2018 Wetland Health Evaluation Program

Dakota County, Minnesota

2018 Wetland Health Evaluation Program Report
Dakota County, MN

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Revised April 2019

Report
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FORTIN CONSULTING, INC.
serving the environment

Acknowledgements

The following organizations participated in and provided funding for
the 2018 Wetland Health Evaluation Program

Local Government:
Dakota County Environmental Resources Department
Dakota County Parks Department
City of Apple Valley
City of Burnsville
City of Eagan
City of Farmington
City of Hastings
City of Lakeville
City of Mendota Heights
City of Rosemount
City of South St. Paul
City of West St. Paul
North Cannon River Watershed Management Organization
Vermillion River Watershed Joint Powers Organization

Special Recognition:
Mark Gernes, Joel Chirhart, Michael Bourdaghs, John Genet; MPCA Technical Experts
Paula Liepold, Dakota County WHEP Coordinator
Mary Karius, Hennepin County WHEP Coordinator
Jeff Korpik, Citizen Monitoring Coordinator
Katie Farber, Carolyn Dindorf; Fortin Consulting

Cover design by:
Paula Liepold

Photos by:
Katie Dennis, Amy Jo Forslund, Emily Gable, Sondra Larson, Tom Loretto, Marianne McKeon, Cindy Taintor, Dianne Rowse, Rick Schuldt, Steve Weston, and Fortin Consulting, Inc.

Special thanks to all of the WHEP volunteers who donated their time and were out in the wetlands or behind the microscopes.

For more information on the Dakota County Wetland Health Evaluation Program or for a copy of this report, please contact the Dakota County Environmental Resources Department or visit ***www.mnwhep.org.***

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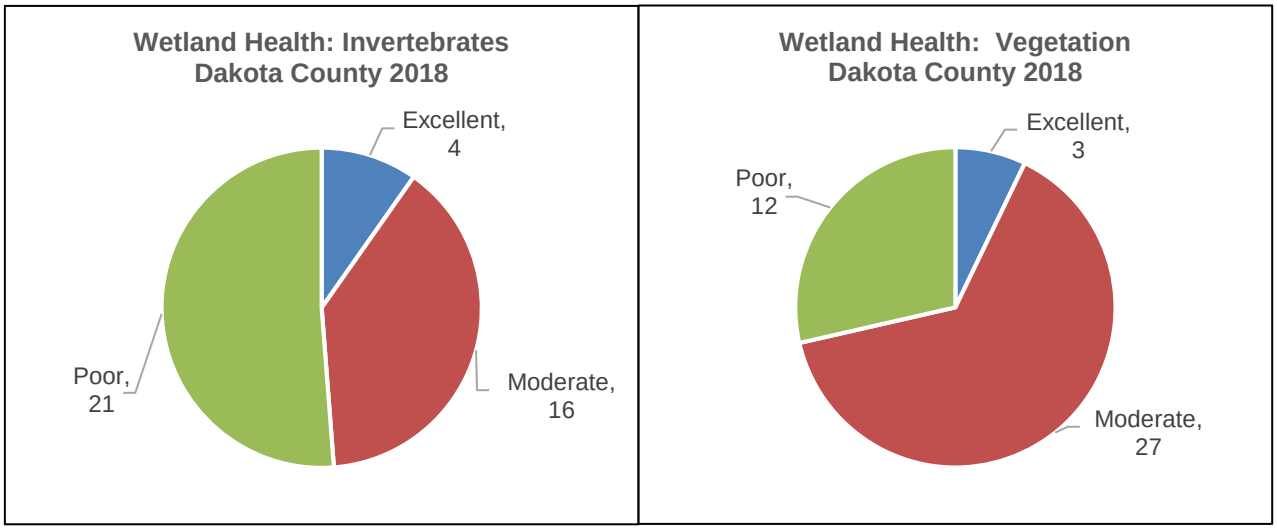
Executive Summary

Dakota County Wetland Health Evaluation Program 2018

Dakota County began sponsoring the Wetland Health Evaluation Program (WHEP) in 1997. Since then, 193 wetlands have been monitored by many volunteers across the County. In 2018, ten cities, one watershed management organization, and Dakota County Parks sponsored WHEP teams, monitoring 42 different wetlands. Eight of these wetlands were monitored for the first time in 2018, including sites from Dakota County Parks, Eagan, Farmington, and Mendota Heights. Trained volunteers collected data on the macroinvertebrates (insects and other small animals without backbones) that live in the wetlands as well as the vegetation (plants) in the wetlands. The invertebrates and vegetation identified by the volunteers were then used to calculate an Index of Biotic Integrity (IBI). This IBI can be used to estimate the health of each wetland.

