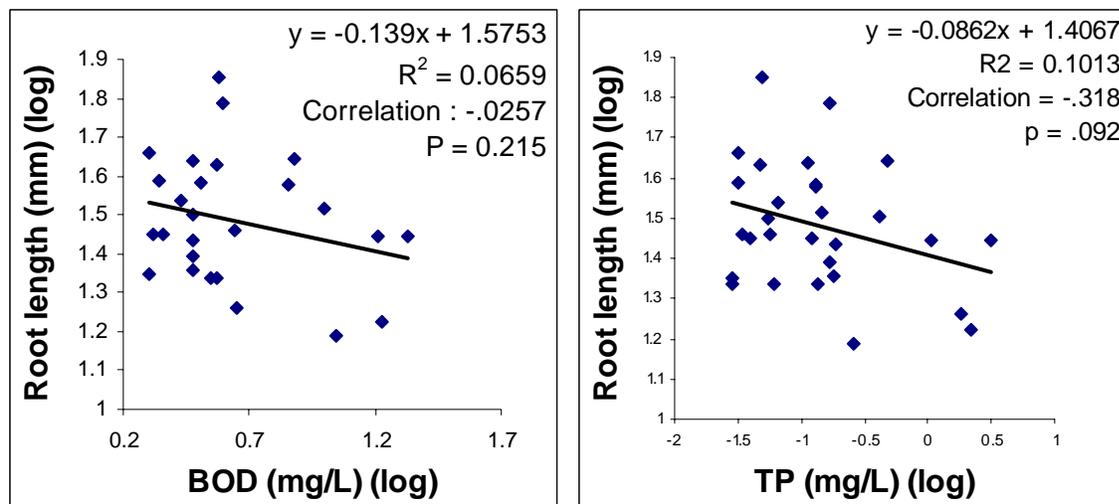


Figure 12. Correlation between log-transformed *Lemna minor* root length and log-transformed BOD and total phosphate in water.

Given the limitations associated with relating single sample nutrient concentrations to plant responses, we also evaluated the 12 different attributes of the macrophyte community based on their response to land use with ANOVA. Species richness, # native species, stem density, sum absolute cover, # native sedge species and FQI all showed non-significant relationships with land use ($P > 0.05$). Note that three of these metrics (richness, # natives, # native sedge species) did have significant relationships with water chemistry as determined by regression analysis.

Land use classification had a significant effect on # invasive species ($P = 0.024$), total mean biomass ($P = 0.026$), mean stem height of all measured species ($P = 0.033$), mean # of turbidity-tolerant species ($P = 0.019$), mean C value ($P = 0.029$) and mean PBI score ($P = 0.002$). On average, urban-impacted wetlands exhibited the highest values for exotics, biomass, and stem height; agricultural areas hosted the greatest number of turbidity-tolerant species. Conversely, metrics positively related to increasing ecological integrity (the mean C value and PBI score) were highest for reference wetlands. Of all potential metrics, PBI score showed the most significant relationship with land use type (Fig. 13).

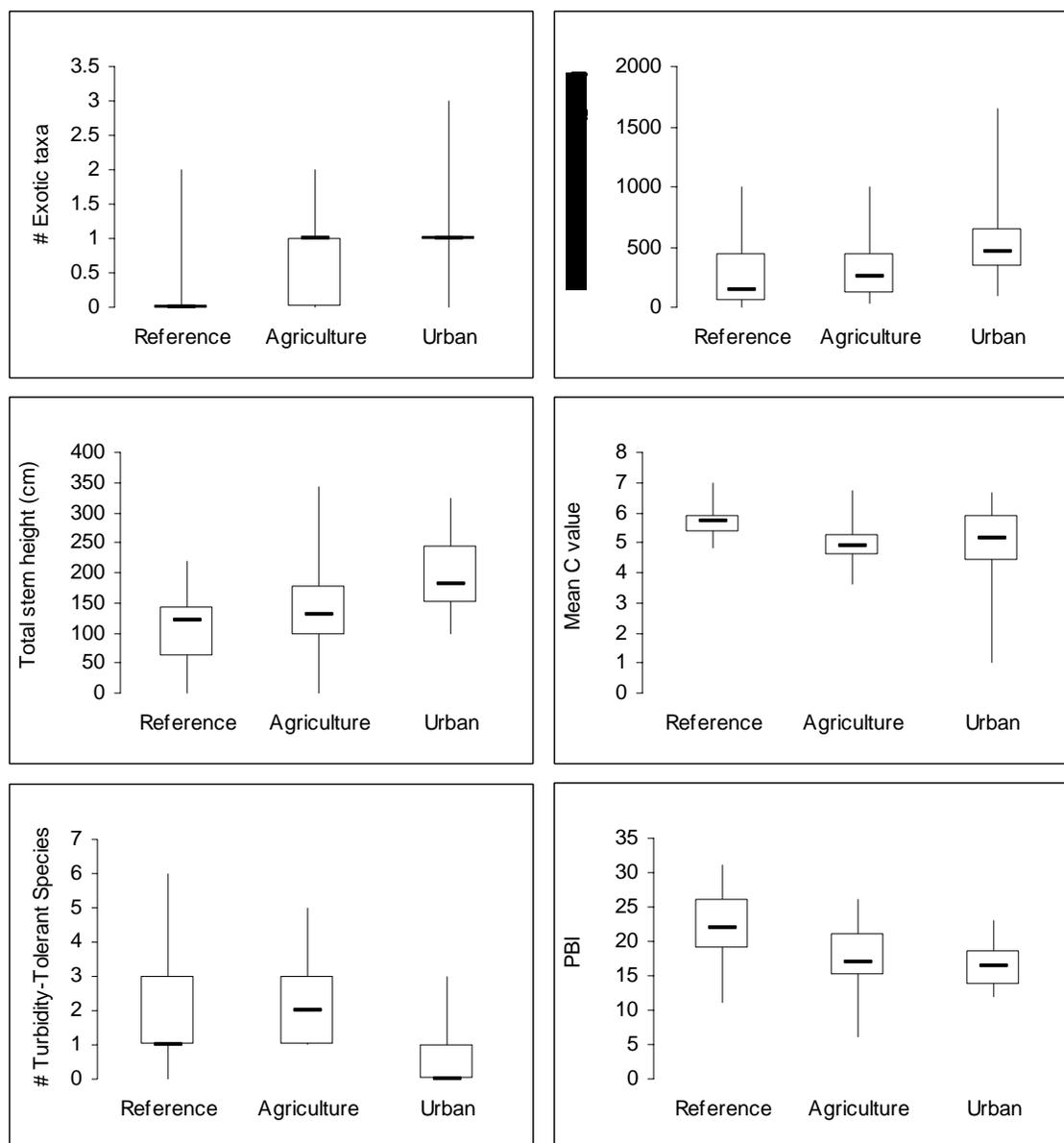


Figure 13. Plant metrics that differed significantly across land use classifications.

DISCUSSION

Plant attributes of 50 wetland communities were compared to two separate indices of human disturbance (nutrient gradients and land use classifications). One of the primary outcomes of human disturbances within watersheds is nutrient enrichment of associated hydrologic systems. Accordingly, we tested the relationships between macrophyte community attributes and surface water chemistry in each of our sample sites. According to the results of the CCA analysis, it is apparent that nitrogen is a significant factor influencing overall vegetative response. Nitrogen has often been found to increase plant production (Tilman 1987; Foster and Gross 1998). Additionally, a study by Chambers (1987) implicated nitrogen as a controlling factor of not only overall biomass, but specifically of the amount of biomass allocated to erect or

canopy-producing growth forms. Though we observed an obvious effect of nitrogen on mean % cover through CCA analysis (Figs. 4 and 5), regression analysis failed to return a significant relationship between biomass and TKN ($P = 0.072$).

Increasing concentrations of nitrogen and phosphorus in wetland surface water was related to a decline in species richness and number of native sedge species. Increasing concentration of surface water phosphorus was also associated with a decrease in native species. The nutrient-related decrease in these parameters is probably due to a shift in community composition toward less diverse assemblages of species tolerant to eutrophic conditions, as shown by Egertson *et al.* (2004).

Elster *et al.* (1995) found a significant negative relationship between duckweed root length and phosphorus concentration, as well as BOD concentration, in 12 village ponds in the Czech Republic. We found that while duckweed root length exhibited a negative correlation with total phosphorus and BOD, this relationship was not significant. The trend was highly influenced by the abundance of very low phosphorus sites.

Lack of significance between nutrients and other aspects of wetland plant communities may be due to our ability to account only for nutrient concentration, as opposed to nutrient *load* (actual metric that affects plants over long term). Our chemistry data are derived from a one-time sample that serves in a limited capacity as an environmental snapshot. Nutrient levels in this case serve as rough approximations of a wetland's trophic state. The high chloride concentrations in urban wetlands relative to the other land use types indicates high volume of runoff from salted urban roads or parking lots (probably also indicative of high nutrient loads); however, P concentrations were lowest in urban wetlands.

In addition to nutrients, anthropogenic influences on plant communities also involve a host of additional environmental factors including (but not limited to) soil disturbance, sedimentation, heavy metal and chemical pollution, and the introduction of exotics. In order to capture potential effects due to these other anthropogenic factors, we compared our community metrics to local land use. Local land use type had a significant effect on mean number of exotic species, total mean biomass, # turbidity-tolerant species, PBI, mean C value, and mean stem height. None of these factors were correlated with nutrient level, despite the significant relationship between nutrient levels and land use.

The parameters that varied significantly with land use, but not nutrient level, are obviously responding more strongly to some anthropogenic effect not encompassed by a measurement of nutrient levels alone. Soil disturbance has been shown to be a significant factor encouraging the shift from a diverse native plant community to one dominated by exotics (Stylinski and Allen, 1999). Likewise, Ellison and Farnsworth (1996) found that pollution by chemical, industrial, and urban wastes reduce system-wide species diversity. Therefore, it is suggested that nutrients alone are insufficient to explain variation in plant parameters, and adequate consideration of human disturbance must consider multiple disturbance surrogate measurements. It is possible, however, that these factors found to vary with land use but not surface water nutrient concentration may significantly relate to nutrient load. It would be beneficial to augment this analysis with an assessment of wetland nutrient loading.

We did not find a significant relationship between FQI and nutrients or land use. This index, used widely as an assessment of ecological integrity was one that we expected to vary across the human disturbance gradient (e.g., Taft, *et al.* 1997; Nichols 1999; Mushet *et al.* 2002; Rogers and Rooney 2002; Lopez and Fennessy 2002). However, it should be noted that one of two components of the index - the mean C value - *was* significantly related to land use.

Matthews (2003) found that FQI was highly dependent on the size of the wetland in which it was measured; small areas tended to underestimate FQI score and that mean C value may be a more robust indicator than FQI of floristic quality when dealing with isolated wetland communities (Bernthal 2003). This assessment is particularly germane to our study which considers only area-limited, isolated sites. Thus, it appears that FQI was not a good predictor of disturbance when applied to small depressional wetlands, however, mean C appears to serve as a sufficient substitute. Of the community attributes studied, the 9-metric PBI proposed by Lillie et al. (2002) shows the strongest and most clear association with land use. We recommend using this index as the best indicator of land use effects on northern depressional wetlands.

While nutrient concentration and land use immediately surrounding wetlands were significantly related to several aspects of plant communities, it should be noted, that wetlands are landscape sinks, and are also affected by factors at a larger landscape scale (Kercher and Zedler 2004). We do not want to underemphasize the importance of a landscape-level approach in considering wetland conservation.

II. DIATOMS

METHODS

General Characteristics of the Wetland Diatom Communities

Eighty wetland sites in northern Wisconsin were evaluated for the construction of a multimetric diatom biotic index. The locations of sampling sites are shown in Figure 1. The sites were mostly depressional wetlands but also included some riverine and lacustrine wetlands. Lacustrine wetlands are lake-like, with more than 8 hectares of open water, while riverine wetlands are associated with rivers and depressional, or palustrine, wetlands are isolated from other water bodies (Mitsch and Gosselink 1993). Land use patterns were known for most of the sites. The wetlands were separated into reference sites with minimal human impact, and human-impacted sites that had primarily agriculture or urban development in the surrounding catchments. Table 4 shows the numbers of wetland types and their land uses in three different diatom data sets that were evaluated for biotic index construction.

Table 4. Land use classes and wetland types in each of the three diatom data sets.

land use	1996	Bad River	2003
depressional total	34	9	16
reference	31	8	7
agricultural	3	---	3
urban	1	1	6
riverine reference	---	9	---
lacustrine	---	8	---
undetermined	---	4	---
sample total	35	30	16

Diatom Sampling, Processing, and Counting

Diatoms were sampled by collecting 1 to 5 scoops of the top 0.5 cm of wetland sediments in a small bottle to make a composite sample. The samples were refrigerated and processed upon returning to the lab, or were preserved with Lugol's solution or 2% glutaraldehyde until they could be processed. Diatoms were cleaned by boiling in nitric acid or using hydrogen peroxide and potassium dichromate (Patrick and Reimer 1966, Lowe and LaLiberte 1996). Cleaned samples were rinsed at least 4 times with deionized distilled water and aliquots were dried on two cover slips. Cover slips were mounted on microscope slides with Naphrax® and slides were examined under oil immersion at 1400x. Between 250 and 500 valves were examined and identified for each sample. An average of 516 valves was counted for the Bad River wetlands in 2001, and an average 256 valves were counted in 2002 and 2003. An average of 264 valves was counted for the 1996 study wetlands, and 500 valves were counted for all of the 2003 study wetland samples. Counts were converted to relative proportions for subsequent analysis. Updated diatom nomenclature was used when possible. The taxonomic works our identifications followed are given in Appendix 2.

Statistical Analysis

Basic descriptive statistics were generated with Microsoft Office Excel 2003. Systat 11 was used for Pearson correlations, Analysis of Variance (ANOVA) tests, and Fisher's Least Significant Difference (LSD) pairwise comparisons. Multivariate analyses were performed with Canoco for Windows 4.5.

EXPLORATORY DIATOM COMMUNITY ANALYSIS

Detrended Correspondence Analysis of Diatom Data

Detrended Correspondence Analysis (DCA) is useful for determining similarities between the biological assemblages of sites (Lepš and Šmilauer 1999). DCA was used to check on the viability of using the three different diatom data sets to construct wetland metrics for northern Wisconsin. Wetland sites considered for analysis are listed in Appendix 3. A DCA was used to evaluate whether the sites intermingled or were segregated, in which case combining the data sets for metric development might not work well. If varieties or forms of a diatom species were present, they were all combined for a single species entry. For the 80 sites, 362 diatom species were recorded. In order to reduce the data set to a more manageable number of species, conservative criteria were set for inclusion of species in the data set for analysis. Species had to occur in at least 10 sites (Kelly and Whitton 1995) and had to be present in at least 1% at one of the sites (Pan et al. 1996), resulting in 101 species which met these criteria. Taxa identified only to genus level were not used. Relative proportions of diatoms were arcsine square root transformed (Zar 1984). Rare species were downweighted in the analysis.

Initially, samples from 80 sites in the three diatom data sets were included in the DCA. It was apparent that some samples were similar (Figure 14). Sites from the 1996 samples, which were mostly reference wetlands, were on the left side of the ordination diagram while sites from the Bad River Reservation were on the right. Some of the Bad River samples were from lacustrine (tombolo and slough) and riverine wetlands. The lacustrine and riverine samples clustered at the outer edges of the samples' scatter. Samples from the 2003 wetlands had a wider scatter, with some sites intermingling with the 1996 sites and some of the Bad River depressional wetlands. The pair of outliers at the top center of the diagram contains 1996 and 2003 samples

from the same wetland. This wetland had the highest proportions of *Brachysira brebissonii* and *Kobayasia subtilissima*. The outlier at the far right of the diagram was dominated by *Staurosirella pinnata* in counts (58%), more than any other site. The outlier at the very bottom of the diagram had nearly 50% *Staurosira construens* and the 1996 depressional outlier directly to the right of the Bad River lacustrine cluster had 45% *S. construens*.

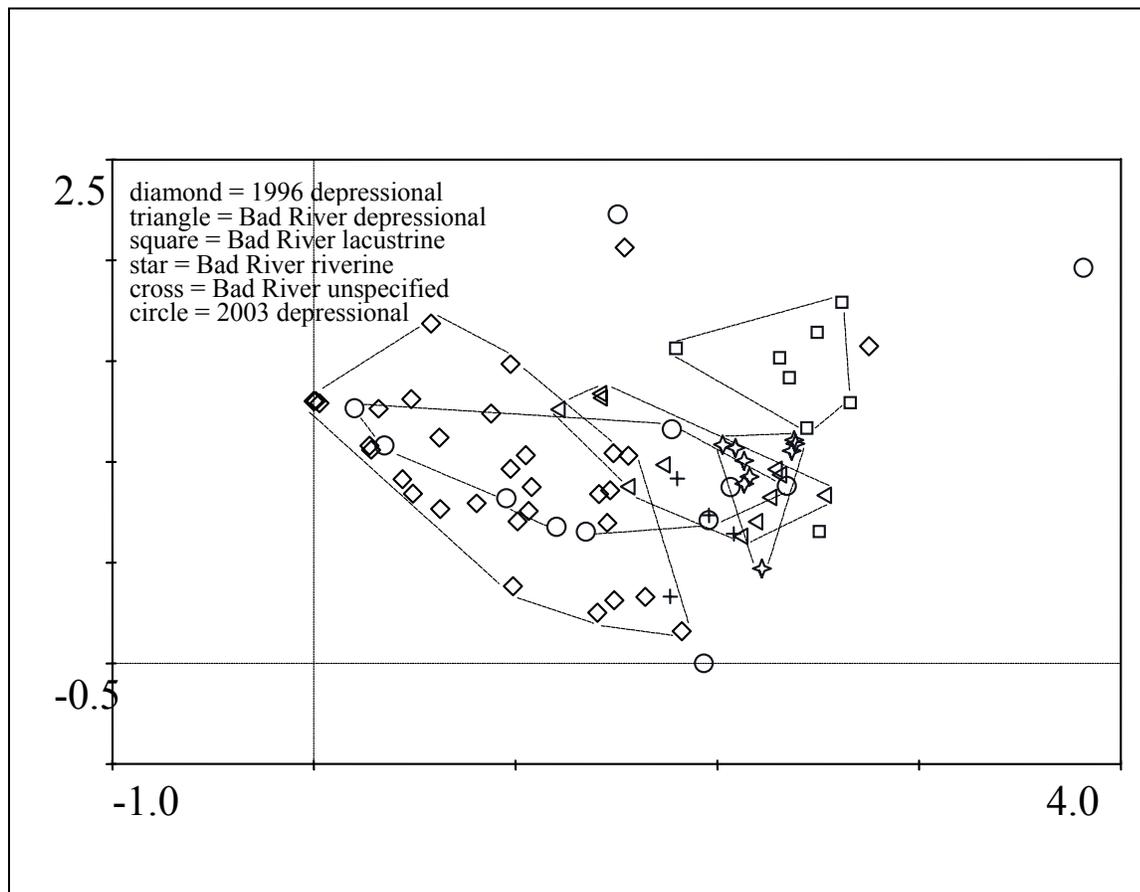


Figure 14. DCA ordination diagram of all 80 potential diatom analysis sites from 3 sets of data. Dashed lines connect and enclose members of different data sets; Bad River samples are subdivided by wetland type. Diamonds on the left are 1996 samples. Triangles on the right are Bad River depressional samples. The clusters of squares and stars on the right are Bad River lacustrine and riverine sites, respectively. Circles represent the 2003 wetlands and are distributed throughout the diagram.

Because the Bad River lacustrine wetland sites were separated from the other overlapping sets of sites in Figure 14, they were omitted, resulting in a data set of 69 depressional and riverine wetland sites for further analysis. A total of 361 diatom species were recorded in the remaining sites. Since fewer sites were used for this analysis, less conservative criteria were used for selecting species for analysis. Of the 361 species present in these 69 sites, 150 were present in at least 3 sites and in at least 1% at one of the sites. These criteria for inclusion of species in the analysis are similar to the criteria used by Reavie et al. (1995) for a multivariate analysis. Taxa identified only to genus level were not used. Relative proportions of diatoms were arcsine square root transformed (Zar 1984). Rare species were downweighted in the analysis.

The scatter of sites in the DCA ordination diagram of the 69 wetlands (Figure 15) is wider than in the first DCA. Without the influence of the lacustrine wetlands, the three groups from the different data sets are separated, with minimal overlap. Most of the 1996 sites were reference sites, which may be why they were grouped together on the left of the ordination diagram. The Bad River samples contained a number of sites that had been resampled in subsequent years, so they were grouped together. The 2003 sites were grouped near the top of the ordination diagram. The different sets of diatom data seem to contain a range of different assemblages, so they were combined into a single data set for further analysis.

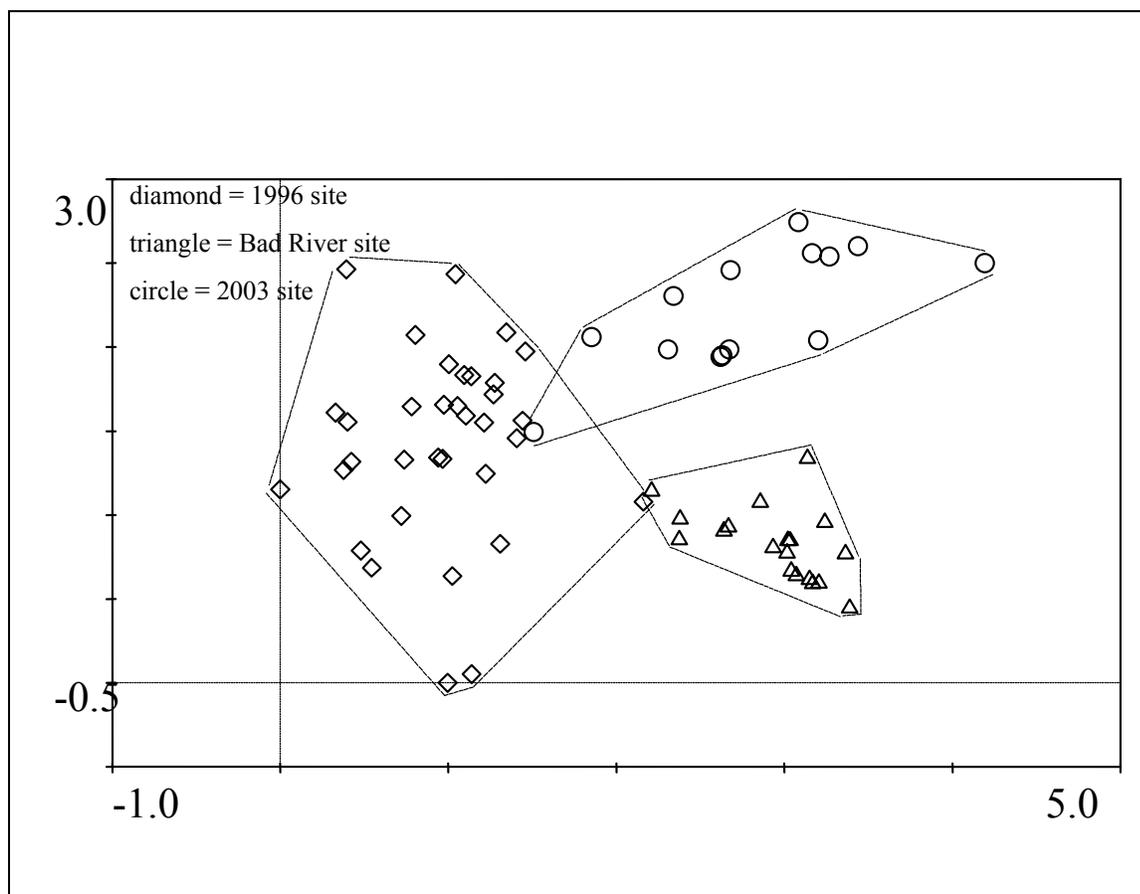


Figure 15. DCA ordination diagram of 69 wetland sites. Dashed lines connect and enclose members of different data sets. Diamonds are 1996 depressional sites, triangles are Bad River depressional and riverine sites, and circles are 2003 depressional sites.

Water Chemistry for the Diatom Sample Sites

Limited chemical data were available for all three sets of diatom data. Only five variables were common to all sets of data: chloride (Cl), total Kjeldahl nitrogen (TKN), total phosphorus (TP), conductivity (Cond), and pH. The ranges of chemical data for the 60 depressional and riverine wetland sites with complete chemical data are given in Table 5.

Canonical Correspondence Analysis of Diatom and Water Chemistry Data

Canonical Correspondence Analysis (CCA) is useful for exploring which environmental gradients have the greatest influence on biological assemblages (ter Braak and Šmilauer 2002).

A CCA was used to explore the influence of the water chemistry data on the wetland diatom species assemblages.

All water chemistry data (except for pH) was $\log_{10}+1$ transformed. Only sites with complete sets of the 5 chemistry variables and known land use were included in the analysis ($n = 60$). For the 60 depressional and riverine sites with chemistry data, 314 species were recorded. Diatom proportion data were arcsine square root transformed (Zar 1984) and diatom species had to occur in at least 3 sites and in at least 1% of the relative proportion for one of the sites, as for the DCA of 69 sites, resulting in the use of 140 of the 314 species present in these 60 sites.

Table 5. Chemical parameters for 60 depressional and riverine wetland sites, grouped by land use.

	Conductivity ($\mu\text{mhos} \cdot \text{cm}^{-1}$)	pH	Cl⁻¹ ($\text{mg} \cdot \text{l}^{-1}$)	Total Kjeldahl Nitrogen ($\text{mg} \cdot \text{l}^{-1}$)	Total Phosphorus ($\text{mg} \cdot \text{l}^{-1}$)
Reference ($n = 47$)					
minimum	14.5	4.16	0.01	0.40	0.002
maximum	197.0	7.86	33.84	4.02	1.016
mean	55.3	6.16	4.31	1.23	0.132
median	33.0	6.08	2.20	0.92	0.069
Agricultural ($n = 6$)					
minimum	46.0	6.06	5.40	0.32	0.034
maximum	276.0	8.15	24.73	4.78	0.424
mean	93.3	6.84	9.29	2.21	0.188
median	57.3	6.75	6.15	1.62	0.109
Urban ($n = 7$)					
minimum	75.0	5.49	2.00	0.68	0.052
maximum	561.0	6.64	170.00	7.49	1.050
mean	188.7	6.35	38.38	3.23	0.452
median	120.0	6.53	10.29	1.64	0.357

A CCA with forward selection was used to analyze the set of 60 depressional and riverine wetland sites which had complete chemical and land use data. Rare species were downweighted, reducing the species data set to 68 species. The forward selection indicated that pH, TKN, and conductivity contribute to explaining the diatom community distribution at the $p = 0.002$ level. Another CCA was done to test the significance of the canonical axes with these 3 environmental variables. Four sites had extreme values (2003 wetlands 004, 011, 111, and 016) and were made supplementary, so they could be plotted without skewing the CCA. Conductivity and pH were significantly correlated (Pearson correlation coefficient = 0.559; Bonferroni $p = 0.000$) so conductivity was eliminated from the analysis. Diatom data for four additional sites which had data for pH, TKN, and land use was added to the analysis. The final CCA was run on 60 sites with an additional 4 supplementary sites with extreme values. TKN and pH were the environmental variables tested and after downweighting, 68 of the 140 diatom species were used in the analysis.

The resulting CCA was significant ($p = 0.002$ for the first and all canonical axes). The first two canonical axes explained 10.8% of the variance in species data. The axis summary

statistics and correlation coefficients are shown in Table 6. An ordination biplot of sites and environmental variables is shown in Figure 16. Depressional and riverine reference sites were divided by those with and without chloride levels $1.0 \text{ mg Cl} \cdot \text{l}^{-1}$ or greater.

Table 6. CCA Results

Axis Summary Statistics	Axis 1	Axis 2	Correlations among the environmental variables		
				pH	log TKN
Eigenvalue	0.375	0.089			
Variance in species data			log TKN	-0.2628	1.0000
% of variance explained	8.8	10.8	environmental axis 1	-0.9893	0.4005
Cumulative % explained	80.7	100	environmental axis 2	0.1456	0.9163

The CCA diagram and analysis show that the diatom assemblages clearly are influenced by the chemistry of the sites. Urban and agricultural sites have scatters elongated along the TKN axis, while reference sites were more numerous at the lower end of the TKN gradient. TKN can indicate human impacts (Dixit et al. 1999) and the clustering of the sites with similar land use classifications (especially urban sites) shows that higher levels of nutrients are structuring the communities. Because the diatom communities are so influenced by these factors, diatoms are good candidates for metrics indicating human impacts. We sought to find diatom-based metrics that could be used to describe and predict wetland condition, and could be combined into a multimetric diatom biotic index.

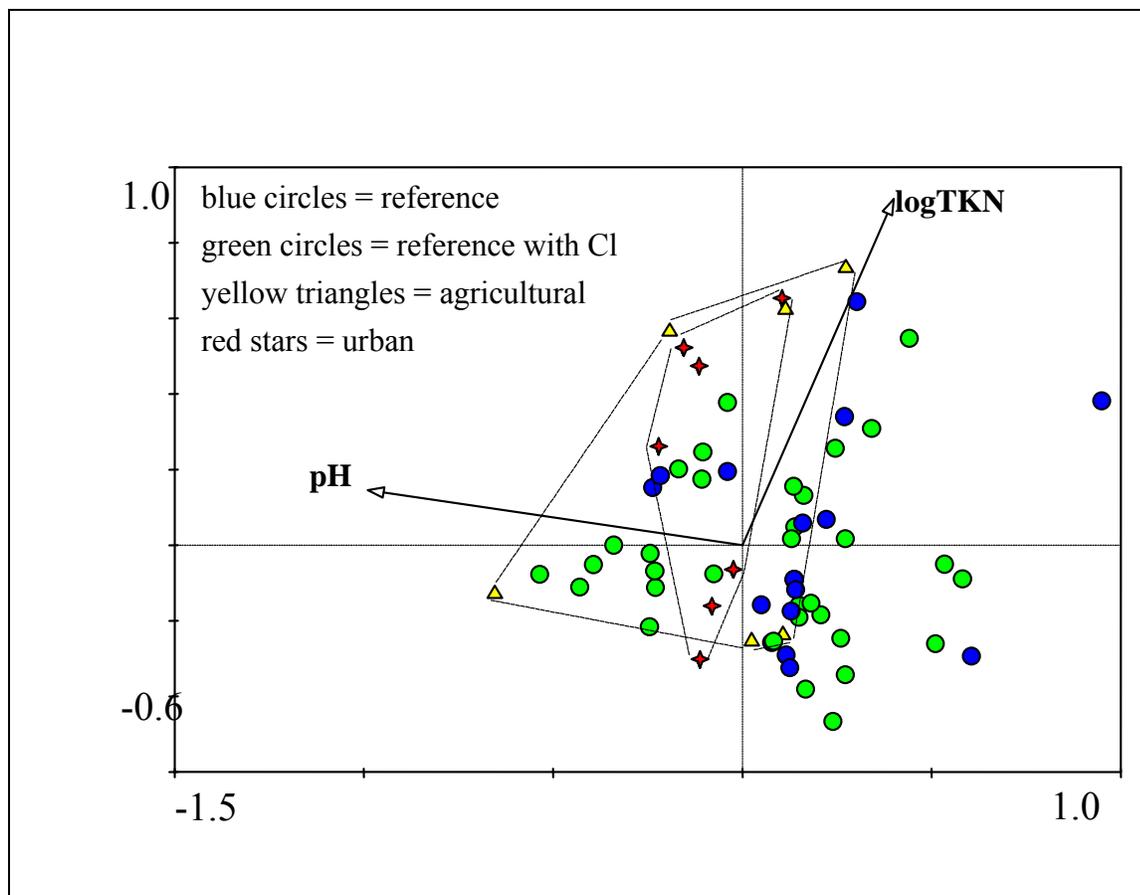


Figure 16. CCA biplot of depressional and riverine wetland sites and environmental gradients. Blue circles represent reference sites, green circles represent reference sites with $> 1.0 \text{ mg Cl} \cdot \text{l}^{-1}$, yellow triangle represent agricultural sites, and red stars represent urban sites. Dashed lines connect and enclose the scatters of agricultural and urban sites. The CCA was run without 4 sites with extreme values, but they are plotted here as supplementary samples.

DEVELOPMENT OF A MULTIMETRIC DIATOM BIOTIC INDEX

Diatom Metrics Tested as Indicators of Human Impact

Six kinds of diatom-based metrics were calculated and evaluated for inclusion in the multimetric diatom biotic index. Data from depressional wetlands with complete water chemistry and land use data ($n = 49$) were used to evaluate the metrics. The classes of metrics investigated included:

- Community metrics: diversity and dominance measured as species present at greater than 10% in a sample (Charles 1999);
- Siltation metrics: the sum of proportions of *Navicula*, *Nitzschia*, and *Surirella* (Bahls 1993);
- van Dam et al. (1994) metrics for pH, salinity, saprobity, trophic state, and moisture;
- Morphological guilds: centrics, araphids, monoraphids, cymbelloids, naviculoids, nitzschioids, eunotioids, epithemioids, surirelloids, and gomphonemoids (Molloy 1992);

- Genera: all species and unknowns within a genus were combined for these metric. Hill et al. (2001) used some genus-level diatom assemblage attributes for stream bioassessment.
- Species: species were included if they occurred in at least 10% of sites (Kelly and Whitton 1995). If varieties and subspecies of a taxon were also present, they were combined for an overall species metric. A total of 112 species were tested for these 49 depressional sites.

Potential metrics were evaluated using ANOVA. Metrics based on relative proportions of counts were arcsine square root transformed (Zar 1984). Metrics that showed significant differences among land use classes in these 49 sites (ANOVA $p < 0.05$ unless otherwise stated; Fisher's LSD Pairwise comparison, $p < 0.05$) included:

- van Dam et al. (1994) metrics: all 7 metrics;
- Morphological guilds: monoraphids (*Achnanthes* sensu lato and *Cocconeis*);
- Genera: *Cyclotella*, *Fragilaria*, *Lemnicola*, *Luticola*, *Pinnularia* ($p = 0.09$), *Staurosirella*, *Eunotia* ($p = 0.052$);
- Species: *Achnantheidium minutissimum*, *Eunotia incisa*, *E. vanheurckii*, *Gomphonema gracile*, *G. parvulum*, *Navicula agrestis*, *Nitzschia palea*, *N. paleacea*, *N. acidoclinata* with *N. perminuta*, *Pinnularia abaujensis*, *P. mesolepta*.

Siltation and diversity did not show significant differences among land use classes. Some of the metrics listed above were significantly different among land use classes despite being present in only a few sites.

Metric Selection

Of the 49 depressional wetland sites with complete chemical and land use data, 36 were reference sites, 6 were agricultural, and 7 were urban. Methods for selecting and scoring metrics were similar to those used in Lillie et al. (2002). A subset of 34 depressional sites were randomly selected from the 49 depressional sites with complete chemistry and land use data to use for scoring the potential metrics, essentially serving as a "calibration set." The remaining 15 of the 49 depressional sites, with an additional 10 depressional sites and 9 riverine wetland sites were combined to serve as a "test set" of 34 wetlands. Water chemistry data for the 34 "calibration set" sites used to score the metrics, and which included 5 agricultural and 5 urban sites, are in Table 7.

Table 7. Chemistry data for subset of 34 randomly selected depressional wetland sites used for scoring metrics.

Chemistry Data for Metric Scoring Sites (n = 34)	Conductivity (umhos • cm⁻¹)	pH	Cl⁻ (mg • l⁻¹)	Total Kjeldahl Nitrogen (mg • l⁻¹)	Total Phosphorus (mg • l⁻¹)
minimum	14.5	4.16	0.01	0.32	0.013
maximum	276.0	8.15	62.60	7.49	1.050
mean	58.6	6.11	7.77	1.81	0.221
median	36.0	6.10	3.48	1.02	0.122

Metrics with ten or fewer occurrences greater than zero in the metric scoring set were eliminated from consideration. For each metric, the 34 values were ranked and partitioned into 3 or 5 sections. Partitions were made at numerical break points. Scoring was done so that values of 1 were given to the sections indicating poorest water quality and values of 5 were given to sections indicating best water quality. If the range of the metric's values was great enough, the metric was sectioned into 5 parts and was scored on a scale of 1 to 5. If the range of values of the metric was limited or if there were a number of zero values, the metric was trisectioned and scores of 1, 3, and 5 were assigned. Monoraphid, *Gomphonema parvulum*, and *Pinnularia mesolepta* metrics were trisectioned.

Different combinations of sums of metric scores were tested with ANOVA to find a combination that maximized the squared multiple R (explaining more variance based on land use) and had the best separation between land use categories as determined with pairwise posthoc tests (Fisher's LSD) in the calibration set.

THE COMPONENTS OF THE NORTHERN WETLAND DIATOM BIOTIC INDEX

The final multimetric index (Northern Wetland Diatom Biotic Index, NWDBI) is a sum of scores from six different metrics. Each metric was scored on a scale of 1 to 5, so the maximum possible NWDBI score was 30 and the minimum possible score was 6. The six metrics in the NWDBI are:

van Dam et al. (1994) Halophils (H): van Dam et al. (1994) use this metric to indicate chloride and salinity.

van Dam et al. (1994) Trophic State (T): van Dam et al. (1994) use species' tolerance for nitrogen and phosphorus to indicate trophic state of a water body.

Monoraphids: there were more of these taxa in the urban sites. Many of these taxa, especially *Achnanthydium*, are early successional species and can proliferate when disturbed by spates (Peterson and Stevenson 1992). Urbanization can lead to increased intensity and frequency of storm water runoff events (Wang et al. 2000).

***Eunotia incisa*:** this species prefers electrolyte-poor, oligotrophic waters (Krammer and Lange-Bertalot 1991) and tolerates only very small concentrations of organic nitrogen (van Dam et al. 1994) so this species indicates sites with very good water quality.

***Gomphonema parvulum*:** this species is among the most nutrient-tolerant diatom species and develops best in water with high nutrients (Patrick and Reimer 1975).

***Pinnularia mesolepta*:** this species prefers water with low mineral content (Patrick and Reimer 1966).

All metrics except proportion of *Eunotia incisa* and proportion of *Pinnularia mesolepta* reflected greater human impact at higher values, and indicated very different aspects of the environmental conditions. *E. incisa* and *P. mesolepta* were similar in that they indicated low-nutrient water, but their distribution patterns were not the same. *P. mesolepta* occurred in 15 fewer sites than *E. incisa*, and the arcsine square root transformed proportions of the two species were not significantly correlated (Pearson's correlation coefficient = 0.274; Bartlett Chi-square test $p = 0.057$). The ranges of values for the individual metric scores are in Table 8.

Table 8. Scoring ranges for the five metrics summed in the NWDBI. Higher score values indicate better water quality.