The results of the monitoring for 2018 showed a variety of wetland conditions. The Index of Biotic Integrity was used to determine wetland health ranging from poor to excellent. The majority of wetlands were in the poor category for macroinvertebrates (51%) and the moderate category for vegetation (64%). Four wetland sites rated excellent for macroinvertebrates: Crystal Lake West (B-1), Kraemer (B-3), 180th Street Marsh (H-56), and White Lake (R-2). Three wetland sites rated excellent for vegetation Lake Rebecca (H-6), DNR #387 (L-7), and Copperfield (MH-2). The City of Hastings' 180th Street Marsh had the highest invertebrates score and one of the lowest vegetation scores in 2018.



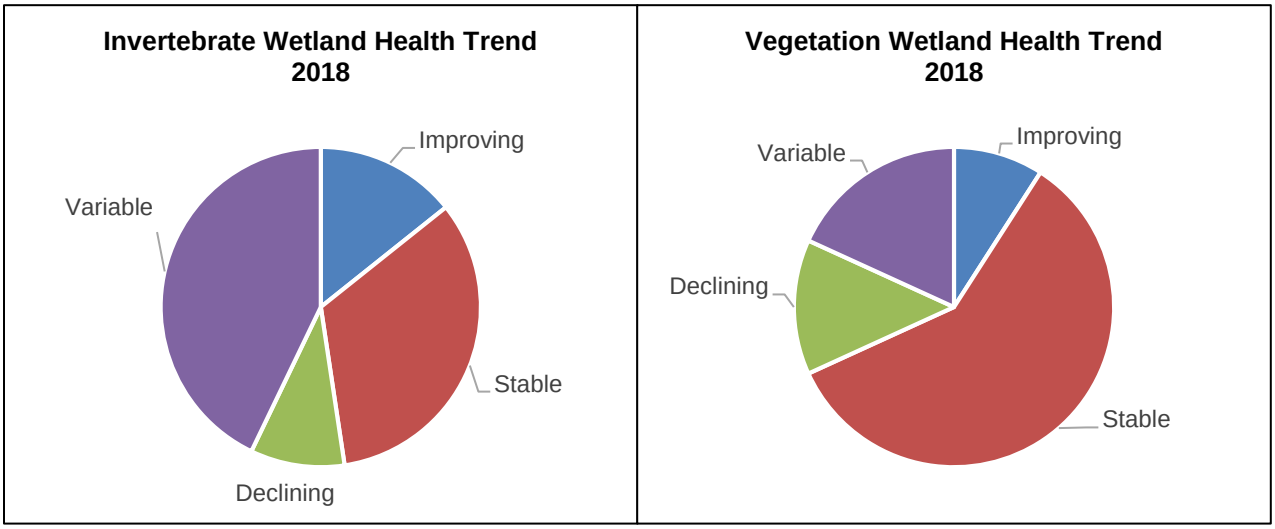
The City of Hastings' 180th Street Marsh (H-56) had the highest invertebrates score (30) and the Cities of Hastings' Lake Rebecca (H-6), Lakeville's DNR #387 (L-7), and Mendota Heights' shared the highest vegetation score (27) in 2018. The City of South St. Paul's Anderson Pond (SSP-1) had the lowest invertebrates score (6). The City of Burnsville's Kraemer (B-3), Dakota County Parks' Duck Pond (DC-10), and Hastings' 180th Street Marsh (H-56) and Cari Park Pond (H-57) shared the lowest vegetation scores (13) in 2018.

A trend analysis was conducted for all of the wetlands monitored in 2018 that had enough data to analyze trends. The overall trends are indicated as follows; however, the health of each wetland is unique and

observed changes in health score trends are discussed with each wetland later in the report. For invertebrates, three of the wetlands appear to be improving, two are declining, seven are stable, and nine have variable data trends. For vegetation, two the wetlands appear to be improving, three are declining, 13 are stable, and four have variable data trends. Twenty wetlands did not have enough years of data to demonstrate a health trend.

Several analyses were done to try to identify some of the causes of wetland health conditions found. No significant relationships were found between IBI scores and wetland alterations.

2018 Dakota County Wetland Health Trends*



*excludes wetlands that did not have adequate data for trend analysis

In 2018, 133 Dakota County WHEP volunteers donated more than 2,438 hours in training, sample collection and sample identification in completion of this valuable monitoring. It gives citizens an opportunity to study the wetlands in their communities and see the impacts of human disturbance on our wetlands, and it provides valuable data to the cities and County. The data collected by the WHEP volunteers can be used for many purposes such as, to help track changes in wetlands over time and relate to changes in the watershed, help identify high quality wetlands that may need protection, track changes in wetland health with restoration projects, evaluate the success of wetland creation or impacts of new stormwater input, and to help find invasive species that threaten the wetlands. WHEP is a great example of a successful cooperative program between citizens, cities, counties and state government.

1.0 Background

The Wetland Health Evaluation Program (WHEP)

The Wetland Health Evaluation Program (WHEP) is a volunteer monitoring program for wetlands. WHEP uses sampling methods and evaluation metrics developed by the Minnesota Pollution Control Agency (MPCA) to evaluate wetland health. The metrics are based on species diversity and richness for both vegetation and macroinvertebrates. Citizen teams, led by a trained team leader with education and/or work experience in natural resources, conduct the sampling.

WHEP got its start at the MPCA in the 1990s, when Mark Gernes and Judy Helgen were separately developing biological indexes to measure wetland health using grants from the US Environmental Protection Agency (US EPA). Mark's biological index was based on wetland plants, Judy's on invertebrates. Developing chemical standards for measuring pollution in wetlands seemed impossible then, so they pushed for the biological approach, as did US EPA.

JUDY HELGEN,
PROGRAM CO-FOUNDER

Wetlands are generally not viewed as having the same status as streams and lakes. The Wetland Conservation Act helps maintain the number and acreage of wetlands in Minnesota, but often the quality of the wetlands is not protected. MPCA staff recognized that they could teach citizens how to evaluate wetlands and they could convince their local governments to protect the water quality as reflected by the diversity of organisms and plants that thrive in healthy wetlands.

MARK GERNES,
PROGRAM CO-FOUNDER
(DEMONSTRATING HIS "SEDGE THREE-RANKED" POSE)

In 1996, the MPCA partnered with Minnesota Audubon, forming a large contract with them (with EPA funds) to help start WHEP. Audubon handled the logistics for the various training sessions and organization of the original teams of volunteers linked to six communities in Scott County. Mark and Judy provided the training and developed the guides for sampling protocols and identifications based on MPCA's more technical biological indexes.

Wetland sampling efforts began in 1997 in Dakota County. During 1998-2000, the program was managed by the Dakota Environmental Education Program. During these years, the project was funded by various sources, including the US EPA grant, Minnesota Legislature (LCCMR grant), and participating cities. Gradually, the number of cities participating in WHEP increased under the leadership of Charlotte Shover and Dan Huff, and now Paula Liepold at Dakota County. Up to thirteen cities/citizen teams have participated in the project in Dakota County. MPCA continues to provide the training, but the organization of teams and other logistics are handled by the County and communities.

Hennepin County joined the project in 2001, and began co-managing with Dakota County in 2002. Dakota County, the Vermillion River Watershed Joint Powers Organization, participating cities, and North Cannon River Watershed Management Organization provide funding for Dakota County WHEP. Today, the program is strong and thriving in both Dakota and Hennepin counties, setting an example for the nation in volunteer wetland monitoring.

Why Monitor Wetlands?

Why are we sampling the plants and critters that live in wetlands? Many aquatic invertebrates (animals without a backbone that live in water) spend much or most of their life living in wetlands. Because these animals are exposed to the conditions within the wetland for a period of time, they serve as indicators of the health of the wetland. Some are more sensitive to pollution and habitat conditions than are others. Aquatic plants also respond to wetland conditions. Different plants are found in different water quality and bottom conditions. If we evaluate what is living in a wetland, we can assess its general condition. When the same wetlands are monitored over time, the data can also be used to track changes in wetland health.

The information collected by the WHEP volunteers can be used by decision makers to help identify the highest quality wetland resources and identify those that have been negatively impacted. More information is available to help with decisions regarding development, transportation corridors, and other areas that may affect our water resources. For example, wetlands ranked as excellent may receive more protection. Cities can use this information to evaluate the overall success of creation or restoration projects or to evaluate the impact of new stormwater inputs.

Citizen volunteers are an essential component to WHEP's success. Each season, volunteers are relied upon to provide important data on the health of wetlands in their communities. The data collected is used by the cities, counties, and the State of Minnesota to better plan and protect these environments.