	Halophils H	Trophic State Metric T	Proportion Monoraphid s	Proportion <i>Eunotia incisa</i>	Proportion <i>Gomphonema parvulum</i>	Proportio n <i>Pinnularia mesolepta</i>
	≥ 1.5	≥ 3.5	≥ 0.05	0	≥ 0.01	0
	1 – 1.49	3 – 3.49	---	0.001 – 0.009	---	---
	0.75 – 0.9	2.5 – 2.99	0.01 – 0.049	0.01 – 0.039	0.001 – 0.009	0.001 – 0.045
	0.5 – 0.749	2.0 – 2.49	---	0.04 – 0.099	---	---
	≤ 0.49	≤ 1.99	≤ 0.009	≥ 0.10	0	≥ 0.05

Individual metrics for the test set of 34 wetlands were scored and summed to estimate the NWDBI. The NWDBI scores for all 68 scored wetlands (calibration set and test set) as separated by land use are shown in box plots in Figure 17. An ANOVA showed that there were significant differences between land use categories ($p = 0.003$). The land use category could explain 16.2% of the variance in NWDBI scores. The NWDBI scores for reference sites were significantly higher than scores for urban sites ($p = 0.001$; Fisher's LSD). Reference site scores were not significantly different from agricultural site scores, but there was a trend for urban sites to score lower than agricultural sites ($p = 0.087$, Fisher's LSD).

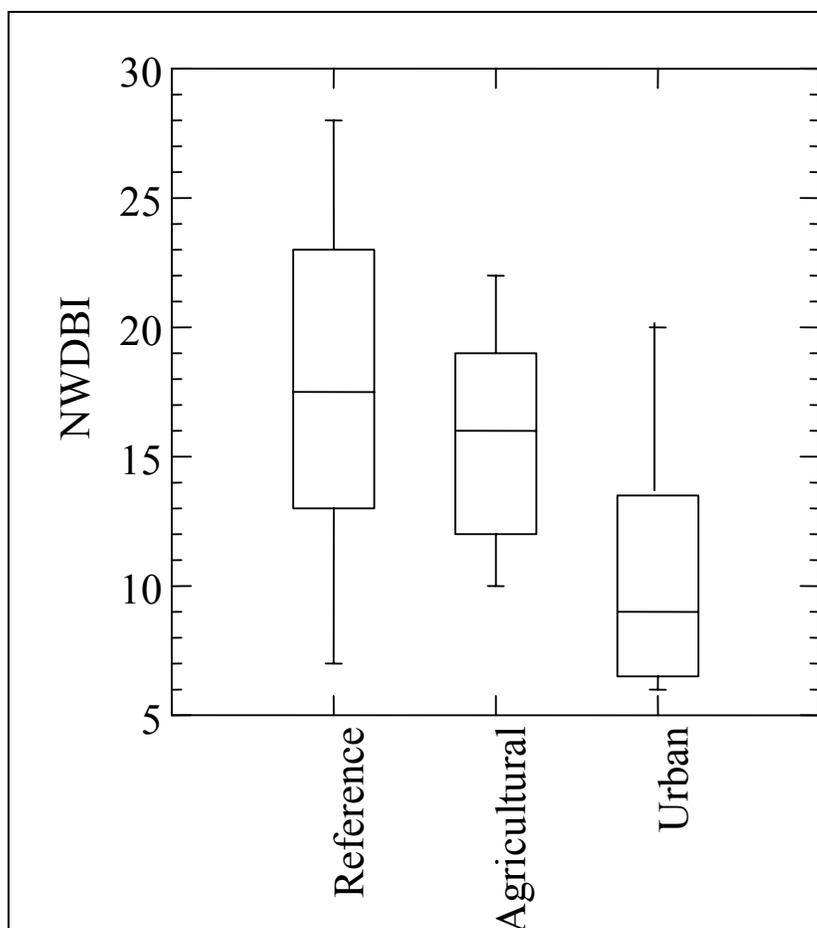


Figure 17. Box plot of NWDBI scores by land use category. Reference sites scored significantly higher than urban sites ($p = 0.001$; Fisher's LSD), and urban sites trend toward being less than agricultural sites ($p = 0.087$, Fisher's LSD).

Most of the 68 wetlands that received NWDBI scores were depressional; 9 were riverine reference sites. Figure 18 shows box plots of NWDBI scores by land use category, with riverine reference sites separated from depressional reference sites. An ANOVA of these data indicates that there are significant differences between the four categories of wetland type and land use category ($p = 0.000$) and land use and wetland type explains 32.0% of the variance in NWDBI scores. Depressional reference sites score higher than riverine reference and urban sites ($p \leq 0.001$, Fisher's LSD). The trend for agricultural sites to score better than urban sites is slightly improved from having riverine and depressional sites lumped ($p = 0.074$).

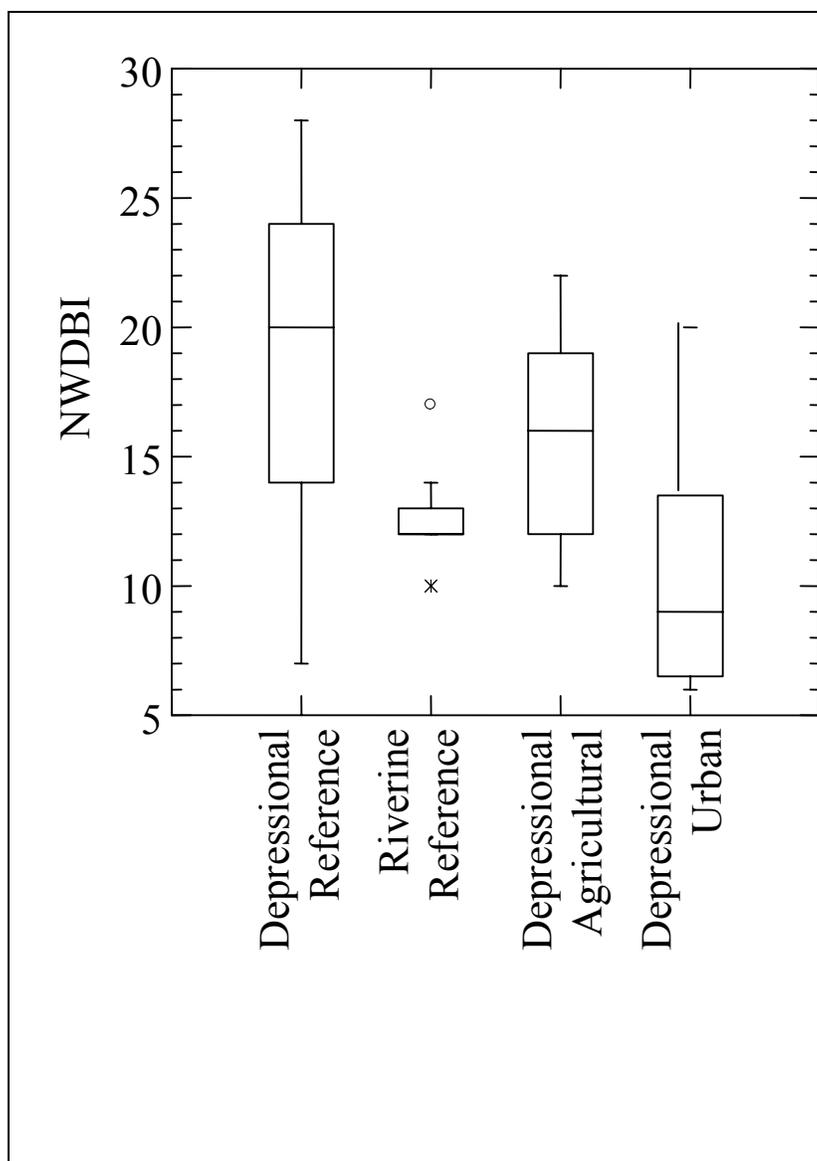


Figure 18. Box plot of NWDBI scores by wetland type and land use category. Depressional reference sites scored significantly higher than riverine reference and urban sites ($p \leq 0.001$; Fisher's LSD), and urban sites trend toward being less than agricultural sites ($p = 0.074$, Fisher's LSD).

NWDBI scores from the 36 depressional reference sites, which were used to select and score metrics, were used to set narrative ratings for the remaining sites (Karr and Chu 1999). The NWDBI scores from the reference sites were sectioned into 10th, 25th, 50th, 75th, and 90th percentiles, with scores above the 90th percentile having excellent ratings, and scores below the 10th percentile having very poor ratings. The score ranges in each of the narrative rating categories, which were applied to the agricultural and urban sites, are shown in Table 9. NWDBI scores and narrative ratings for the 68 scored wetland sites are given in Appendix 4.

Table 9. Narrative rating system for NWDBI scores based on percentiles of scores in reference wetlands.

Narrative rating	Range of NWDBI scores
------------------	-----------------------

Excellent	> 26
Very Good	25 – 25.9
Good	22 – 24.9
Fair	20 - 21.9
Poor	15 – 19.9
Very Poor	< 14.9

PERFORMANCE OF THE NORTHERN WETLAND DIATOM BIOTIC INDEX

The number of sites with each kind of land use in each NWDBI narrative rating category is shown in Table 10. Some of the reference sites had elevated chloride levels (greater than 1.0 mg Cl⁻•l⁻¹) which can indicate human impact (Herlihy et al. 1998) so this subcategory of reference sites was examined for the distribution of the ratings categories as well.

There were significant differences in NWDBI scores between almost all narrative rating categories (ANOVA p = 0.000; Fisher's LSD p < 0.02). The only two narrative rating categories which were not significantly different from each other were the Very Good and Excellent categories. The distributions of scores in the narrative rating categories are shown in box plots in Figure 19.

Table 10. Distribution of narrative NWDBI ratings among the wetland types. Wetlands are depressional unless otherwise stated. For reference sites, the number in parentheses is the number of reference sites with elevated chloride levels (greater than 1.0 mg Cl⁻•l⁻¹).

	Excellent	Very Good	Good	Fair	Poor	Very Poor	Sum	Excellent to Good	Poor to Very Poor
Depression al Reference	5 (2)	5 (4)	11 (4)	5 (3)	6 (3)	13 (3)	4 5	47% (22%)	42% (13%)
Riverine Reference	---	---	---	---	1 (1)	8 (7)	9	---	100% (100%)
Agricultura l	---	---	1	---	3	2	6	17%	83%
Urban	---	---	---	1	1	6	8	---	88%

The ratings seem to correspond well to the types of land use around depressional wetlands. As expected, urban and agricultural sites showed the most effects of human impact, with 83% of the agricultural sites and 86% of the urban sites in the Poor to Very Poor categories. All ten sites that were rated Excellent or Very Good were depressional reference wetlands; 47%

of depressional wetlands were rated as Good or better. However, all riverine reference wetlands and 42% of the depressional reference wetlands were in the Poor or Very Poor categories. The ranges of chemical data for the different narrative rating categories are shown in Table 11.

Because 34 reference sites were used to set the range of scores for the narrative ratings, 10 of those 34 sites ended up in the Poor and Very Poor categories. Most of the agricultural and urban sites were classified in these groups as well, and their presence reinforces the likelihood that the classifications are correct. Most of the reference sites in the test set were classified in the Poor and Very Poor categories. Lack of taxonomic resolution was a problem for the trophic state and halophil metrics for some of these sites; if there was no clear correlation between abundance of a genus and environmental conditions, no genus-based scores could be assigned for trophic state or halophils.

All but one of the riverine reference sites in the test set were classified as Very Poor, and the riverine sites may be misclassified because only depressional sites were used to evaluate potential metrics. It is possible that the diatom assemblages of riverine and depressional wetlands differ too much for the NWDBI to be used for both types of wetlands. We found that the diatom assemblages of lacustrine wetlands were very different from depressional and riverine wetlands (Figure 14). Differences between depressional and riverine wetland diatom assemblages may be enhanced by the metrics we used in the NWDBI. The riverine sites had significantly more araphids than depressional reference, agricultural, and urban sites (ANOVA $p = 0.000$; Fisher's LSD $p < 0.05$), which would affect the scoring potential of the NWDBI for those sites. The riverine sites did not have significantly elevated TKN and TP levels compared to the depressional sites (ANOVA $p < 0.05$; Fisher's LSD $p > 0.05$), so the NWDBI may perform best only for depressional wetlands.

Two of the five Excellent wetlands had elevated chloride levels (8.9 and $9.5 \text{ mg Cl}^- \cdot \text{l}^{-1}$), but these sites also had the lowest mean TKN and TP levels among the narrative categories (Table 8) and the low nutrient levels are much more likely responsible for the "good" diatom assemblages at these sites. This is to be expected from the results of the CCA with forward selection, in which TP and TKN significantly contributed to the distribution of samples. Chloride was not significant in the CCA with forward selection, which is somewhat unusual as it significantly impacts diatom assemblages in lakes in the northeastern United States (Dixit et al. 1999) and was significant in depressional wetlands in southern Wisconsin (Lillie et al. 2002). Even at sites with high chloride, we did not find dominance of halophilic taxa such as *Craticula*. However, chloride may still be acting as a surrogate indicator for human disturbance in the watershed (Herlihy et al. 1998).

Table 11. Ranges of water chemistry values for the 6 narrative rating categories.

		Conductivity ($\mu\text{mhos} \cdot \text{cm}^{-1}$)	pH	Cl⁻ ($\text{mg} \cdot \text{l}^{-1}$)	Total Kjeldahl Nitrogen ($\text{mg} \cdot \text{l}^{-1}$)	Total Phosphorus ($\text{mg} \cdot \text{l}^{-1}$)
Excellent	maximum	40.0	6.30	9.54	2.45	1.016
	minimum	14.5	5.92	0.36	0.80	0.029
	mean	24.0	6.04	3.94	1.29	0.271
	median	23.5	6.03	0.44	0.88	0.112
Very Good	maximum	127.0	6.15	33.84	1.61	0.163
	minimum	16.5	5.72	0.22	0.55	0.047
	mean	45.3	5.98	15.25	1.04	0.093
	median	21.5	6.04	15.26	0.88	0.063
Good	maximum	46.0	6.33	9.08	3.90	0.597
	minimum	19.5	4.68	0.05	0.49	0.002
	mean	28.6	5.82	2.96	1.14	0.115
	median	27.8	6.01	0.83	0.71	0.060
Fair	maximum	97.0	6.84	10.29	1.64	0.357
	minimum	28.0	4.94	0.17	0.92	0.025
	mean	55.3	6.12	2.92	1.34	0.154
	median	48.3	6.15	1.47	1.45	0.124
Poor	maximum	561.0	7.38	170.00	4.78	0.424
	minimum	16.5	4.16	0.01	0.40	0.019
	mean	100.4	5.88	22.04	2.03	0.165
	median	46.5	5.87	5.06	1.36	0.074
Very Poor	maximum	276.0	8.15	62.60	7.49	1.050
	minimum	17.0	5.55	0.47	0.32	0.032
	mean	108.9	6.79	6.87	1.77	0.195
	median	99.0	6.74	2.97	1.23	0.099

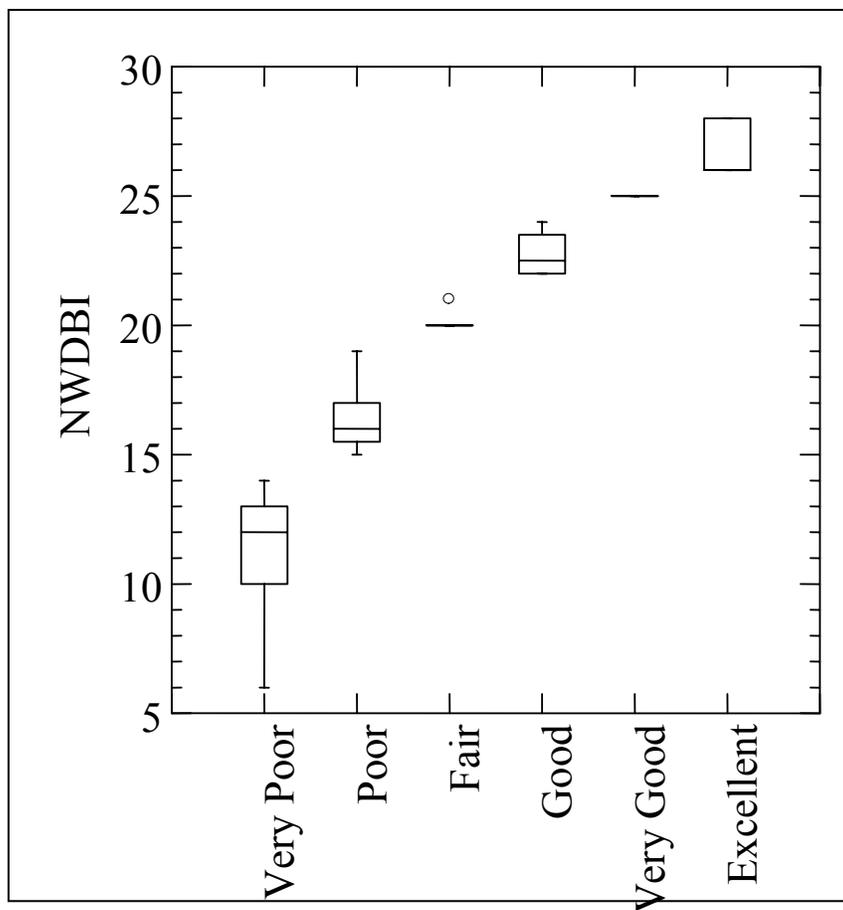


Figure 19. Box plots of NWDBI scores by narrative rating category. Only the Very Good and Excellent categories are not significantly different from each other (ANOVA $p = 0.000$; Fisher's LSD $p < 0.02$).

SUMMARY

The Northern Wetland Diatom Biotic Index was developed for depressional wetlands in northern Wisconsin. It consisted of a set of 6 metrics: halophil and trophic state metrics of van Dam et al. (1994), and proportions of monoraphid diatoms, *Eunotia incisa*, *Gomphonema parvulum*, and *Pinnularia mesolepta*. The NWDBI performed well in detecting differences between human-impacted and unimpacted (reference) wetlands. Higher Cl, TKN, and TP in urban sites were reflected by the lowest NWDBI scores, while low nutrients were indicated by the highest NWDBI scores. The NWDBI will be further tested and refined on other northern depressional wetlands in the future.

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APPENDIX 1. Site Assessment Data Sheets for the 50 sites sampled between 2003 and 2004 for plants.