Although ten million acres of wetlands remain, Minnesota has lost approximately 50 percent of its wetlands since it became a state. Throughout the country, wetlands are being lost due to agriculture, development, and road expansion. Wetlands play a vital role in ecosystems by filtering runoff for groundwater, absorbing rain and snowmelt before flooding, providing habitat for mammals, birds, amphibians, reptiles, and many other organisms, and creating beautiful views for our own recreation. Since the adoption of the Minnesota Wetland Conservation Act, Minnesota has worked to maintain no-net-loss of wetlands.

Everyone involved in Minnesota WHEP past, present, and future can be pleased with their contribution, and rewarded with increasingly healthier wetland ecosystems to enjoy for years to come.

Wetland Types

Wetlands make up about 6.5 percent (24,501 acres) of the total area in Dakota County. Using the Circular 39 classification system, eight different wetland types are recognized in Minnesota. A description of each type and estimates of acreage are listed below. Two additional wetland categories are included in the total, riverine (between banks) and industrial/municipal (dike-related impoundments). WHEP focuses on the open water wetlands, types 3, 4 and 5.

Type 1 – Seasonally Flooded Basin or Flat: 5,995 acres
Seasonally Flooded Basins or Flats are fully saturated or periodically covered with water, usually with well-drained soils during much of the growing season. The vegetation varies from bottomland hardwoods to herbaceous plants depending on the season and length of flooding.

Type 2 – Wet Meadow: 551 acres
Wet Meadow wetlands usually do not have standing water, but have saturated soils within a few inches of the surface during the growing season. Grasses, sedges, rushes, and various broad-leaved plants dominate Wet Meadows. Common sites include low prairies, sedge meadows, and calcareous fens.

Type 3 – Shallow Marsh: 12,491 acres
Shallow Marsh wetlands often have saturated soils and six inches or more standing water during the growing season. Grasses, bulrush, spike rush, cattail, arrowhead, pickerelweed, and smartweed often grow in these wetlands.

Type 4 – Deep Marsh: 778 acres
Deep Marsh wetlands often have inundated soils and six inches to three feet or more standing water during the growing season. Cattail, reed, bulrush, spike rush, and wild rice grow in these wetlands. Pondweed, naiad, coontail, watermilfoil, waterweed, duckweed, water lily, and spatterdock can often be found in the open water areas.

Type 5 – Shallow Open Water: 1,213 acres
Shallow Open Water wetlands have standing water less than 10 feet deep. These wetland types include shallow ponds and reservoirs. Emergent plants are often found in these areas.

Type 6 – Shrub Swamp: 1,188 acres
Shrub Swamp wetlands are often covered with up to six inches of water, and the soils are usually completely saturated. The water table is usually at or near the surface of these areas. Alder, willow, buttonbush, dogwood, and swamp privet inhabit these areas.

Type 7 – Wood Swamp: 1,859 acres
Wood Swamp wetlands often have one foot of standing water, and the soils are completely saturated during the growing season. The water table is usually at or near the surface of these areas. Hardwood and coniferous swamps contain tamarack, northern white cedar, black spruce, balsam fir, balsam poplar, red maple, and black ash.

Type 8 – Bogs: 0 acres
Bogs are often supplied by the water table being at or near the surface of these areas. The acidic peat soils are usually saturated. Heath shrubs, sphagnum mosses, sedges, leatherleaf, Labrador tea, cranberry, and cottongrass dominate bogs.

Riverine: 52 acres
Wetlands associated with rivers and found between the river banks.

Municipal/Industrial: 374 acres
Municipal/Industrial wetlands include diked areas.

Total wetland area in Dakota County: 24,501 acres

Many federal and state agencies are involved in wetland regulation, protection, and restoration. In Minnesota, the state wetland regulations are overseen by the Board of Water and Soil Resources and

Department of Natural Resources. To learn more about regulations and programs that affect or protect wetlands, visit www.bwsr.state.mn.us and click on wetlands. Many cities, watershed organizations and counties have adopted local administration of the state Wetland Conservation Act.

Dakota County Wetland Monitoring

There are many hands involved in the success of the Dakota County Wetland Health Evaluation Program (WHEP). It is invaluable to have a dedicated and enthusiastic group of people working together to continue the success and growth of the program each year.

PAULA LIEPOLD AND EMILY GABLE

Dakota County is proud to support the Wetland Health Evaluation Program and its volunteers. We appreciate the volunteers and local government units for participating in WHEP. Paula Liepold and Emily Gable enjoyed working together to manage the program.

JEFF KORPIK

Jeff Korpik is the Field Coordinating Monitor for Dakota County WHEP. He has been involved in WHEP since 2007 as a volunteer, team leader, and Field Monitoring Coordinator. Jeff commented, "I really enjoyed my second year as field supervisor. My favorite part is traveling all around the county and seeing all of the sites, good and bad, the cities pick for monitoring. I want to thank all of the dedicated volunteers and team leaders, and especially hope some of the younger team leaders stay active in the program. I still miss being part of a team, but I got to help several times this summer when team leaders were short of volunteers. Looking forward to next season!"

2.0 Methods

2.1 Training

Training for citizen monitors is arranged by Dakota and Hennepin counties and taught by technical experts from the MPCA and Fortin Consulting. Both classroom and field sessions are held. Training is provided on vegetation plot selection/sampling and invertebrate sampling (dip netting and setting/retrieving bottle traps). Volunteers learn to identify the vegetation and macroinvertebrates during laboratory identification sessions which cover sampling protocol, key characteristics for invertebrate and plant identification, as well as hands-on identification of live and preserved specimens. For a more detailed explanation of the methods used in WHEP, visit www.mnwhep.org.

Minnesota Pollution Control Agency Experts

Part of the success of WHEP is due to the great assistance provided by the knowledgeable team of experts from the MPCA. Mark Gernes and Michael Bourdaghs provide WHEP vegetation training and technical assistance. Joel Chirhart and John Genet provide WHEP macroinvertebrate training and technical assistance.

MARK GERNES

MICHAEL BOURDAGHS

Mark Gernes commented, "WHEP is an opportunity for citizens to learn about wetland plants and bugs, build lasting friendships all while helping our local communities protect and manage water resources. As a watershed professional I value the contribution citizen scientists are able to make. Each year I look forward to recounts of citizen experiences in their local wetlands."

JOEL CHIRHART

JOHN GENET

The MPCA staff support WHEP and have been very helpful in making WHEP a success.

2.2 Data Collection

In order to use the data to interpret the health or condition of the wetlands, a scoring process called the Index of Biological Integrity (IBI) is used. Separate IBIs are calculated for plants and macroinvertebrates. Several measures, referred to as metrics, are used to calculate an IBI. The IBI scores are categorized into poor, moderate or excellent. Biological integrity is commonly defined as "the ability to support and maintain a balanced, integrated, and adaptive community of organisms having a species composition,

diversity and functional organization comparable to those of natural habitats within a region" (Karr, J. R. and D. R. Dudley. 1981. Ecological perspectives on water quality goals. Environmental Management 5: 55-68). Biological integrity is equated with pristine conditions, or those conditions with no or minimal disturbance (U.S.EPA www.epa.gov/bioindicators/html/about.html). Each city participating in WHEP has identified "reference" wetlands, those that are believed to be minimally disturbed and represent the most pristine conditions within the city.

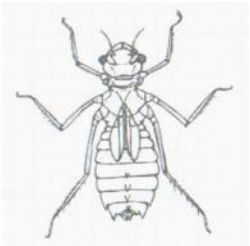
Vegetation Index of Biological Integrity (IBI)

Vegetation is analyzed using a 100 square meter releve plot. All species within the sampling plot are identified to the genus level, and documented on the field data sheet. Vegetation is divided into categories based on their ecological function or relationship. The categories include nonvascular, woody, grass-like and forbs. The forbs are further subdivided into various submergent and emergent categories. The number and coverage of genera identified are then evaluated using the metrics developed by MPCA.

The methodology and evaluation for the vegetation IBI has remained relatively consistent throughout the project. However, the persistent litter metric calculation was revised in 2004 to reflect average cover values as compared to maximum cover values. In 2005 and again in 2015, minor changes to the data sheets were implemented to reduce the number of transcription errors. The scoring criteria were adjusted slightly to better represent vegetation diversity. Previous changes in methodology have been documented in earlier summary reports.

Macroinvertebrate IBI

Macroinvertebrates (small aquatic animals with no backbone) are analyzed by collecting samples using six bottle traps and two dip netting efforts combined to represent one sample. The invertebrates are then identified to the genera or "kind" level. Generally, the invertebrates evaluated are macroinvertebrates and include leeches, bugs and beetles, dragonflies and damselflies, caddisflies, mayflies, fingernail clams, snails, crustaceans and phantom midges. The number of genera identified is then evaluated using the metrics developed by MPCA.



DRAGONFLY GRAPHIC: MPCA

Several changes have been made to the data collection and metrics for the invertebrate IBI over the duration of the program. There were no modifications to the methods after 2004. Previous changes in methodology have been documented in earlier summary reports.

Blank data sheets and equipment lists can be found at www.mnwhep.org.