Wetland Name: 3 County: Vilas Researchers: Sue Kenney, Jen Hauxwell	Date: 08/06/2003 Time: 4:38 PM Location: Lat: 45° N Lg. 89° W ~or~ TN: RG: Sec Qtr:																																																										
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input checked="" type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																											
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input checked="" type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input checked="" type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Field Measurements</th> </tr> <tr> <td>Air Temp</td> <td>73 F</td> </tr> <tr> <td>Water Temp</td> <td>74 F</td> </tr> <tr> <td>Clarity</td> <td></td> </tr> <tr> <td>Max Depth</td> <td></td> </tr> <tr> <td>Algal Bloom?</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input type="checkbox"/> 1%</td> </tr> <tr> <td>Duckweed sp.</td> <td><u>Lemna minor</u></td> </tr> <tr> <th>Color Code</th> <th>Samples</th> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart <input type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. (acid) <input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>diatoms (60 ml.) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>Chlorophyl <input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>BOD sample <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Photo <input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><u>Lemna minor</u> <input checked="" type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and % frequency or fronds in each species.</td> <td><u>Lemna major</u> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><u>Spirodela polyrrhiza</u> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><u>Wolffia columbiana</u> <input type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td><u>70</u> % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td><u>25</u></td> </tr> <tr> <td>% Emergents</td> <td><u>5</u></td> </tr> <tr> <td>% Submergents</td> <td><u>10</u></td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other...</td> </tr> <tr> <td>Organic <input type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input checked="" type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	73 F	Water Temp	74 F	Clarity		Max Depth		Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> 1%	Duckweed sp.	<u>Lemna minor</u>	Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	Chlorophyl <input type="checkbox"/>	Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	BOD sample <input checked="" type="checkbox"/>		Photo <input checked="" type="checkbox"/>	Duckweed root length	<u>Lemna minor</u> <input checked="" type="checkbox"/>	Plant Species Name and % frequency or fronds in each species.	<u>Lemna major</u> <input type="checkbox"/>		<u>Spirodela polyrrhiza</u> <input type="checkbox"/>		<u>Wolffia columbiana</u> <input type="checkbox"/>	General Measurements		% Open Water	<u>70</u> % Shade Cover	% Floating Leaf	<u>25</u>	% Emergents	<u>5</u>	% Submergents	<u>10</u>	Dominant Bottom Type		Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...	Organic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>	Roots <input type="checkbox"/>	Leafpack <input checked="" type="checkbox"/>
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Wetland Name: 4 County: Vilas Researchers: Jen Hauxwell, Sue Kenney	Date: 08/07/2003 Time: 6:10 AM Location: Lat: 45° N Lg. 89° W ~or~ TN: RG: Sec Qtr:																
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input checked="" type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																	
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input checked="" type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> <input type="checkbox"/> Other...roads, hwys nearby <input type="checkbox"/> <input type="checkbox"/>	Field Measurements Air Temp 67 F Water Temp 70 F Clarity Poor Max Depth 25 cm Algal Bloom? <input type="checkbox"/> Duckweed Abundant <input type="checkbox"/> 1% Duckweed sp. <u>L. minor</u>																
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;">Color Code</td> <td style="width:50%;">Samples</td> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart <input type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. (acid) <input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>diatoms (60 ml.) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>Chlorophyl <input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>BOD sample <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Photo <input type="checkbox"/></td> </tr> </table>		Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	Chlorophyl <input type="checkbox"/>	Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	BOD sample <input checked="" type="checkbox"/>		Photo <input type="checkbox"/>
Color Code	Samples																
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	Photo <input type="checkbox"/>																
Duckweed root length <u>Lemna minor</u> <input checked="" type="checkbox"/> Plant Species Name and % frequency or fronds in each species. <u>Lemna major</u> <input type="checkbox"/> <u>Spirodela polyrrhiza</u> <input type="checkbox"/> <u>Wolfia columbiana</u> <input type="checkbox"/>																	
General Measurements % Open Water <u>19</u> % Shade Cover % Floating Leaf <u>1</u> <u>0</u> % Emergents <u>80</u> % Submergents _____																	
Dominant Bottom Type Peat <input checked="" type="checkbox"/> Mud <input checked="" type="checkbox"/> Other... Oraganic <input type="checkbox"/> Silt-Sand <input type="checkbox"/> Roots <input type="checkbox"/> Leafpack <input type="checkbox"/>																	
Direction: N ↑ 																	
Comments:																	

Wetland Name: 5 County: Washburn Researchers: Sue Kenney, Paul Kanehl, Jesse Kanehl	Date: 08/09/2003 Time: 10:05 AM Location: Lat: 45° N Lg. 91° W ~or~ TN: RG: Sec Qtr:																
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input checked="" type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																	
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other...near hwy 10 <input type="checkbox"/> <input type="checkbox"/>	Field Measurements Air Temp _____ Water Temp _____ Clarity _____ Max Depth _____ Algal Bloom? <input checked="" type="checkbox"/> Duckweed Abundant <input type="checkbox"/> % Duckweed sp. _____																
	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:50%;">Color Code</th> <th style="width:50%;">Samples</th> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart <input type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. (acid) <input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>diatoms (60 ml.) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>Chlorophyll <input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>BOD sample <input type="checkbox"/></td> </tr> <tr> <td></td> <td>Photo <input checked="" type="checkbox"/></td> </tr> </table>	Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	Chlorophyll <input type="checkbox"/>	Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	BOD sample <input type="checkbox"/>		Photo <input checked="" type="checkbox"/>
Color Code	Samples																
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Clear/Grn <input type="checkbox"/>	BOD sample <input type="checkbox"/>																
	Photo <input checked="" type="checkbox"/>																
	Duckweed root length <i>Lemna minor</i> <input type="checkbox"/> Plant Species Name and % <i>Lemna major</i> <input type="checkbox"/> frequency or fronds in each species. <i>Spirodela polyrrhiza</i> <input type="checkbox"/> <i>Wolfia columbiana</i> <input type="checkbox"/>																
	General Measurements % Open Water 35 % Shade Cover _____ % Floating Leaf 5 0 % Emergents 60 % Submergents 25																
	Dominant Bottom Type Peat <input type="checkbox"/> Mud <input checked="" type="checkbox"/> Other... Oraganic <input checked="" type="checkbox"/> Silt-Sand <input type="checkbox"/> Roots <input checked="" type="checkbox"/> Leafpack <input type="checkbox"/>																
Direction: N ↑ 	Comments: 																

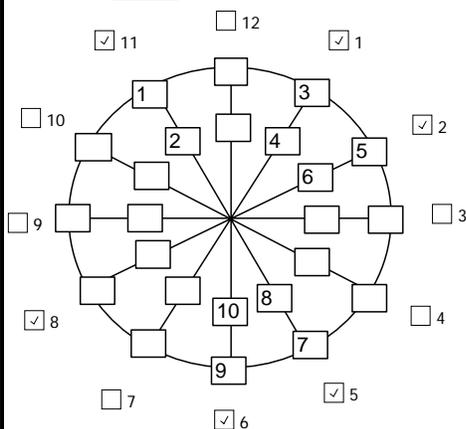
Wetland Name: 6	Date: 08/09/2003
County: Washburn	Time: 4:48 PM
Researchers: Paul Kanehl, Sue Kenney, Jesse Kanehl	Location:
	Lat: 45° N
	Lg: 91° W
	~or~ TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livestock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...hwy 70	<input type="checkbox"/> <input type="checkbox"/>

Field Measurements	
Air Temp	81 F
Water Temp	75 F
Clarity	
Max Depth	
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> <1%
Duckweed sp.	<input checked="" type="checkbox"/> <i>L. minor</i>
Color Code	
Dark-stain	<input type="checkbox"/>
Light Stain	<input type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>
Clear/Blue	<input type="checkbox"/>
Clear/Grn	<input type="checkbox"/>
Samples	
Quart	<input type="checkbox"/>
250 ml. (acid)	<input type="checkbox"/>
diatoms (60 ml.)	<input checked="" type="checkbox"/>
Chlorophyl	<input type="checkbox"/>
plant vouchers	<input type="checkbox"/>
BOD sample	<input checked="" type="checkbox"/>
Photo	<input type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolfia columbiana</i> <input type="checkbox"/>
General Measurements	
% Open Water	_____ % Shade Cover
% Floating Leaf	_____ 10
% Emergents	_____
% Submergents	_____
Dominant Bottom Type	
Peat	<input type="checkbox"/>
Organic	<input checked="" type="checkbox"/>
Roots	<input checked="" type="checkbox"/>
Mud	<input checked="" type="checkbox"/>
Silt-Sand	<input type="checkbox"/>
Leafpack	<input type="checkbox"/>
Other...	<input type="checkbox"/>

Direction: N ↑



Comments:



Wetland Name: 7		Date: 08/09/2003	
County: Washburn		Time:	
Researchers: Sue Kenney, Paul Kanehl		Location:	
		Lat: °	N
		Lg. °	W
~or~ TN:		RG:	Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...road	<input checked="" type="checkbox"/> <input type="checkbox"/>

Field Measurements	
Air Temp	80 F
Water Temp	77.5 F
Clarity	
Max Depth	
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> %
Duckweed sp.	

Color Code		Samples	
Dark-stain	<input type="checkbox"/>	Quart	<input type="checkbox"/>
Light Stain	<input type="checkbox"/>	250 ml. (acid)	<input type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>	diatoms (60 ml.)	<input checked="" type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>	Chlorophyl	<input type="checkbox"/>
Clear/Blue	<input type="checkbox"/>	plant vouchers	<input type="checkbox"/>
Clear/Grn	<input type="checkbox"/>	BOD sample	<input type="checkbox"/>
		Photo	<input type="checkbox"/>

Duckweed root length	<i>Lemna minor</i>	<input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i>	<input type="checkbox"/>
	<i>Spirodela polyrrhiza</i>	<input type="checkbox"/>
	<i>Wolfia columbiana</i>	<input type="checkbox"/>

General Measurements	
% Open Water	25 % Shade Cover
% Floating Leaf	50 15
% Emergents	25
% Submergents	

Dominant Bottom Type	
Peat	<input type="checkbox"/> Mud <input type="checkbox"/> Other...
Oraganic	<input checked="" type="checkbox"/> Silt-Sand <input checked="" type="checkbox"/>
Roots	<input checked="" type="checkbox"/> Leafpack <input type="checkbox"/>

Direction: N ↑

Comments:

Wetland Name: 8 Date: 08/13/2003
 County: Oneida Time: 12:32 PM
 Researchers: Sue Kenney, Jen Hauxwell Location:
 Lat: 45° N
 Lg. 089° W
 ~or~ TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...road	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp 80 F
 Water Temp 76 F
 Clarity
 Max Depth
 Algal Bloom?
 Duckweed Abundant <1%
 Duckweed sp.

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	Chlorophyll <input type="checkbox"/>
Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	BOD sample <input checked="" type="checkbox"/>
	Photo <input checked="" type="checkbox"/>

Duckweed root length *Lemna minor*
 Plant Species Name and % *Lemna major*
 frequency or fronds in each species. *Spirodela polyrrhiza*
Wolffia columbiana

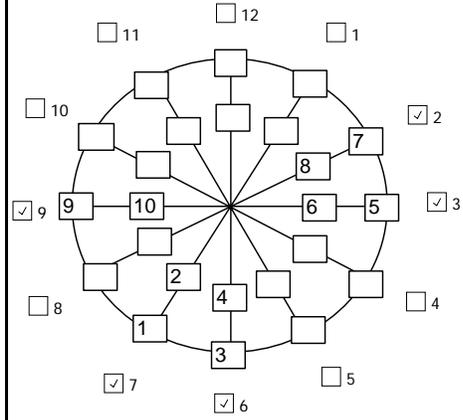
General Measurements

% Open Water 29 % Shade Cover
 % Floating Leaf 1 5
 % Emergents 50
 % Submergents 50

Dominant Bottom Type

Peat Mud Other...
 Oraganic Silt-Sand
 Roots Leafpack

Direction: N ↑



Comments:

Wetland Name: 9 County: Oneida Researchers: Jen Hauxwell, Sue Kenney	Date: 08/13/2003 Time: 5:30 PM Location: Lat: 45° N Lg. 089° W ~or~ TN: RG: Sec Qtr:																																																										
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input checked="" type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																											
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Wooded <input type="checkbox"/> <input type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Other...run off from road <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Field Measurements</th> </tr> <tr> <td>Air Temp</td> <td>72 F</td> </tr> <tr> <td>Water Temp</td> <td>79 F</td> </tr> <tr> <td>Clarity</td> <td></td> </tr> <tr> <td>Max Depth</td> <td></td> </tr> <tr> <td>Algal Bloom?</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input type="checkbox"/> %</td> </tr> <tr> <td>Duckweed sp.</td> <td></td> </tr> <tr> <th>Color Code</th> <th>Samples</th> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart <input type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. (acid) <input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>diatoms (60 ml.) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>Chlorophyll <input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>BOD sample <input type="checkbox"/></td> </tr> <tr> <td></td> <td>Photo <input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and %</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td>frequency or fronds in each species.</td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolffia columbiana</i> <input type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td>69 % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td>1 0</td> </tr> <tr> <td>% Emergents</td> <td>30</td> </tr> <tr> <td>% Submergents</td> <td></td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other...</td> </tr> <tr> <td>Organic <input type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	72 F	Water Temp	79 F	Clarity		Max Depth		Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> %	Duckweed sp.		Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	Chlorophyll <input type="checkbox"/>	Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	BOD sample <input type="checkbox"/>		Photo <input checked="" type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>	Plant Species Name and %	<i>Lemna major</i> <input type="checkbox"/>	frequency or fronds in each species.	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolffia columbiana</i> <input type="checkbox"/>	General Measurements		% Open Water	69 % Shade Cover	% Floating Leaf	1 0	% Emergents	30	% Submergents		Dominant Bottom Type		Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...	Organic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>	Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>
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Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>																																																										
Direction: N ↑ 																																																											
Comments: AT 1 o'clock, outfall with cobble (energy dissipators?) this is probably input of stormwater from road throughout all open water there is an <i>Alisma</i> sp. A possible second input but smaller																																																											

Wetland Name: 10	Date: 08/14/2003	
County: Oneida	Time: 7:00 AM	
Researchers: Sue Kenney, Jen Hauxwell	Location:	
	Lat: °	N
	Lg. °	W
	~or~ TN: RG: Sec Qtr:	
Wetland Class:		
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>	
Class 2. Urban impacted	<input checked="" type="checkbox"/>	
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>	
Class 4. Agriculture - Row Crops	<input type="checkbox"/>	
Surrounding Landuse: Double Check=Dominant		
Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other...roads	<input type="checkbox"/>	<input type="checkbox"/>
Field Measurements		
Air Temp	70 F	
Water Temp	65 F	
Clarity		
Max Depth		
Algal Bloom?	<input type="checkbox"/>	
Duckweed Abundant	<input type="checkbox"/>	1%
Duckweed sp.	L. minor	
Color Code		
Dark-stain	<input type="checkbox"/>	
Light Stain	<input type="checkbox"/>	
Turbid/Brn	<input type="checkbox"/>	
Turbid/Grn	<input type="checkbox"/>	
Clear/Blue	<input type="checkbox"/>	
Clear/Grn	<input type="checkbox"/>	
Samples		
Quart	<input type="checkbox"/>	
250 ml. (acid)	<input type="checkbox"/>	
diatoms (60 ml.)	<input checked="" type="checkbox"/>	
Chlorophyl	<input type="checkbox"/>	
plant vouchers	<input checked="" type="checkbox"/>	
BOD sample	<input checked="" type="checkbox"/>	
Photo	<input type="checkbox"/>	
Duckweed root length		
<i>Lemna minor</i>	<input checked="" type="checkbox"/>	
Plant Species Name and % frequency or fronds in each species.		
<i>Lemna major</i>	<input type="checkbox"/>	
<i>Spirodela polyrrhiza</i>	<input type="checkbox"/>	
<i>Wolffia columbiana</i>	<input type="checkbox"/>	
General Measurements		
% Open Water	24	% Shade Cover
% Floating Leaf	1	0
% Emergents	70	
% Submergents	1	
Dominant Bottom Type		
Peat	<input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other... clay
Organic	<input type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots	<input type="checkbox"/>	Leafpack <input type="checkbox"/>
Direction: N ↑		
Comments: big box		

Wetland Name: 11 County: Ashland Researchers: Sue Kenney, Jen Hauxwell	Date: 08/26/2003 Time: 1:30 PM Location: Lat: 46° N Lg. 90° W ~or~ TN: RG: Sec Qtr:																																																										
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input checked="" type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																											
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input type="checkbox"/> <input type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other...reservation foad <input type="checkbox"/> <input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Field Measurements</th> </tr> <tr> <td>Air Temp</td> <td>95 F</td> </tr> <tr> <td>Water Temp</td> <td>77 F</td> </tr> <tr> <td>Clarity</td> <td></td> </tr> <tr> <td>Max Depth</td> <td></td> </tr> <tr> <td>Algal Bloom?</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input checked="" type="checkbox"/> 90%</td> </tr> <tr> <td>Duckweed sp.</td> <td>L. minor, W. columbiana</td> </tr> <tr> <th>Color Code</th> <th>Samples</th> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart <input type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. (acid) <input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>diatoms (60 ml.) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>Chlorophyl <input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>BOD sample <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Photo <input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input checked="" type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and %</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td>frequency or fronds in each species.</td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolfia columbiana</i> <input checked="" type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td>10 % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td>80 15</td> </tr> <tr> <td>% Emergents</td> <td>10</td> </tr> <tr> <td>% Submergents</td> <td></td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other...</td> </tr> <tr> <td>Organic <input checked="" type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	95 F	Water Temp	77 F	Clarity		Max Depth		Algal Bloom?	<input checked="" type="checkbox"/>	Duckweed Abundant	<input checked="" type="checkbox"/> 90%	Duckweed sp.	L. minor, W. columbiana	Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart <input type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. (acid) <input type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	diatoms (60 ml.) <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	Chlorophyl <input type="checkbox"/>	Clear/Blue <input type="checkbox"/>	plant vouchers <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	BOD sample <input checked="" type="checkbox"/>		Photo <input checked="" type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>	Plant Species Name and %	<i>Lemna major</i> <input type="checkbox"/>	frequency or fronds in each species.	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolfia columbiana</i> <input checked="" type="checkbox"/>	General Measurements		% Open Water	10 % Shade Cover	% Floating Leaf	80 15	% Emergents	10	% Submergents		Dominant Bottom Type		Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...	Organic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>	Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>
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Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>																																																										
Direction: N ↑																																																											
Comments: all typha measurements are upland cattails, 20 ft at least from water edge note narrow band or zone around wetland or water basin of rice cut grass, rice cut grass dominant A lot of woody debris, cattail far back from water edge																																																											

Wetland Name: 12	Date: 08/27/2003
County: Washburn	Time: 4:10 PM
Researchers: Jen Hauxwell, Sue Kenney	Location:
	Lat: 45° N
	Lg. 91° W
	~or~ TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input type="checkbox"/>
Park	<input type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...	<input type="checkbox"/> <input type="checkbox"/>

Field Measurements	
Air Temp	71 F
Water Temp	84 F
Clarity	
Max Depth	
Algal Bloom?	<input checked="" type="checkbox"/>
Duckweed Abundant	<input checked="" type="checkbox"/> 10%
Duckweed sp.	<i>L. minor</i>

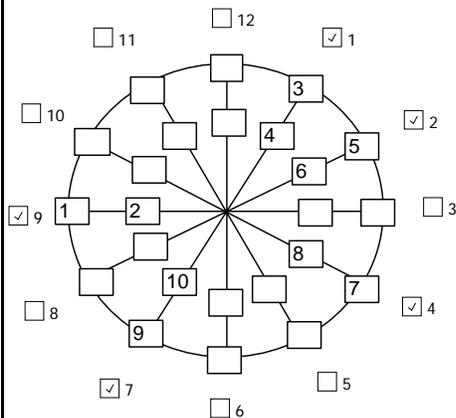
Color Code		Samples	
Dark-stain	<input checked="" type="checkbox"/>	Quart	<input type="checkbox"/>
Light Stain	<input type="checkbox"/>	250 ml. (acid)	<input type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>	diatoms (60 ml.)	<input checked="" type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>	Chlorophyll	<input type="checkbox"/>
Clear/Blue	<input type="checkbox"/>	plant vouchers	<input checked="" type="checkbox"/>
Clear/Grn	<input type="checkbox"/>	BOD sample	<input checked="" type="checkbox"/>
		Photo	<input type="checkbox"/>

Duckweed root length	<i>Lemna minor</i>	<input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i>	<input type="checkbox"/>
	<i>Spirodela polyrrhiza</i>	<input checked="" type="checkbox"/>
	<i>Wolffia columbiana</i>	<input type="checkbox"/>

General Measurements	
% Open Water	85 % Shade Cover
% Floating Leaf	15 10
% Emergents	1
% Submergents	30

Dominant Bottom Type	
Peat	<input type="checkbox"/> Mud <input checked="" type="checkbox"/> Other...
Organic	<input checked="" type="checkbox"/> Silt-Sand <input type="checkbox"/>
Roots	<input type="checkbox"/> Leafpack <input type="checkbox"/>

Direction: N ↑



Comments:
 along shore, oil like substance in mud Q8, Q9 biomass = 0 around entire edge near water is 8 cm tall grass species, may have planted grass for erosion control stem hts of RCG + area back from waters edge green algae scum (small red cells) 15% cover bright green looks like wolffia max depth 85 cm



Wetland Name: 13	Date: 08/28/2003
County: Wahburn	Time: 6:35 AM
Researchers: Jen Hauxwell, Sue Kenney	Location:
	Lat: 45° N
	Lg. 91° W
	~or~ TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input checked="" type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input checked="" type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...	<input type="checkbox"/> <input type="checkbox"/>