2.3 Cross-Checks and Quality Control

Each city is responsible for evaluating one wetland in another city as a means of providing a cross-check. The citizen cross-check provides a second sample for the selected wetland. The purpose of the cross-check is to determine if two different samples provide similar results for the vegetation and invertebrate IBI. Large wetlands and wetlands with complex plant communities may have different site scores, depending on where the samples are collected. The Citizen Monitoring Coordinator (Jeff Korpik) provides advice

regarding proper sampling methods and proper site selection. Fortin Consulting provides Quality Control (QC) review of the completed data sheets. This review identifies and corrects errors in scoring, transfer of data, and data analysis.

Fortin Consulting (FCI), the technical expert, provides quality assurance and report preparation. FCI has been working with Dakota County on the WHEP program since 2007. FCI conducts QC checks on the wetlands sampled by reviewing the vegetation sample plot that was selected and evaluated by the citizen team. FCI also checks the invertebrate identification of the citizen team for the invertebrate IBI; therefore, the invertebrate QC is not a second invertebrate sample of the same wetland site, but a review of the sample collected and evaluated by the citizen team.

CONNIE FORTIN, JESSICA JACOBSON, LAUREN SCHULZETENBERG, CAROLYN DINDORF, ROMAN ROWAN, AND KATIE FARBER

Over the duration of the project, the work of each citizen team has been reviewed on a rotational basis. The technical expert reviews 10 percent of the vegetation plots and one invertebrate collection from each team. In 2018, Fortin Consulting cross-checked the vegetation plots of four wetlands, one in Burnsville (B-3), Lakeville (L-8), Rosemount (R-2), and West St. Paul (WSP-6). Fortin Consulting also reviewed the invertebrate samples from sites AV-7, B-2, DC-5 (DC Team 1 and DC Team 2 turned in invertebrate samples for review from same wetland), E-43, F-7, H-6, L-8, MH-2, NCR-2, R-2, SSP-1, and WSP-6. The purpose of the checks is to determine if the data being collected by the citizen team is accurate and complete, to verify and correct the samples, and to help the teams better interpret their data and strengthen their vegetation and invertebrate identification. The tables and graphs in Section 4.0 include the corrected data from both the scoring checks and the technical quality control checks. The official data scores are derived from the City team's data incorporating any corrections made during the technical quality control checks (invertebrate identification review, vegetation cross-check, and datasheet review) conducted by FCI. Data for the cross-check's conducted by another City team is presented in Section 3.2.

2.4 Wetland Scores and Quality Ratings

Each metric, or measure, is evaluated based on the specimens identified and given a score of one, three or five points. The scores for each metric are then combined to get a total score for the IBI. Table 2-1 illustrates the scoring range for each IBI, the corresponding quality rating, and the scores in percent form.

Table 2.1 Interpretation of site IBI scores.

INVERTEBRATE IBI SCORE INTERPRETATION			**VEGETATION IBI SCORE INTERPRETATION**		
Point Scores	**Quality Rating**	**Percent Score**	**Point Scores**	**Quality Rating**	**Percent Score**
6 – 14	Poor	<50%	7 – 15	Poor	<46%
15 – 22	Moderate	50 – 76 %	16 – 25	Moderate	46 – 74%
23 – 30	Excellent	>76%	26 – 35	Excellent	>74%

The ratings (poor, moderate, and excellent) are useful to give the wetland a qualitative description, which can make it easier to describe the overall quality of the wetland. A wetland described as having poor quality would have low species richness (number of species) and diversity and a large number of the species would likely be pollution tolerant. A wetland of excellent quality would have high diversity and species richness and would include species that are sensitive to pollution or human disturbance. It should be noted that the invertebrate and vegetation IBIs have slightly different ratings based on the scoring range. This is due, in part, to the number of metrics evaluated in each IBI: six for the invertebrate IBI and seven for the vegetation IBI.

Converting IBI scores to percentages allows for the ability to compare the site scores over several years. Thus, the trend in the vegetation or invertebrate IBI can be evaluated. Additionally, the percent scores allow comparison of the IBI results for a given year. This may be helpful to determine if the scores are consistent, and to determine if additional data collection or more intensive evaluation is necessary to characterize the wetland.

IBI point scores can be used to directly compare sites for a given year; however, they cannot be used to compare sites from year to year because:

- The 1998 invertebrate IBI was scored using seven metrics as compared to the six that have been used in 1999 until present.
- The ranges used to determine the quality rating have been modified since 1998 and numerous scoring sheet and metric modifications have been occurring as well.
- The total possible score is not the same for the two IBIs (vegetation IBI has seven metrics with a possible 35 point score while the invertebrate IBI has six metrics with a possible 30 point score).