Field Measurements	
Air Temp	60 F
Water Temp	66 F
Clarity	
Max Depth	
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input checked="" type="checkbox"/> 5%
Duckweed sp.	<i>L. minor</i> , <i>Wolffia</i>

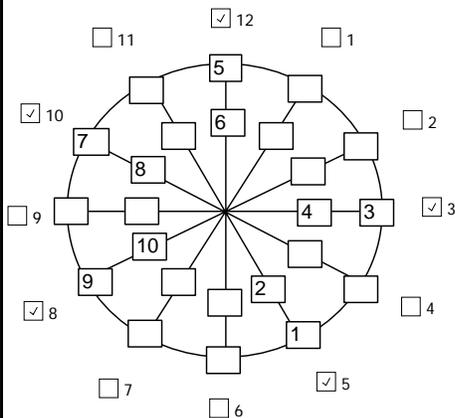
Color Code		Samples	
Dark-stain	<input checked="" type="checkbox"/>	Quart	<input type="checkbox"/>
Light Stain	<input checked="" type="checkbox"/>	250 ml. (acid)	<input type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>	diatoms (60 ml.)	<input checked="" type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>	Chlorophyll	<input type="checkbox"/>
Clear/Blue	<input type="checkbox"/>	plant vouchers	<input checked="" type="checkbox"/>
Clear/Grn	<input type="checkbox"/>	BOD sample	<input type="checkbox"/>
		Photo	<input checked="" type="checkbox"/>

Duckweed root length	<i>Lemna minor</i>	<input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i>	<input type="checkbox"/>
	<i>Spirodela polyrrhiza</i>	<input type="checkbox"/>
	<i>Wolffia columbiana</i>	<input type="checkbox"/>

General Measurements	
% Open Water	95 % Shade Cover
% Floating Leaf	5 1
% Emergents	0
% Submergents	0

Dominant Bottom Type	
Peat	<input type="checkbox"/> Mud <input type="checkbox"/> Other...
Organic	<input type="checkbox"/> Silt-Sand <input type="checkbox"/>
Roots	<input type="checkbox"/> Leafpack <input type="checkbox"/>

Direction: N ↑



Comments:
ask where water comes from runoff
note: voucher for verbena is pink steeple bush (*spirea tomentosa*) or hardhack



Wetland Name: 15 County: Wahsburn Researchers: Sue Kenney, Matt, Diana Downes, Shawn Haseleu	Date: 09/04/2003 Time: 8:01 AM Location: Lat: ° N Lg. ° W ~or~ TN: RG: Sec Qtr:																																																																																		
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input checked="" type="checkbox"/> Class 4. Agriculture - Row Crops <input checked="" type="checkbox"/>																																																																																			
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input checked="" type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Field Measurements</th> </tr> <tr> <td>Air Temp</td> <td></td> </tr> <tr> <td>Water Temp</td> <td></td> </tr> <tr> <td>Clarity</td> <td></td> </tr> <tr> <td>Max Depth</td> <td></td> </tr> <tr> <td>Algal Bloom?</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input type="checkbox"/> %</td> </tr> <tr> <td>Duckweed sp.</td> <td>L. minor <input checked="" type="checkbox"/></td> </tr> <tr> <th colspan="2">Color Code</th> </tr> <tr> <td>Dark-stain</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Light Stain</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Clear/Blue</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Clear/Grn</td> <td><input type="checkbox"/></td> </tr> <tr> <th colspan="2">Samples</th> </tr> <tr> <td>Quart</td> <td><input type="checkbox"/></td> </tr> <tr> <td>250 ml. 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L. minor <input checked="" type="checkbox"/>	Color Code		Dark-stain	<input type="checkbox"/>	Light Stain	<input type="checkbox"/>	Turbid/Brn	<input type="checkbox"/>	Turbid/Grn	<input type="checkbox"/>	Clear/Blue	<input type="checkbox"/>	Clear/Grn	<input type="checkbox"/>	Samples		Quart	<input type="checkbox"/>	250 ml. (acid)	<input type="checkbox"/>	diatoms (60 ml.)	<input checked="" type="checkbox"/>	Chlorophyll	<input type="checkbox"/>	plant vouchers	<input checked="" type="checkbox"/>	BOD sample	<input checked="" type="checkbox"/>	Photo	<input type="checkbox"/>	Duckweed root length		<i>Lemna minor</i>	<input checked="" type="checkbox"/>	Plant Species Name and %	<i>Lemna major</i> <input type="checkbox"/>	frequency or fronds in each species.	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolffia columbiana</i> <input type="checkbox"/>	General Measurements		% Open Water	70 % Shade Cover	% Floating Leaf	5 0	% Emergents	20	% Submergents	50	Dominant Bottom Type		Peat	<input checked="" type="checkbox"/>	Organic	<input checked="" type="checkbox"/>	Roots	<input type="checkbox"/>	Mud	<input type="checkbox"/>	Silt-Sand	<input type="checkbox"/>	Leafpack	<input type="checkbox"/>	Other...	<input type="checkbox"/>
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Other...	<input type="checkbox"/>																																																																																		
Direction: N ↑ 																																																																																			
Comments: Blowdown tornado																																																																																			

Wetland Name: 16 County: Washburn Researchers: Shawn Haseleu, Sheri Snowbank, Matt, Sue Kenney, Diana Downes	Date: 09/04/2003 Time: 2:00 PM Location: Lat: 45° N Lg. 92° W ~or~ TN: RG: Sec Qtr:																																																																												
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input checked="" type="checkbox"/> Class 4. Agriculture - Row Crops <input checked="" type="checkbox"/>																																																																													
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L. minor	Color Code		Dark-stain	<input type="checkbox"/>	Light Stain	<input type="checkbox"/>	Turbid/Brn	<input type="checkbox"/>	Turbid/Grn	<input type="checkbox"/>	Clear/Blue	<input type="checkbox"/>	Clear/Grn	<input type="checkbox"/>	Samples		Quart	<input type="checkbox"/>	250 ml. (acid)	<input type="checkbox"/>	diatoms (60 ml.)	<input checked="" type="checkbox"/>	Chlorophyll	<input type="checkbox"/>	plant vouchers	<input checked="" type="checkbox"/>	BOD sample	<input checked="" type="checkbox"/>	Photo	<input type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>	Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/> <i>Spirodela polyrrhiza</i> <input type="checkbox"/> <i>Wolffia columbiana</i> <input type="checkbox"/>	General Measurements		% Open Water	60 % Shade Cover	% Floating Leaf	3	% Emergents	40	% Submergents		Dominant Bottom Type		Peat	<input type="checkbox"/>	Organic	<input checked="" type="checkbox"/>	Roots	<input type="checkbox"/>	Mud	<input type="checkbox"/>	Silt-Sand	<input type="checkbox"/>	Leafpack	<input type="checkbox"/>	Other...	<input type="checkbox"/>
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Other...	<input type="checkbox"/>																																																																												
Direction: N ↑ 																																																																													
Comments:																																																																													

Wetland Name: 20 Date: 06/29/2004
 County: Washburn Time: 1:00 PM
 Researchers: Jen Hauxwell, Glenn Vorhes Location:
 Lat: 46 ' N
 Lg. 91 ' W ~or~
 TN: RG: Sec Qtr:

Wetland Class:

Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wooded	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

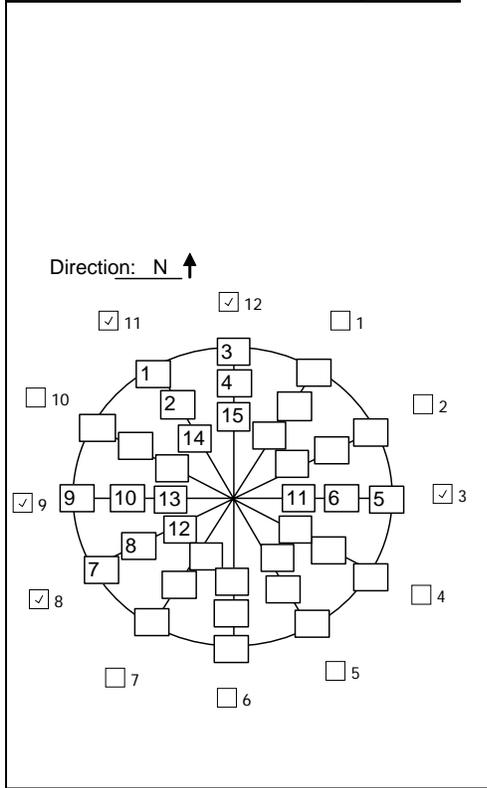
Field Measurements
 Air Temp 98 - Walmart thermometer
 Water Temp _____
 Clarity _____
 Max Depth ~140 cm
 Algal Bloom?
 Duckweed Abundant _____%
 Duckweed sp. _____

Color Code	Samples
Dark-stain	<input type="checkbox"/> Quart (2) <input checked="" type="checkbox"/>
Light Stain	<input type="checkbox"/> 250 ml. <input checked="" type="checkbox"/>
Turbid/Brn	<input type="checkbox"/> -Acid <input checked="" type="checkbox"/>
Turbid/Grn	<input checked="" type="checkbox"/> 60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue	<input type="checkbox"/> diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn	<input type="checkbox"/> -glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*
 Plant Species Name and *Lemna major*
 % frequency or fronds in *Spirodela polyrrhiza*
 each species. *Wolffia*

General Measurements
 % Open Water 70 % Shade Cover _____
 % Floating Leaf 45 0
 % Emergents 30
 % Submergents 40

Dominant Bottom Type
 Peat Mud Other...
 Oraganic Silt-Sand
 Roots Leafpack



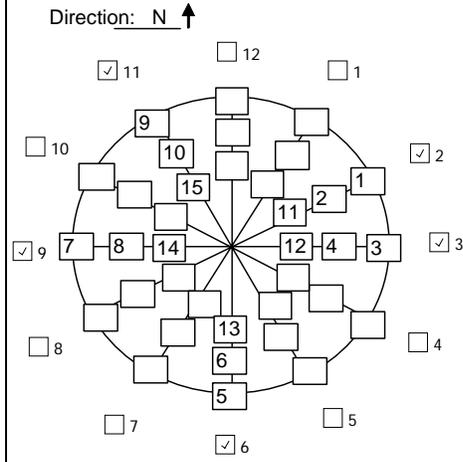
Wetland Name: 21	Date: 6/29-30/04
County: Washburn	Time: 7:00 AM
Researchers: Jen Hauxwell, Glenn Vorhes	Location:
	Lat: 46 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	5 ft
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolfia</i> <input type="checkbox"/>
General Measurements	
% Open Water	70 % Shade Cover
% Floating Leaf	60 0
% Emergents	30
% Submergents	40
Dominant Bottom Type	
Peat <input type="checkbox"/>	Mud <input type="checkbox"/> Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>



Wetland Name: 22	Date: 06/30/2004
County: Washburn	Time: 1:00 PM
Researchers: Jen Hauxwell, Glenn Vorhes	Location:
	Lat: 45 N
	Lg. 91 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp 85

Water Temp _____

Clarity _____

Max Depth _____

Algal Bloom?

Duckweed Abundant _____%

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input type="checkbox"/>
	-Color <input type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % *Lemna major*

frequency or fronds in each *Spirodela polyrrhiza*

species. *Wolfia*

General Measurements

% Open Water 70 % Shade Cover _____

% Floating Leaf 0 _____

% Emergents 30 _____

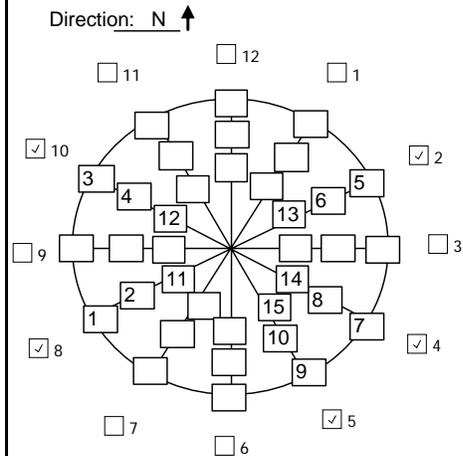
% Submergents 60 _____

Dominant Bottom Type

Peat Mud Other... _____

Oraganic Silt-Sand

Roots Leafpack



Wetland Name: 23 County: Baron Researchers: Gina LaLiberte, Glenn Vorhes	Date: 07/06/2004 Time: 12:00 PM Location: Lat: 45 N Lg: 91 W ~or~ TN: RG: Sec Qtr:																																																																																																																																											
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(plastic)</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>diatoms (glass)</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>-glutaraldehyde</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Chlorophyl</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>-Filter</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>-Color</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>plant vouchers</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>BOD sample</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Duckweed root length</td><td><i>Lemna minor</i> <input checked="" type="checkbox"/></td></tr> <tr><td>Plant Species Name and % frequency or fronds in each species.</td><td><i>Lemna major</i> <input type="checkbox"/></td></tr> <tr><td></td><td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td></tr> <tr><td></td><td><i>Wolfia</i> <input type="checkbox"/></td></tr> <tr><td colspan="2">General Measurements</td></tr> <tr><td>% Open Water</td><td>_____ % Shade Cover</td></tr> <tr><td>% Floating Leaf</td><td>_____ 5</td></tr> <tr><td>% Emergents</td><td>_____</td></tr> <tr><td>% Submergents</td><td>_____</td></tr> <tr><td colspan="2">Dominant Bottom Type</td></tr> <tr><td>Peat</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Oraganic</td><td><input type="checkbox"/></td></tr> <tr><td>Roots</td><td><input type="checkbox"/></td></tr> <tr><td>Mud</td><td><input type="checkbox"/></td></tr> <tr><td>Silt-Sand</td><td><input type="checkbox"/></td></tr> <tr><td>Leafpack</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Other...</td><td><input type="checkbox"/></td></tr> </table>	Field Measurements		Air Temp	_____	Water Temp	_____	Clarity	_____	Max Depth	80 cm	Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input checked="" type="checkbox"/> <5%	Duckweed sp.	L. minor	Color Code		Dark-stain	<input type="checkbox"/>	Light Stain	<input checked="" type="checkbox"/>	Turbid/Brn	<input type="checkbox"/>	Turbid/Grn	<input type="checkbox"/>	Clear/Blue	<input type="checkbox"/>	Clear/Grn	<input type="checkbox"/>	Samples		Quart (2)	<input checked="" type="checkbox"/>	250 ml.	<input checked="" type="checkbox"/>	-Acid	<input checked="" type="checkbox"/>	60 ml. (plastic)	<input checked="" type="checkbox"/>	diatoms (glass)	<input checked="" type="checkbox"/>	-glutaraldehyde	<input checked="" type="checkbox"/>	Chlorophyl	<input checked="" type="checkbox"/>	-Filter	<input checked="" type="checkbox"/>	-Color	<input checked="" type="checkbox"/>	plant vouchers	<input checked="" type="checkbox"/>	BOD sample	<input checked="" type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>	Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>		<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolfia</i> <input type="checkbox"/>	General Measurements		% Open Water	_____ % Shade Cover	% Floating Leaf	_____ 5	% Emergents	_____	% Submergents	_____	Dominant Bottom Type		Peat	<input checked="" type="checkbox"/>	Oraganic	<input type="checkbox"/>	Roots	<input type="checkbox"/>	Mud	<input type="checkbox"/>	Silt-Sand	<input type="checkbox"/>	Leafpack	<input checked="" type="checkbox"/>	Other...	<input type="checkbox"/>
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Wetland Name: 24	Date: 07/06/2004
County: Washburn	Time: 4:00 PM
Researchers: Gina LaLiberte, Glenn Vorhes	Location:
	Lat: 45 N
	Lg: 91 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input checked="" type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input checked="" type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...	<input type="checkbox"/> <input type="checkbox"/>

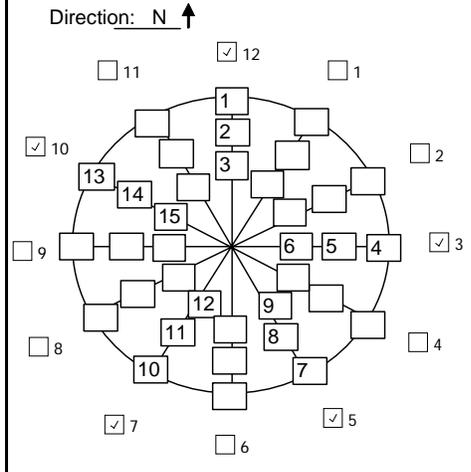
Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	_____
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	

Color Code		Samples	
Dark-stain	<input type="checkbox"/>	Quart (2)	<input checked="" type="checkbox"/>
Light Stain	<input type="checkbox"/>	250 ml.	<input checked="" type="checkbox"/>
Turbid/Brn	<input checked="" type="checkbox"/>	-Acid	<input type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>	60 ml. (plastic)	<input checked="" type="checkbox"/>
Clear/Blue	<input type="checkbox"/>	diatoms (glass)	<input checked="" type="checkbox"/>
Clear/Grn	<input type="checkbox"/>	-glutaraldehyde	<input type="checkbox"/>
		Chlorophyl	<input checked="" type="checkbox"/>
		-Filter	<input type="checkbox"/>
		-Color	<input type="checkbox"/>
		plant vouchers	<input checked="" type="checkbox"/>
		BOD sample	<input type="checkbox"/>

Duckweed root length	<i>Lemna minor</i>	<input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i>	<input type="checkbox"/>
	<i>Spirodela polyrrhiza</i>	<input type="checkbox"/>
	<i>Wolffia</i>	<input type="checkbox"/>

General Measurements	
% Open Water	95 _____ % Shade Cover
% Floating Leaf	0 _____ 0 _____
% Emergents	0 _____
% Submergents	0 _____

Dominant Bottom Type			
Peat	<input type="checkbox"/>	Mud	<input type="checkbox"/>
Oraganic	<input type="checkbox"/>	Silt-Sand	<input type="checkbox"/>
Roots	<input type="checkbox"/>	Leafpack	<input type="checkbox"/>
		Other...	<input type="checkbox"/>
		Gravel	<input type="checkbox"/>



Wetland Name: 25	Date: 07/07/2004
County: Washburn	Time: 8:00 AM
Researchers: Gina LaLiberte, Glenn Vorhes	Location:
	Lat: 45 N
	Lg: 91 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...Fish Hatchery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Field Measurements

Air Temp 54 F

Water Temp _____

Clarity _____

Max Depth _____

Algal Bloom?

Duckweed Abundant _____%

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input type="checkbox"/>
	Chlorophyl <input type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % frequency or fronds in each species. *Lemna major*

Spirodela polyrrhiza

Wolffia

General Measurements

% Open Water _____ % Shade Cover _____

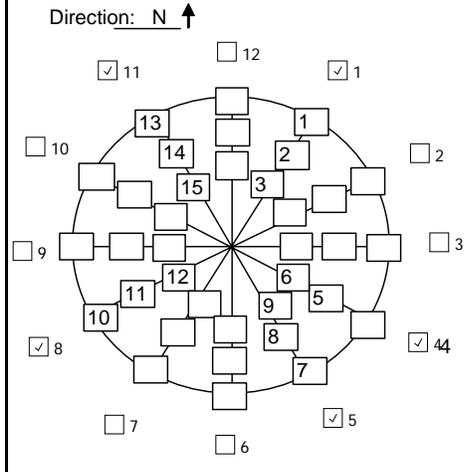
% Floating Leaf _____

% Emergents _____

% Submergents _____

Dominant Bottom Type

Peat <input type="checkbox"/>	Mud <input type="checkbox"/>	Other... <input type="checkbox"/>
Oraganic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>	
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>	



Wetland Name: 26	Date: 07/07/2004
County: Washburn	Time: 11:00 AM
Researchers: Gina LaLiberte, Glenn Vorhes	Location:
	Lat: 45 N
	Lg: 91 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other...Fish Hatchery	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____

Water Temp _____

Clarity _____

Max Depth _____

Algal Bloom?

Duckweed Abundant _____%

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input type="checkbox"/>
	Chlorophyl <input type="checkbox"/>
	-Filter <input type="checkbox"/>
	-Color <input type="checkbox"/>
	plant vouchers <input type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % frequency or fronds in each species. *Lemna major*

Spirodela polyrrhiza

Wolfia

General Measurements

% Open Water _____ % Shade Cover _____

% Floating Leaf _____

% Emergents _____

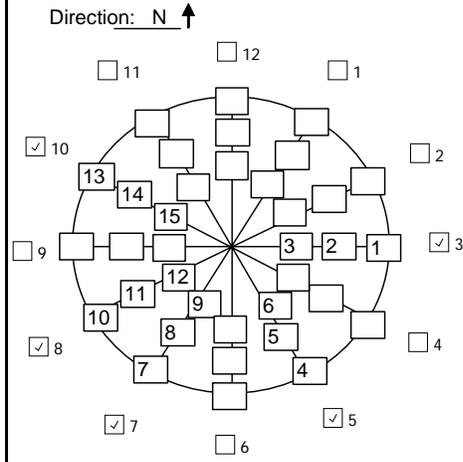
% Submergents _____

Dominant Bottom Type

Peat Mud Other...

Oraganic Silt-Sand

Roots Leafpack



Wetland Name: 27	Date: 07/13/2004
County: Burnette	Time: 1:00 PM
Researchers: Glenn Vorhes, Katie Bohren	Location:
	Lat: 45 N
	Lg: 92 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____ 80

Water Temp _____

Clarity _____

Max Depth _____

Algal Bloom?

Duckweed Abundant 5%

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % frequency or fronds in each species. *Lemna major*

Spirodela polyrrhiza

Wolffia

General Measurements

% Open Water 90 % Shade Cover _____

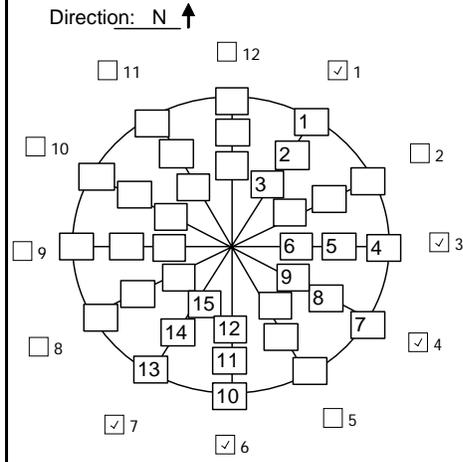
% Floating Leaf 0 _____ 0 _____

% Emergents 10 _____

% Submergents 50 _____

Dominant Bottom Type

Peat <input checked="" type="checkbox"/>	Mud <input type="checkbox"/>	Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input checked="" type="checkbox"/>	
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>	



Wetland Name: 27 Date: 07/13/2004 County: Burnette Time: 1:00 PM Researchers: Glenn Vorhes, Katie Bohren Location: Lat: 45 N Lg: 92 W ~or~ TN: RG: Sec Qtr:

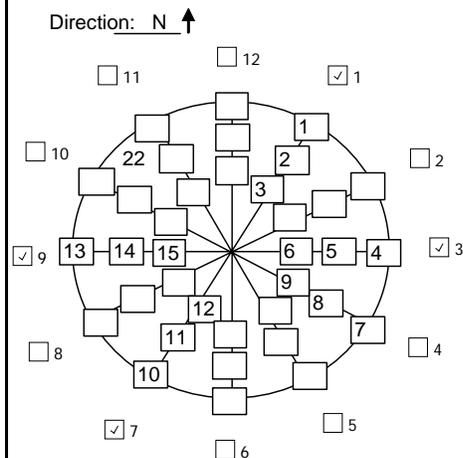
Wetland Name: 28	Date: 07/13/2004
County: Washburn	Time: 5:00 PM
Researchers: Glenn Vorhes, Katie Bohren	Location:
	Lat: 45 N
	Lg: 91 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Livestock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...Cows pasture	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	_____
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input checked="" type="checkbox"/> 10%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input checked="" type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolffia</i> <input type="checkbox"/>
General Measurements	
% Open Water	90 % Shade Cover
% Floating Leaf	0 0
% Emergents	5
% Submergents	5
Dominant Bottom Type	
Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...
Organic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>



fewer livestock on north side of fence,
middle of wetland has more plants/species



Wetland Name: 29 County: Washburn Researchers: Glenn Vorhes, Katie Bohren	Date: <u>07/14/2004</u> Time: <u>8:00 AM</u> Location: Lat: 45 N Lg: 92 W ~or~ TN: RG: Sec Qtr:
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input checked="" type="checkbox"/> Class 4. Agriculture - Row Crops <input checked="" type="checkbox"/>	
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input checked="" type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	Field Measurements Air Temp _____ Water Temp _____ Clarity _____ Max Depth _____ Algal Bloom? <input type="checkbox"/> Duckweed Abundant <input checked="" type="checkbox"/> _____ <1% Duckweed sp. _____ Color Code Dark-stain <input type="checkbox"/> Light Stain <input checked="" type="checkbox"/> Turbid/Brn <input type="checkbox"/> Turbid/Grn <input type="checkbox"/> Clear/Blue <input type="checkbox"/> Clear/Grn <input type="checkbox"/> Samples Quart (2) <input checked="" type="checkbox"/> 250 ml. <input checked="" type="checkbox"/> -Acid <input checked="" type="checkbox"/> 60 ml. (plastic) <input checked="" type="checkbox"/> diatoms (glass) <input checked="" type="checkbox"/> -glutaraldehyde <input checked="" type="checkbox"/> Chlorophyll <input checked="" type="checkbox"/> -Filter <input checked="" type="checkbox"/> -Color <input checked="" type="checkbox"/> plant vouchers <input checked="" type="checkbox"/> BOD sample <input checked="" type="checkbox"/> Duckweed root length <i>Lemna minor</i> <input checked="" type="checkbox"/> Plant Species Name and % frequency or fronds in each species. <i>Lemna major</i> <input type="checkbox"/> <i>Spirodela polyrrhiza</i> <input type="checkbox"/> <i>Wolffia</i> <input type="checkbox"/>
Direction: N ↑ 	General Measurements % Open Water <u>75</u> % Shade Cover _____ % Floating Leaf _____ 10 _____ % Emergents <u>15</u> % Submergents <u>10</u> Dominant Bottom Type Peat <input checked="" type="checkbox"/> Mud <input checked="" type="checkbox"/> Other... Oraganic <input type="checkbox"/> Silt-Sand <input checked="" type="checkbox"/> Roots <input type="checkbox"/> Leafpack <input type="checkbox"/>

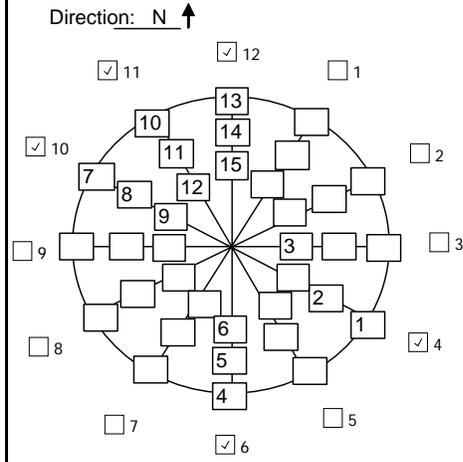
Wetland Name: 30	Date: 07/14/2004
County: Washburn	Time: 11:00 AM
Researchers: Glenn Vorhes, Katie Bohren	Location:
	Lat: 45 N
	Lg: 92 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	_____
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input checked="" type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolffia</i> <input type="checkbox"/>
General Measurements	
% Open Water	75 _____ % Shade Cover
% Floating Leaf	_____ 0 _____
% Emergents	25 _____
% Submergents	10 _____
Dominant Bottom Type	
Peat <input checked="" type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...
Organic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input checked="" type="checkbox"/>	Leafpack <input type="checkbox"/>

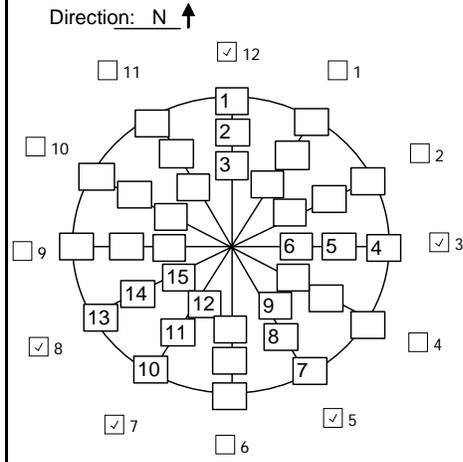


Wetland Name: 31	Date: 07/19/2004
County: Washburn	Time: 2:00 PM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>
Livesock Pasture	<input checked="" type="checkbox"/>
Scattered Residential	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>
Construction	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>
Mining	<input type="checkbox"/>
Industrial	<input type="checkbox"/>
Golf course	<input type="checkbox"/>
Logging	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>
Commercial	<input type="checkbox"/>
Other...	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	deep _____
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input checked="" type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolfia</i> <input type="checkbox"/>
General Measurements	
% Open Water	90 _____ % Shade Cover
% Floating Leaf	2 _____ 5 _____
% Emergents	10 _____
% Submergents	5 _____
Dominant Bottom Type	
Peat <input checked="" type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...
Oraganic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>



Wetland Name: 32 County: Washburn Researchers:Katie & Glenn	Date: <u>07/19/2004</u> Time: <u>6:00 PM</u> Location: Lat: 45 ' N Lg: 91 ' W ~or~ TN: RG: Sec Qtr:																																																																		
Wetland Class:																																																																			
Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/>																																																																			
Class 2. Urban impacted <input type="checkbox"/>																																																																			
Class 3. Agriculture - Cover Crops <input checked="" type="checkbox"/>																																																																			
Class 4. Agriculture - Row Crops <input checked="" type="checkbox"/>																																																																			
Surrounding Landuse: Double Check=Dominant																																																																			
Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input checked="" type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">Field Measurements</td> </tr> <tr> <td>Air Temp</td> <td>_____</td> </tr> <tr> <td>Water Temp</td> <td>_____</td> </tr> <tr> <td>Clarity</td> <td>_____</td> </tr> <tr> <td>Max Depth</td> <td><u>80 cm</u></td> </tr> <tr> <td>Algal Bloom?</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input type="checkbox"/> _____%</td> </tr> <tr> <td colspan="2">Duckweed sp.</td> </tr> <tr> <td>Color Code</td> <td>Samples</td> </tr> <tr> <td>Dark-stain <input type="checkbox"/></td> <td>Quart (2) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input checked="" type="checkbox"/></td> <td>-Acid <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>60 ml. (plastic) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>diatoms (glass) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>-glutaraldehyde <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Chlorophyll <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Filter <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Color <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>BOD sample <input type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and % frequency or fronds in each species.</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolffia</i> <input type="checkbox"/></td> </tr> <tr> <td colspan="2">General Measurements</td> </tr> <tr> <td>% Open Water</td> <td><u>80</u> % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td><u>10</u> <u>5</u></td> </tr> <tr> <td>% Emergents</td> <td><u>10</u></td> </tr> <tr> <td>% Submergents</td> <td><u>40</u></td> </tr> <tr> <td colspan="2">Dominant Bottom Type</td> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other...</td> </tr> <tr> <td>Oraganic <input type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	_____	Water Temp	_____	Clarity	_____	Max Depth	<u>80 cm</u>	Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> _____%	Duckweed sp.		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Wetland Name: 33 County: Washburn Researchers: K. Bohren and G. Vorhes	Date: <u>07/20/2004</u> Time: <u>10:00 AM</u> Location: Lat: 45 ' N Lg: 91 ' W ~or~ TN: RG: Sec Qtr:																																																																																																																																											
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Wetland Name: 34	Date: 07/20/2004
County: Washburn	Time: 2:00 PM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
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Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth 90
 Algal Bloom?
 Duckweed Abundant 80%
 Duckweed sp. L. minor

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

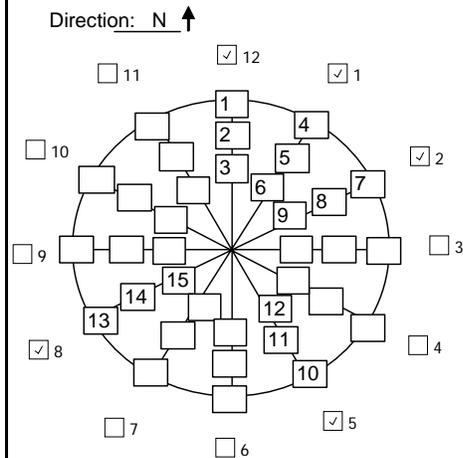
Duckweed root length Lemna minor
 Plant Species Name and % frequency or fronds in each species. Lemna major
Spirodela polyrrhiza
Wolfia

General Measurements

% Open Water 5 % Shade Cover _____
 % Floating Leaf 80 _____
 % Emergents 15 _____
 % Submergents 0 _____

Dominant Bottom Type

Peat <input checked="" type="checkbox"/>	Mud <input type="checkbox"/>	Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>	
Roots <input type="checkbox"/>	Leafpack <input checked="" type="checkbox"/>	



thick and loose peat



Wetland Name: 35	Date: 07/21/2004
County: Washburn	Time: 9:30 AM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth 30 cm
 Algal Bloom?
 Duckweed Abundant 10%
 Duckweed sp. L. minor

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

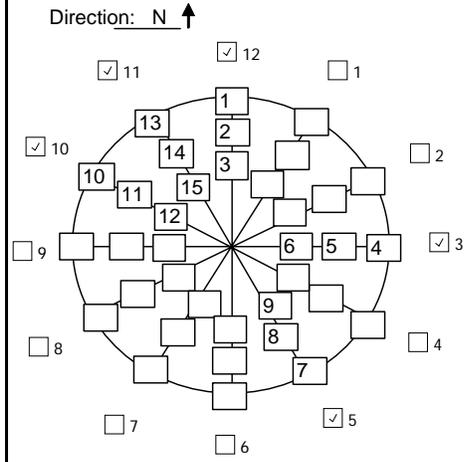
Duckweed root length Lemna minor
 Plant Species Name and % frequency or fronds in each species.
Lemna major
Spirodela polyrrhiza
Wolfia

General Measurements

% Open Water 70 % Shade Cover _____
 % Floating Leaf 1 _____ 5 _____
 % Emergents 20
 % Submergents 40

Dominant Bottom Type

Peat Mud Other...
 Oraganic Silt-Sand
 Roots Leafpack



Deep and loose peat



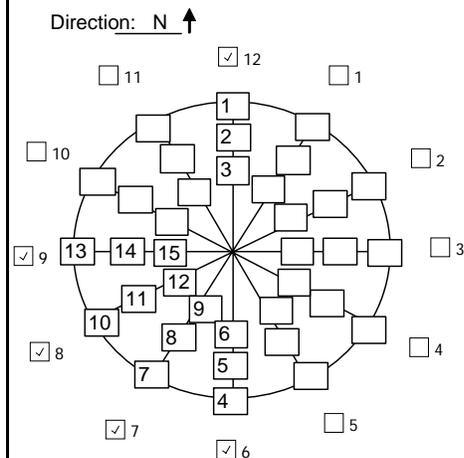
Wetland Name: 36	Date: 07/21/2004
County: Washburn	Time: 11:30 AM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input checked="" type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	30 cm
Algal Bloom?	<input checked="" type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input checked="" type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolfia</i> <input type="checkbox"/>
General Measurements	
% Open Water	100 % Shade Cover
% Floating Leaf	0
% Emergents	none see note
% Submergents	10
Dominant Bottom Type	
Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other...
Oraganic <input type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>



exposed mudflat around perimeter



Wetland Name: 37	Date: 08/02/2004
County: Oneida	Time: 4:00 PM
Researchers:Katie and Glenn	Location:
	Lat: 45° N
	Lg: 89° W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input checked="" type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

roads

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth _____
 Algal Bloom?
 Duckweed Abundant _____%
 Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*
 Plant Species Name and % *Lemna major*
 frequency or fronds in each *Spirodela polyrrhiza*
 species. *Wolffia*

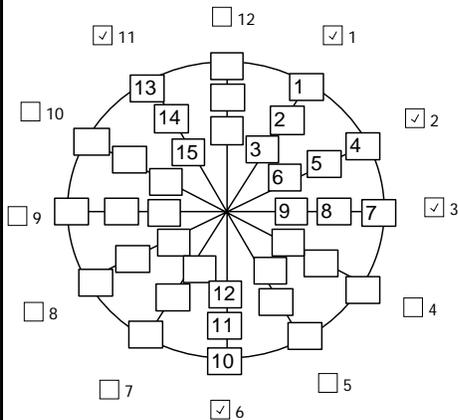
General Measurements

% Open Water 20 _____ % Shade Cover _____
 % Floating Leaf 0 _____
 % Emergents 80 _____
 % Submergents _____

Dominant Bottom Type

Peat <input checked="" type="checkbox"/>	Mud <input type="checkbox"/>	Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>	
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>	

Direction: N ↑



Wetland Name: 38 County: Oneida Researchers:Katie and Glenn	Date: <u>08/03/2004</u> Time: <u>10:00 AM</u> Location: Lat: 45° N Lg. 89° W ~or~ TN: RG: Sec Qtr:																																																																		
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input checked="" type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																																			
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Field Measurements</th> </tr> <tr> <td>Air Temp</td> <td>_____</td> </tr> <tr> <td>Water Temp</td> <td>_____</td> </tr> <tr> <td>Clarity</td> <td>_____</td> </tr> <tr> <td>Max Depth</td> <td>_____</td> </tr> <tr> <td>Algal Bloom?</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Duckweed Abundant</td> <td><input type="checkbox"/> _____%</td> </tr> <tr> <td colspan="2">Duckweed sp.</td> </tr> <tr> <th>Color Code</th> <th>Samples</th> </tr> <tr> <td>Dark-stain <input checked="" type="checkbox"/></td> <td>Quart (2) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Light Stain <input type="checkbox"/></td> <td>250 ml. <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Brn <input type="checkbox"/></td> <td>-Acid <input checked="" type="checkbox"/></td> </tr> <tr> <td>Turbid/Grn <input type="checkbox"/></td> <td>60 ml. (plastic) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>diatoms (glass) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>-glutaraldehyde <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Chlorophyl <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Filter <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Color <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>BOD sample <input type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and % frequency or fronds in each species.</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolffia</i> <input type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td><u>30</u> % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td><u>0</u> <u>50</u></td> </tr> <tr> <td>% Emergents</td> <td><u>60</u></td> </tr> <tr> <td>% Submergents</td> <td><u>10</u></td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input checked="" type="checkbox"/></td> <td>Mud <input type="checkbox"/> Other...</td> </tr> <tr> <td>Oraganic <input checked="" type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input checked="" type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	_____	Water Temp	_____	Clarity	_____	Max Depth	_____	Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> _____%	Duckweed sp.		Color Code	Samples	Dark-stain <input checked="" type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>	Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>		Chlorophyl <input checked="" type="checkbox"/>		-Filter <input checked="" type="checkbox"/>		-Color <input checked="" type="checkbox"/>		plant vouchers <input checked="" type="checkbox"/>		BOD sample <input type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>	Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>		<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolffia</i> <input type="checkbox"/>	General Measurements		% Open Water	<u>30</u> % Shade Cover	% Floating Leaf	<u>0</u> <u>50</u>	% Emergents	<u>60</u>	% Submergents	<u>10</u>	Dominant Bottom Type		Peat <input checked="" type="checkbox"/>	Mud <input type="checkbox"/> Other...	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Direction: N ↑ 																																																																			

Wetland Name: 39 County: Oneida Researchers: Katie B and Glenn V	Date: <u>08/03/2004</u> Time: <u>2:00 PM</u> Location: Lat: 45° N Lg. 89° W ~or~ TN: RG: Sec Qtr:																																																																		
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input type="checkbox"/> Class 2. Urban impacted <input checked="" type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																																			
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(plastic) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>diatoms (glass) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>-glutaraldehyde <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Chlorophyl <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Filter <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Color <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>BOD sample <input type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and % frequency or fronds in each species.</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolffia</i> <input type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td><u>85</u> % Shade Cover</td> </tr> <tr> <td>% Floating Leaf</td> <td><u>0</u> <u>0</u></td> </tr> <tr> <td>% Emergents</td> <td><u>15</u></td> </tr> <tr> <td>% Submergents</td> <td><u>10</u></td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other...</td> </tr> <tr> <td>Oraganic <input type="checkbox"/></td> <td>Silt-Sand <input checked="" type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	_____	Water Temp	_____	Clarity	_____	Max Depth	_____	Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> _____%	Duckweed sp.		Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>	Turbid/Brn <input checked="" type="checkbox"/>	-Acid <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	60 ml. 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Direction: N ↑ 																																																																			

Wetland Name: 42	Date: 08/10/2004
County: Oneida	Time: 2:45 PM
Researchers: Jen and Glenn	Location:
	Lat: 45° N
	Lg: 89° W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____

Water Temp _____

Clarity _____

Max Depth 90

Algal Bloom?