2.5 Using the Data

Biological data can be difficult to interpret and use. Converting the data collected to metrics and indexes is helpful in interpreting and presenting the data. The methods used in WHEP allow one to identify wetland health conditions. However, they do not determine the cause of poor wetland health. Once a condition of poor wetland health is identified and confirmed, additional testing and analysis of the wetland may be necessary to further define the problem. For example, monitoring of nutrient and/or chloride may be appropriate. To identify the cause of poor wetland health, analysis of surrounding land use, stormwater inputs and other potential stressors is the next step.

For those wetlands identified as having excellent wetland health, local governmental organizations may choose to adopt requirements to provide protection to these wetlands in order to maintain wetland health. Where poor wetland health or declining trends are indicated, steps may need to be taken to help reverse the trend. Best management practices (BMPs), actions taken to reduce pollutant loading or stressors to the wetland, may need to be implemented within the wetland or in the surrounding watershed.

When BMPs are implemented, biological monitoring can be used to help track the impacts of the BMPs on the wetland. Continued monitoring can identify a change in trend or improvement in a wetland.

3.0 General Results and Recommendations

3.1 2018 Sampling Season Results

During the 2018 sampling season, thirteen citizen teams (Apple Valley, Burnsville, Dakota County Parks Team 1, Dakota County Parks Team 2, Eagan, Farmington, Hastings, Lakeville, Mendota Heights, North Cannon River Watershed Management Organization, Rosemount, South St. Paul, and West St. Paul) monitored 42 wetlands in ten cities in Dakota County. Thirteen of these wetlands were sampled twice through citizen cross-checks. Four wetland vegetation samples and thirteen invertebrate samples were checked for accuracy through the quality control check performed by Fortin Consulting.

Figure 3.1.1 Dakota County Wetland Ratings

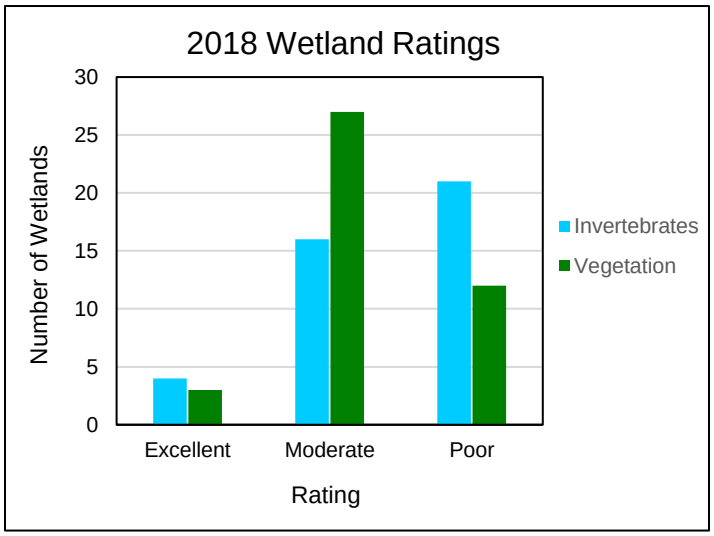


Figure 3.1.1 and Table 3.1.1 show the invertebrate and vegetation ratings for all of the wetlands assessed during the 2018 sampling season. Based on invertebrate scores, four of the wetlands rated excellent, 16 of the wetlands were rated moderate, and 21 rated poor. Invertebrate scores ranged from 6 to 30 out of a maximum of 30 points.

The vegetation analysis resulted in three wetlands rating excellent, 27 rating moderate and twelve poor. Vegetation scores ranged from 13 to 27 out of a maximum of 35 points.

Several of the sites showed different ratings for vegetation versus invertebrates. Twenty-four of the wetlands showed agreeing ratings for vegetation versus invertebrates. Differing ratings per wetland may be the result of varying factors influencing the plant and invertebrate communities in each wetland. Possible factors affecting wetland quality are described in the next section. Appendix A lists the wetland scores separated per metric per wetland. Each metric can achieve a score of 1, 3, or 5.