Duckweed Abundant <1 %

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % frequency or fronds in each species. *Lemna major*

Spirodela polyrrhiza

Wolfia

General Measurements

% Open Water 100 % Shade Cover _____

% Floating Leaf _____ 70

% Emergents _____

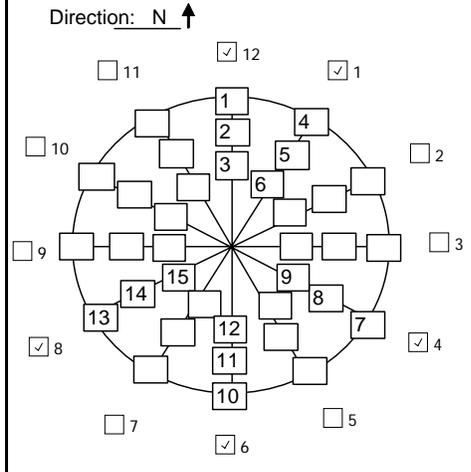
% Submergents 10

Dominant Bottom Type

Peat Mud Other... _____

Oraganic Silt-Sand

Roots Leafpack



Wetland Name: 43	Date: 08/10/2004
County: Oneida	Time: 1:00 PM
Researchers: Jen and Glenn	Location:
	Lat: 45° N
	Lg: 89° W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input checked="" type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...	<input type="checkbox"/> <input type="checkbox"/>

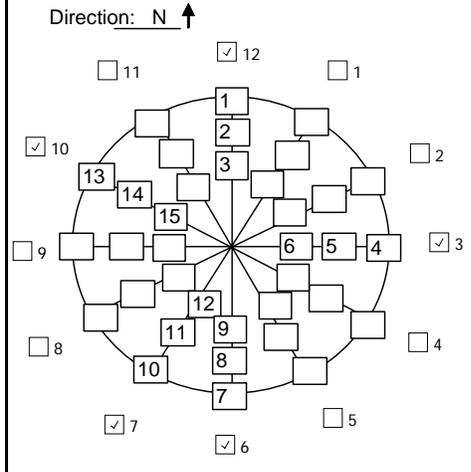
Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	150 cm
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	

Color Code		Samples	
Dark-stain	<input checked="" type="checkbox"/>	Quart (2)	<input checked="" type="checkbox"/>
Light Stain	<input type="checkbox"/>	250 ml.	<input checked="" type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>	-Acid	<input checked="" type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>	60 ml. (plastic)	<input checked="" type="checkbox"/>
Clear/Blue	<input type="checkbox"/>	diatoms (glass)	<input checked="" type="checkbox"/>
Clear/Grn	<input type="checkbox"/>	-glutaraldehyde	<input checked="" type="checkbox"/>
		Chlorophyl	<input checked="" type="checkbox"/>
		-Filter	<input checked="" type="checkbox"/>
		-Color	<input checked="" type="checkbox"/>
		plant vouchers	<input checked="" type="checkbox"/>
		BOD sample	<input type="checkbox"/>

Duckweed root length	<i>Lemna minor</i>	<input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i>	<input type="checkbox"/>
	<i>Spirodela polyrrhiza</i>	<input type="checkbox"/>
	<i>Wolffia</i>	<input type="checkbox"/>

General Measurements	
% Open Water	60 % Shade Cover
% Floating Leaf	30 40-60
% Emergents	10
% Submergents	20

Dominant Bottom Type			
Peat	<input type="checkbox"/>	Mud	<input type="checkbox"/> Other...
Organic	<input type="checkbox"/>	Silt-Sand	<input type="checkbox"/>
Roots	<input type="checkbox"/>	Leafpack	<input checked="" type="checkbox"/>

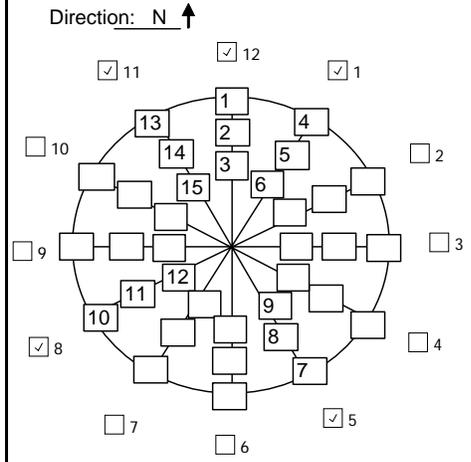


Wetland Name: 44	Date: 08/11/2004
County: Oneida	Time: 8:00 AM
Researchers: Jen and Glenn	Location:
	Lat: 45° N
	Lg: 89° W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant	
Grassland & Ungrazed Fields	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/> <input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/> <input type="checkbox"/>
Scattered Residential	<input type="checkbox"/> <input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/> <input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Park	<input checked="" type="checkbox"/> <input type="checkbox"/>
Construction	<input type="checkbox"/> <input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/> <input type="checkbox"/>
Mining	<input type="checkbox"/> <input type="checkbox"/>
Industrial	<input type="checkbox"/> <input type="checkbox"/>
Golf course	<input type="checkbox"/> <input type="checkbox"/>
Logging	<input type="checkbox"/> <input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/> <input type="checkbox"/>
Commercial	<input type="checkbox"/> <input type="checkbox"/>
Other...	<input type="checkbox"/> <input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	50 cm
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input checked="" type="checkbox"/> 5%
Duckweed sp.	mostly major, some minor
Color Code	
Dark-stain	<input type="checkbox"/>
Light Stain	<input type="checkbox"/>
Turbid/Brn	<input type="checkbox"/>
Turbid/Grn	<input type="checkbox"/>
Clear/Blue	<input type="checkbox"/>
Clear/Grn	<input type="checkbox"/>
Samples	
Quart (2)	<input checked="" type="checkbox"/>
250 ml.	<input checked="" type="checkbox"/>
-Acid	<input checked="" type="checkbox"/>
60 ml. (plastic)	<input checked="" type="checkbox"/>
diatoms (glass)	<input checked="" type="checkbox"/>
-glutaraldehyde	<input checked="" type="checkbox"/>
Chlorophyl	<input checked="" type="checkbox"/>
-Filter	<input checked="" type="checkbox"/>
-Color	<input checked="" type="checkbox"/>
plant vouchers	<input checked="" type="checkbox"/>
BOD sample	<input checked="" type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input checked="" type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolffia</i> <input type="checkbox"/>
General Measurements	
% Open Water	70 % Shade Cover
% Floating Leaf	10 10
% Emergents	20
% Submergents	75
Dominant Bottom Type	
Peat	<input checked="" type="checkbox"/>
Oraganic	<input checked="" type="checkbox"/>
Roots	<input type="checkbox"/>
Mud	<input type="checkbox"/>
Silt-Sand	<input type="checkbox"/>
Leafpack	<input type="checkbox"/>
Other...	



Wetland Name: 45 County: Oneida Researchers: Jen and Glenn	Date: <u>08/11/2004</u> Time: <u>10:20 AM</u> Location: Lat: 45° N Lg. 89° W ~or~ TN: RG: Sec Qtr:																																																																																																																																															
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Wetland Name: 46	Date: 08/16/2004
County: Ashland	Time: 1:30 PM
Researchers: Gina and Glenn	Location:
	Lat: 46 N
	Lg: 90 W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____

Water Temp _____

Clarity _____

Max Depth _____

Algal Bloom?

Duckweed Abundant _____%

Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

Duckweed root length *Lemna minor*

Plant Species Name and % *Lemna major*

frequency or fronds in each *Spirodela polyrrhiza*

species. *Wolffia*

General Measurements

% Open Water 60 % Shade Cover _____

% Floating Leaf 20 15

% Emergents 20

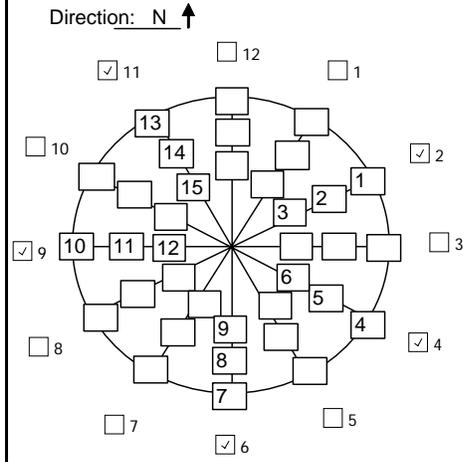
% Submergents 90

Dominant Bottom Type

Peat Mud Other... _____

Organic Silt-Sand

Roots Leafpack



Wetland Name: 47	Date: 08/16/2004
County: Ashland	Time: 5:00 PM
Researchers: Gina and Glenn	Location:
	Lat: 46 ' N
	Lg: 90 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth deep
 Algal Bloom?
 Duckweed Abundant _____ %
 Duckweed sp. _____

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

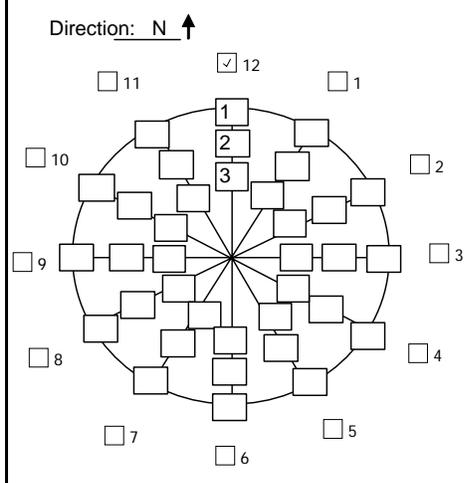
Duckweed root length *Lemna minor*
 Plant Species Name and % frequency or fronds in each species. *Lemna major*
Spirodela polyrrhiza
Wolfia

General Measurements

% Open Water 80 % Shade Cover _____
 % Floating Leaf 10 _____
 % Emergents 10 _____
 % Submergents 80 _____

Dominant Bottom Type

Peat Mud Other... _____
 Oraganic Silt-Sand
 Roots Leafpack



Wetland Name: 48 County: Ashland Researchers: Gina and Glenn	Date: <u>08/17/2004</u> Time: <u>10:00 AM</u> Location: Lat: 46 ' N Lg: 90 ' W ~or~ TN: RG: Sec Qtr:																																																																		
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input checked="" type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input checked="" type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>																																																																			
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(plastic) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Blue <input type="checkbox"/></td> <td>diatoms (glass) <input checked="" type="checkbox"/></td> </tr> <tr> <td>Clear/Grn <input type="checkbox"/></td> <td>-glutaraldehyde <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>Chlorophyll <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Filter <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>-Color <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>plant vouchers <input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>BOD sample <input checked="" type="checkbox"/></td> </tr> <tr> <td>Duckweed root length</td> <td><i>Lemna minor</i> <input type="checkbox"/></td> </tr> <tr> <td>Plant Species Name and % frequency or fronds in each species.</td> <td><i>Lemna major</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Spirodela polyrrhiza</i> <input type="checkbox"/></td> </tr> <tr> <td></td> <td><i>Wolffia</i> <input type="checkbox"/></td> </tr> <tr> <th colspan="2">General Measurements</th> </tr> <tr> <td>% Open Water</td> <td><u>60</u> % Shade Cover _____</td> </tr> <tr> <td>% Floating Leaf</td> <td><u>30</u> _____</td> </tr> <tr> <td>% Emergents</td> <td><u>10</u> _____</td> </tr> <tr> <td>% Submergents</td> <td><u>95</u> _____</td> </tr> <tr> <th colspan="2">Dominant Bottom Type</th> </tr> <tr> <td>Peat <input type="checkbox"/></td> <td>Mud <input checked="" type="checkbox"/> Other... _____</td> </tr> <tr> <td>Organic <input checked="" type="checkbox"/></td> <td>Silt-Sand <input type="checkbox"/></td> </tr> <tr> <td>Roots <input type="checkbox"/></td> <td>Leafpack <input type="checkbox"/></td> </tr> </table>	Field Measurements		Air Temp	_____	Water Temp	_____	Clarity	_____	Max Depth	_____	Algal Bloom?	<input type="checkbox"/>	Duckweed Abundant	<input type="checkbox"/> _____%	Duckweed sp.		Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>	Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>	Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>	Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>		Chlorophyll <input checked="" type="checkbox"/>		-Filter <input checked="" type="checkbox"/>		-Color <input checked="" type="checkbox"/>		plant vouchers <input checked="" type="checkbox"/>		BOD sample <input checked="" type="checkbox"/>	Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>	Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>		<i>Spirodela polyrrhiza</i> <input type="checkbox"/>		<i>Wolffia</i> <input type="checkbox"/>	General Measurements		% Open Water	<u>60</u> % Shade Cover _____	% Floating Leaf	<u>30</u> _____	% Emergents	<u>10</u> _____	% Submergents	<u>95</u> _____	Dominant Bottom Type		Peat <input type="checkbox"/>	Mud <input checked="" type="checkbox"/> Other... _____	Organic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>	Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>
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Organic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>																																																																		
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>																																																																		
Direction: N ↑ 																																																																			

Wetland Name: 49 Date: 08/17/2004
 County: Ashland Time: 12:00 PM
 Researchers: Gina and Glenn Location:
 Lat: 46 ' N
 Lg: 90 ' W ~or~
 TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

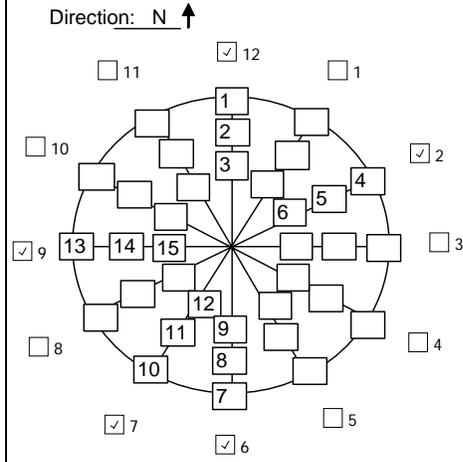
Field Measurements
 Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth _____
 Algal Bloom?
 Duckweed Abundant _____ %
 Duckweed sp. _____

Color Code	Samples
Dark-stain	Quart (2) <input checked="" type="checkbox"/>
Light Stain	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn	-Acid <input checked="" type="checkbox"/>
Turbid/Grn	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

Duckweed root length *Lemna minor*
 Plant Species Name and % *Lemna major*
 frequency or fronds in each *Spirodela polyrrhiza*
 species. *Wolffia*

General Measurements
 % Open Water 70 % Shade Cover _____
 % Floating Leaf 10 _____
 % Emergents 20 _____
 % Submergents 60 _____

Dominant Bottom Type
 Peat Mud Other...
 Oraganic Silt-Sand
 Roots Leafpack



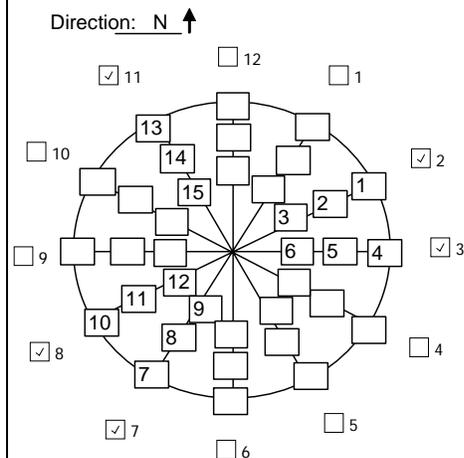
Wetland Name: 50	Date: 08/17/2004
County: Ashland	Time: 2:30 PM
Researchers: Gina and Glenn	Location:
	Lat: 46 ' N
	Lg: 90 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input checked="" type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input type="checkbox"/>	<input type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	_____
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input type="checkbox"/> _____%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolffia</i> <input type="checkbox"/>
General Measurements	
% Open Water	90 _____ % Shade Cover
% Floating Leaf	5 _____
% Emergents	5 _____
% Submergents	20 _____
Dominant Bottom Type	
Peat <input type="checkbox"/>	Mud <input type="checkbox"/> Other...
Organic <input type="checkbox"/>	Silt-Sand <input checked="" type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input type="checkbox"/>



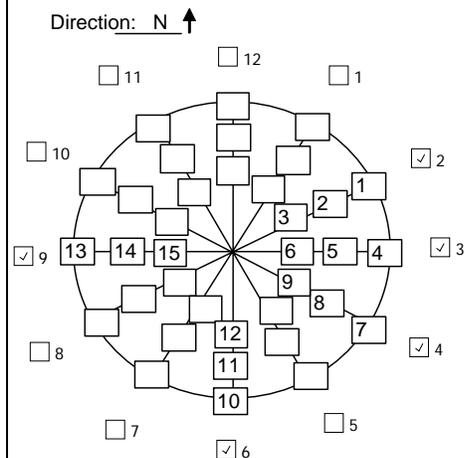
Wetland Name: 51	Date: 08/23/2004
County: Chippewa	Time: 1:00 PM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements	
Air Temp	_____
Water Temp	_____
Clarity	_____
Max Depth	80
Algal Bloom?	<input type="checkbox"/>
Duckweed Abundant	<input checked="" type="checkbox"/> 5%
Duckweed sp.	
Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>
Duckweed root length	<i>Lemna minor</i> <input checked="" type="checkbox"/>
Plant Species Name and % frequency or fronds in each species.	<i>Lemna major</i> <input checked="" type="checkbox"/>
	<i>Spirodela polyrrhiza</i> <input type="checkbox"/>
	<i>Wolfia</i> <input type="checkbox"/>
General Measurements	
% Open Water	90 % Shade Cover
% Floating Leaf	5 10
% Emergents	0
% Submergents	5
Dominant Bottom Type	
Peat <input checked="" type="checkbox"/>	Mud <input type="checkbox"/> Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>
Roots <input type="checkbox"/>	Leafpack <input checked="" type="checkbox"/>



Wetland Name: 52	Date: 08/23/2004
County: Chippewa	Time: 4:00 PM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth 80
 Algal Bloom?
 Duckweed Abundant 5%
 Duckweed sp. l. major/minor

Color Code	Samples
Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyll <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

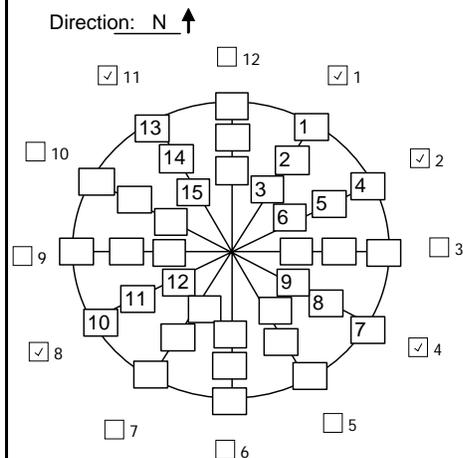
Duckweed root length *Lemna minor*
 Plant Species Name and % *Lemna major*
 frequency or fronds in each *Spirodela polyrrhiza*
 species. *Wolfia*

General Measurements

% Open Water 60 % Shade Cover _____
 % Floating Leaf 5 10
 % Emergents 40
 % Submergents 40

Dominant Bottom Type

Peat <input type="checkbox"/>	Mud <input type="checkbox"/>	Other...
Oraganic <input checked="" type="checkbox"/>	Silt-Sand <input type="checkbox"/>	
Roots <input type="checkbox"/>	Leafpack <input checked="" type="checkbox"/>	



Wetland Name: 53	Date: 08/24/2004
County: Chippewa	Time: 10:00 AM
Researchers:Katie and Glenn	Location:
	Lat: 45 ' N
	Lg: 91 ' W ~or~
	TN: RG: Sec Qtr:

Wetland Class:	
Class 1. Unimpacted by anthropogenic sources (reference sites)	<input checked="" type="checkbox"/>
Class 2. Urban impacted	<input type="checkbox"/>
Class 3. Agriculture - Cover Crops	<input type="checkbox"/>
Class 4. Agriculture - Row Crops	<input type="checkbox"/>

Surrounding Landuse: Double Check=Dominant

Grassland & Ungrazed Fields	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Cover Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture - Row Crop Field	<input type="checkbox"/>	<input type="checkbox"/>
Livesock Pasture	<input type="checkbox"/>	<input type="checkbox"/>
Scattered Residential	<input type="checkbox"/>	<input type="checkbox"/>
Moderate to High Density Residential	<input type="checkbox"/>	<input type="checkbox"/>
Wooded	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Park	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary Landfill	<input type="checkbox"/>	<input type="checkbox"/>
Mining	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>
Golf course	<input type="checkbox"/>	<input type="checkbox"/>
Logging	<input type="checkbox"/>	<input type="checkbox"/>
Sewage Treatment	<input type="checkbox"/>	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>

Field Measurements

Air Temp _____
 Water Temp _____
 Clarity _____
 Max Depth 40
 Algal Bloom?
 Duckweed Abundant _____%
 Duckweed sp. _____

Color Code	Samples
Dark-stain <input checked="" type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>
Light Stain <input type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>
Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>
Turbid/Grn <input type="checkbox"/>	60 ml. (plastic) <input checked="" type="checkbox"/>
Clear/Blue <input type="checkbox"/>	diatoms (glass) <input checked="" type="checkbox"/>
Clear/Grn <input type="checkbox"/>	-glutaraldehyde <input checked="" type="checkbox"/>
	Chlorophyl <input checked="" type="checkbox"/>
	-Filter <input checked="" type="checkbox"/>
	-Color <input checked="" type="checkbox"/>
	plant vouchers <input checked="" type="checkbox"/>
	BOD sample <input checked="" type="checkbox"/>

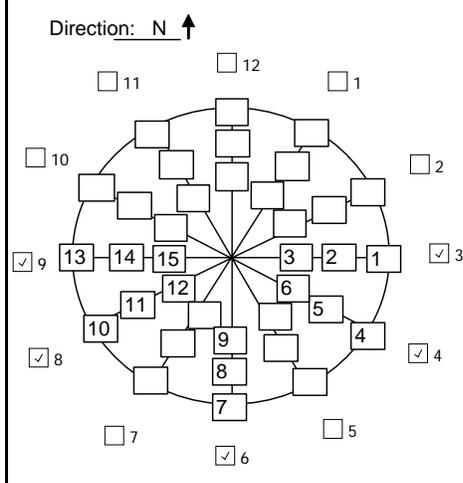
Duckweed root length *Lemna minor*
 Plant Species Name and % *Lemna major*
 frequency or fronds in each *Spirodela polyrrhiza*
 species. *Wolfia*

General Measurements

% Open Water 25 % Shade Cover _____
 % Floating Leaf 35 40
 % Emergents 50
 % Submergents 10

Dominant Bottom Type

Peat Mud Other...
 Oraganic Silt-Sand
 Roots Leafpack



Wetland Name: 54 County: Chippewa Researchers:Katie and Glenn	Date: <u>08/24/2004</u> Time: <u>1:00 PM</u> Location: Lat: 45 ' N Lg: 91 ' W ~or~ TN: RG: Sec Qtr:
Wetland Class: Class 1. Unimpacted by anthropogenic sources (reference sites) <input checked="" type="checkbox"/> Class 2. Urban impacted <input type="checkbox"/> Class 3. Agriculture - Cover Crops <input type="checkbox"/> Class 4. Agriculture - Row Crops <input type="checkbox"/>	
Surrounding Landuse: Double Check=Dominant Grassland & Ungrazed Fields <input checked="" type="checkbox"/> <input type="checkbox"/> Agriculture - Cover Crop Field <input type="checkbox"/> <input type="checkbox"/> Agriculture - Row Crop Field <input type="checkbox"/> <input type="checkbox"/> Livesock Pasture <input type="checkbox"/> <input type="checkbox"/> Scattered Residential <input type="checkbox"/> <input type="checkbox"/> Moderate to High Density Residential <input type="checkbox"/> <input type="checkbox"/> Wooded <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Park <input type="checkbox"/> <input type="checkbox"/> Construction <input type="checkbox"/> <input type="checkbox"/> Sanitary Landfill <input type="checkbox"/> <input type="checkbox"/> Mining <input type="checkbox"/> <input type="checkbox"/> Industrial <input type="checkbox"/> <input type="checkbox"/> Golf course <input type="checkbox"/> <input type="checkbox"/> Logging <input type="checkbox"/> <input type="checkbox"/> Sewage Treatment <input type="checkbox"/> <input type="checkbox"/> Commercial <input type="checkbox"/> <input type="checkbox"/> Other... <input type="checkbox"/> <input type="checkbox"/>	Field Measurements Air Temp _____ Water Temp _____ Clarity _____ Max Depth <u>80</u> Algal Bloom? <input type="checkbox"/> Duckweed Abundant <input checked="" type="checkbox"/> <u>5%</u> Duckweed sp. _____ Color Code Dark-stain <input type="checkbox"/> Light Stain <input type="checkbox"/> Turbid/Brn <input type="checkbox"/> Turbid/Grn <input type="checkbox"/> Clear/Blue <input type="checkbox"/> Clear/Grn <input type="checkbox"/> Samples Quart (2) <input checked="" type="checkbox"/> 250 ml. <input checked="" type="checkbox"/> -Acid <input checked="" type="checkbox"/> 60 ml. (plastic) <input checked="" type="checkbox"/> diatoms (glass) <input checked="" type="checkbox"/> -glutaraldehyde <input checked="" type="checkbox"/> Chlorophyl <input checked="" type="checkbox"/> -Filter <input checked="" type="checkbox"/> -Color <input checked="" type="checkbox"/> plant vouchers <input checked="" type="checkbox"/> BOD sample <input checked="" type="checkbox"/> Duckweed root length <i>Lemna minor</i> <input checked="" type="checkbox"/> Plant Species Name and % frequency or fronds in each species. <i>Lemna major</i> <input type="checkbox"/> <i>Spirodela polyrrhiza</i> <input type="checkbox"/> <i>Wolfia</i> <input type="checkbox"/>
Direction: N ↑ 	General Measurements % Open Water <u>80</u> % Shade Cover _____ % Floating Leaf <u>5</u> _____ <u>10</u> _____ % Emergents <u>15</u> % Submergents <u>40</u> Dominant Bottom Type Peat <input checked="" type="checkbox"/> Mud <input type="checkbox"/> Other... Oraganic <input checked="" type="checkbox"/> Silt-Sand <input type="checkbox"/> Roots <input type="checkbox"/> Leafpack <input type="checkbox"/>

Wetland Name: 55 County: Chippewa Researchers: Glenn and Katie	Date: <u>08/25/2004</u> Time: <u>10:30 AM</u> Location: Lat: 45 ' N Lg: 91 ' W ~or~ TN: RG: Sec Qtr:																																																																		
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Color Code	Samples	Dark-stain <input type="checkbox"/>	Quart (2) <input checked="" type="checkbox"/>	Light Stain <input checked="" type="checkbox"/>	250 ml. <input checked="" type="checkbox"/>	Turbid/Brn <input type="checkbox"/>	-Acid <input checked="" type="checkbox"/>	Turbid/Grn <input type="checkbox"/>	60 ml. 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Wetland Name: 56 County: Chippewa Researchers:Katie and Glenn	Date: <u>08/25/2004</u> Time: <u>11:30 AM</u> Location: Lat: 45 ' N Lg: 91 ' W ~or~ TN: RG: Sec Qtr:																																																																		
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APPENDIX 2. Diatom Taxonomic References.

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- Krammer, K., and Lange-Bertalot, H., 1997a (reprinted from 1986). Süßwasserflora von Mitteleuropa. Bacillariophyceae. Part 1: Naviculaceae. Eds. H. Ettl, J. Gerloff, H. Heynig, and D. Mollenhauer. Gustav Fisher, Stuttgart, Germany.

APPENDIX 2 Continued.

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APPENDIX 3. Eighty wetland sites with diatom data considered for analysis leading to a Northern Wetland Diatom Biotic Index. Wetlands are depressional unless otherwise stated. Sites with more than 1 mg Cl⁻¹ • l⁻¹ are noted in the Cl column. Entries with dashes lacked chemistry data.

Data Set	Year Sampled	Site Number	Site Name	Type and Reference	Cl	County
1996	1996	1996-01	22-8 (bog)	reference		Oneida
1996	1996	nochems 1	22-8 (pool)	reference	--	Oneida
1996	1996	1996-02	22-9a	reference	Cl	Oneida
1996	1996	1996-03	22-12a	reference	Cl	Oneida
1996	1996	1996-04	22-12b	reference	Cl	Oneida
1996	1996	1996-05	22-14	reference	Cl	Oneida
1996	1996	1996-06	22-16	reference	Cl	Oneida
1996	1996	nochems 2	15-13	reference	--	Oneida
1996	1996	1996-07	B mud	reference		Oneida
1996	1996	1996-08	B leaves	reference		Oneida
1996	1996	nochems 3	Between 22-9 & B	reference	--	Oneida
1996	1996	1996-09	Pond I	reference		Oneida
1996	1996	1996-10	15-16 C	reference		Oneida
1996	1996	1996-11	15-16 D	reference		Oneida
1996	1996	1996-12	70 S	reference	Cl	Washburn
1996	1996	1996-13	70 N	reference	Cl	Washburn
1996	1996	1996-14	Tower Rd	agricultural	Cl	Washburn
1996	1996	1996-15	63 NE	agricultural	Cl	Washburn
1996	1996	1996-16	63 SE	agricultural	Cl	Washburn
1996	1996	1996-17	63 West	reference	Cl	Washburn
1996	1996	1996-18	6	reference		Oneida
1996	1996	1996-19	9	reference		Oneida
1996	1996	1996-20	Black Tern	reference	Cl	Vilas
1996	1996	1996-21	Jimi Hendrix	reference	Cl	Vilas
1996	1996	1996-22	LRL Frog	reference		Vilas
1996	1996	1996-23	Arbor Vitae	reference	Cl	Vilas
1996	1996	1996-24	Schneider 7	reference		Vilas
1996	1996	1996-25	Big Box Store	urban	Cl	Barron
1996	1996	1996-26	Emmons Ck	reference		Portage
1996	1996	1996-27	Old Hwy 54	reference	Cl	Jackson
1996	1996	1996-28	Kostka 4	reference		St. Croix
1996	1996	1996-29	Kostka 5	reference		St. Croix
1996	1996	1996-30	White North	reference	Cl	Waushara
1996	1996	1996-31	White South	reference		Waushara
Bad River	2001	2001-01	Reyk Dahl 2001	reference	--	Ashland
Bad River	2001	2001-02	Birch Hill 2001	undetermined	--	Ashland
Bad River	2001	2001-03	Birch Hill Sewage 2001	urban	--	Ashland
Bad River	2001	2001-04	Elm Hoist 2001	undetermined	--	Ashland
Bad River	2001	2001-05	Elm Hoist Logging 2001	undetermined	--	Ashland
Bad River	2001	2001-06	Kaggerville 2001	riverine reference	--	Ashland
Bad River	2001	2001-07	Elm Creek 2001	reference	--	Ashland
Bad River	2001	2001-08	Gov at houses	undetermined	--	Ashland

APPENDIX 3 continued.

Data Set	Year Sampled	Site Number	Site Name	Type	CI	County
Bad River	2002	2002-01	Reykdahl 2002	reference	Cl	Ashland
Bad River	2002	2002-02	Elm Creek 2002	reference	Cl	Ashland
Bad River	2002	2002-03	Frost 2002	reference	Cl	Ashland
Bad River	2002	2002-04	Bad River @ Mouth 2002	reference	Cl	Ashland
Bad River	2002	2002-05	Kaggerville 2002	riverine reference	Cl	Ashland
Bad River	2002	2002-06	Kakagon @ Bear Trap 2002	riverine reference	Cl	Ashland
Bad River	2002	2002-07	Big Round 2002	riverine reference	Cl	Ashland
Bad River	2002	2002-08	Kakagon @ Wood Cr 2002	riverine reference	Cl	Ashland
Bad River	2002	2002-09	HJ East 2002	lacustrine reference	Cl	Ashland
Bad River	2002	2002-10	HJ Mid 2002	lacustrine	Cl	Ashland
Bad River	2002	2002-11	Bad River @ Denomi 2002	lacustrine	Cl	Ashland
Bad River	2002	2002-12	Bad River Slough West 2002	lacustrine reference	Cl	Ashland
Bad River	2003	2003-01	Kakagon @ Wood Cr 2003	riverine reference	Cl	Ashland
Bad River	2003	2003-02	NE Slough 2003	riverine reference	Cl	Ashland
Bad River	2003	2003-03	Big Round 2003	riverine reference	Cl	Ashland
Bad River	2003	2003-04	Little Round 2003	riverine reference	Cl	Ashland
Bad River	2003	2003-05	Bad River Slough North 2003	lacustrine	Cl	Ashland
Bad River	2003	2003-06	Bad River Slough West 2003	lacustrine	Cl	Ashland
Bad River	2003	2003-07	HJ East 2003	lacustrine reference	Cl	Ashland
Bad River	2003	2003-08	HJ Central 2003	lacustrine	Cl	Ashland
Bad River	2003	2003-09	Caville Rd 2003	reference		Ashland
Bad River	2003	2003-10	Reykdahl 2003	reference		Ashland
2003	2003	WET-001	Black Tern	reference	Cl	Vilas
2003	2003	WET-002	LRL Frog	reference	Cl	Vilas
2003	2003	WET-003	Schneider 7	reference		Vilas
2003	2003	WET-004	Minocqua 51/70 Urban Bog	urban	Cl	Vilas
2003	2003	WET-005	Hwy 63 W	reference	Cl	Washburn
2003	2003	WET-006	Hwy 70 NE	reference	Cl	Washburn
2003	2003	WET-007	Hwy 70 NW	reference	Cl	Washburn
2003	2003	WET-008	L-9	reference	Cl	Oneida
2003	2003	WET-009	Rhineland Big Box Store 1	urban	Cl	Oneida
2003	2003	WET-010	Rhineland Big Box Store 2	urban	Cl	Oneida
2003	2003	WET-011	Birch Hill Sewage Bad River	urban	Cl	Ashland
2003	2003	WET-012	Spooner Ag Station	agricultural	Cl	Washburn
2003	2003	WET-013	Spooner Ball Park	urban	Cl	Washburn
2003	2003	WET-015	Tozer Springs	agricultural	Cl	Washburn
2003	2003	WET-016	Lauritzen	agricultural	Cl	Washburn
2003	2003	WET-111	Birch Hill Sewage Bad River	urban	Cl	Ashland

APPENDIX 4. Narrative ratings and NWDBI scores for selected wetlands. Wetland types include depressional reference (R), depressional agricultural (A), depressional urban (U), and riverine reference (RR). Sites with more than 1 mg Cl⁻¹ • l⁻¹ are noted in the Cl column. Entries with dashes lacked chemistry data.

	rating	NWDBI score	type	Cl?	site	site name
Excellent	6	26	R		1996-19	L-9
	6	26	R		1996-28	Kostka 4
	6	26	R	Cl	1996-23	Arbor Vitae
	6	28	R		1996-31	White South
	6	28	R	Cl	1996-04	22-12b
Very Good	5	25	R		1996-24	Schneider 7
	5	25	R	Cl	1996-02	22-9a
	5	25	R	Cl	1996-03	22-12a
	5	25	R	Cl	1996-12	70 S
	5	25	R	Cl	1996-13	70 N
Good	4	24	R		1996-10	15-16 C
	4	24	R		1996-22	LRL Frog
	4	24	R	Cl	1996-06	22-16
	4	23	R		1996-09	Pond I
	4	23	R		1996-26	Emmons Ck
	4	23	R	Cl	1996-17	63 West
	4	22	R		1996-08	B leaves
	4	22	R		1996-27	Old Hwy 54
	4	22	R		1996-29	Kostka 5
	4	22	R	Cl	1996-20	Black Tern
	4	22	R	Cl	WET-001	Black Tern
4	22	A		1996-15	63 NE	
Fair	3	21	R		1996-18	L-6
	3	20	R		1996-07	B mud
	3	20	R	Cl	1996-05	22-14
	3	20	R	Cl	1996-30	White North
	3	20	R	Cl	2002-01	Reyk Dahl 2002
	3	20	U		1996-25	Big Box Store
Poor	2	19	A		1996-14	Tower Rd
	2	18	R		1996-11	15-16 D
	2	17	R	Cl	WET-008	L-9
	2	17	U		WET-004	Minocqua 51/70 Urban Bog
	2	17	RR	Cl	2003-04	Little Round 2003
	2	16	A		1996-16	63 SE
	2	16	A		WET-016	Lauritzen
	2	16	R	--	nochems2	15-13
	2	15	R		2002-02	Elm Creek 2002
	2	15	R	Cl	1996-01	22-8 bog
	2	15	R	Cl	1996-21	Jimi Hendrix

APPENDIX 4 continued.

	rating	NWDBI score	type	CI?	site	site name
Very Poor	1	14	R		WET-002	LRL Frog
	1	14	R		WET-003	Schneider 7
	1	14	R	--	nochems3	Between 22-9 & B
	1	14	R	--	2001-01	Reykdahl 2001
	1	14	RR	CI	2003-01	Kakagon @ Wood Cr 2003
	1	14	R		2003-10	Reykdahl 2003
	1	13	R		WET-005	Hwy 63 W
	1	13	R		WET-006	Hwy 70 NE
	1	13	RR	CI	2002-06	Kakagon @ Bear Trap 2002
	1	13	RR	CI	2003-03	Big Round 2003
	1	12	A		WET-015	Tozer Springs
	1	12	R	CI	WET-007	Hwy 70 NW
	1	12	RR	--	2001-06	Kaggerville 2001
	1	12	R	--	2001-07	Elm Creek 2001
	1	12	RR	CI	2002-07	Big Round 2002
	1	12	RR	CI	2002-08	Kakagon @ Wood Cr 2002
	1	10	A		WET-012	Spooner Ag Station
	1	10	U		WET-011	Birch Hill Sewage Bad River
	1	10	R	CI	2002-04	Bad River @ Mouth 2002
	1	10	RR	CI	2002-05	Kaggerville 2002
	1	10	RR	CI	2003-02	NE Slough 2003
	1	10	R		2003-09	Caville Rd 2003
	1	9	U		WET-010	Rhinelanders Big Box Store 2
	1	9	U		WET-111	Birch Hill Sewage Bad River
	1	8	R	--	nochems 1	22-8 (pool)
	1	7	U	--	2001-03	Birch Hill Sewage 2001
1	7	R	CI	2002-03	Frost 2002	
1	6	U		WET-009	Rhinelanders Big Box Store 1	
1	6	U		WET-013	Spooner Ball Park	



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