WHEP FIELD TRAINING

WHEP LAB TRAINING

Table 3.1.1 Wetland Ratings by City Based on IBI Scores

Values are listed as number of wetlands rated in each category for Invertebrates/Vegetation

City	Poor	Moderate	Excellent
Apple Valley (AV)	2/2	2/2	0/0
Burnsville (B)	0/1	2/3	2/0
Dakota County (DC)	6/2	2/6	0/0
Eagan (E)	1/0	2/3	0/0
Farmington (F)	2/0	1/3	0/0
Hastings (H)	2/3	1/0	1/1
Lakeville (L)	0/0	2/1	0/1
Mendota Heights (MH)	1/1	1/0	0/1
North Cannon River (NCR)	2/2	0/0	0/0
Rosemount (R)	2/0	0/4	1/0
South Saint Paul (SSP)	1/0	1/2	0/0
West Saint Paul (WSP)	2/1	2/3	0/0
Totals	**21/ 12**	**16/ 27**	**4/ 3**

Figures 3.1.2 and 3.1.3 show the distribution of wetland health ratings for each site monitored in 2017.

Note: For an interpretation of scores, please see page 7.

Figure 3.1.2 2018 Invertebrate Scores

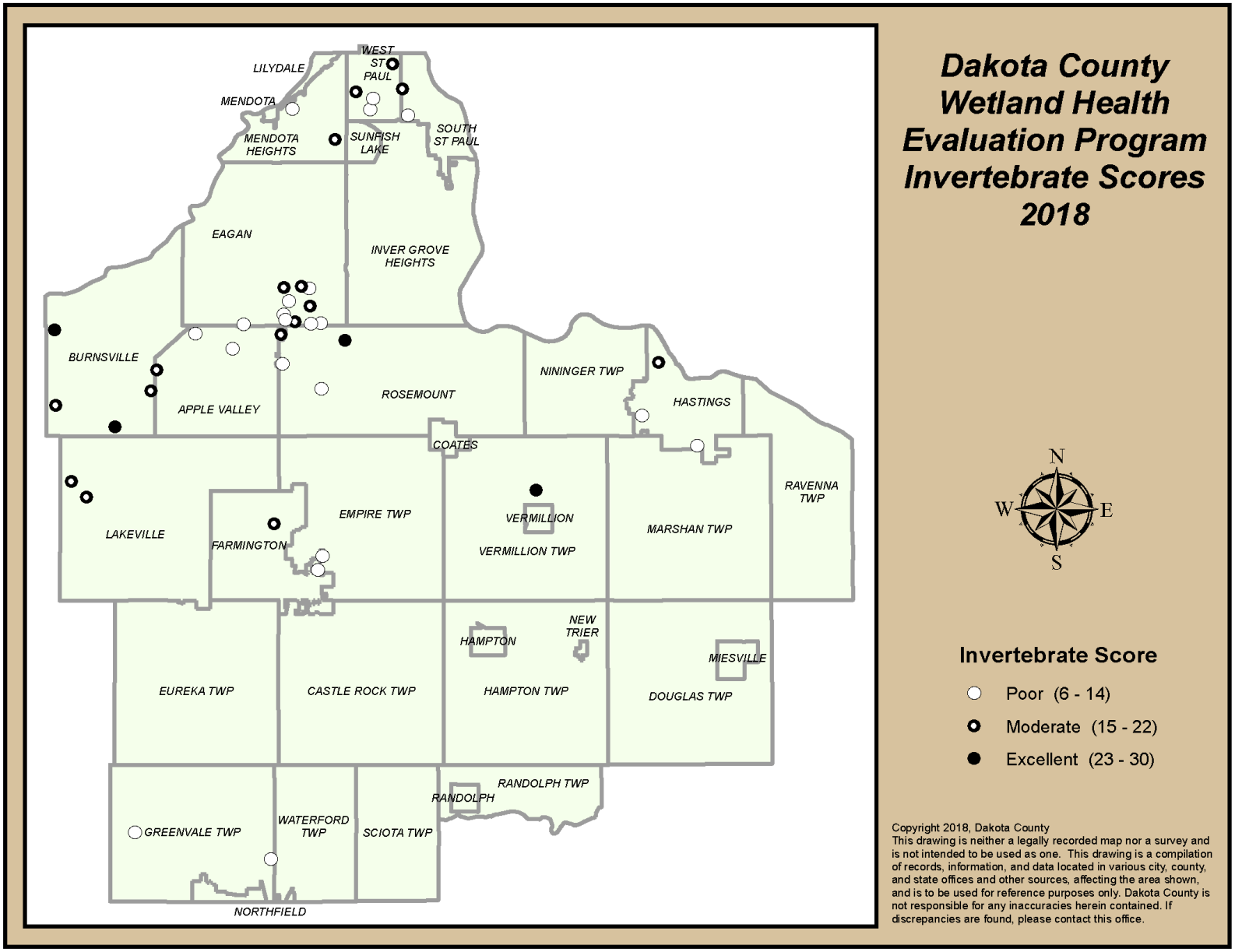
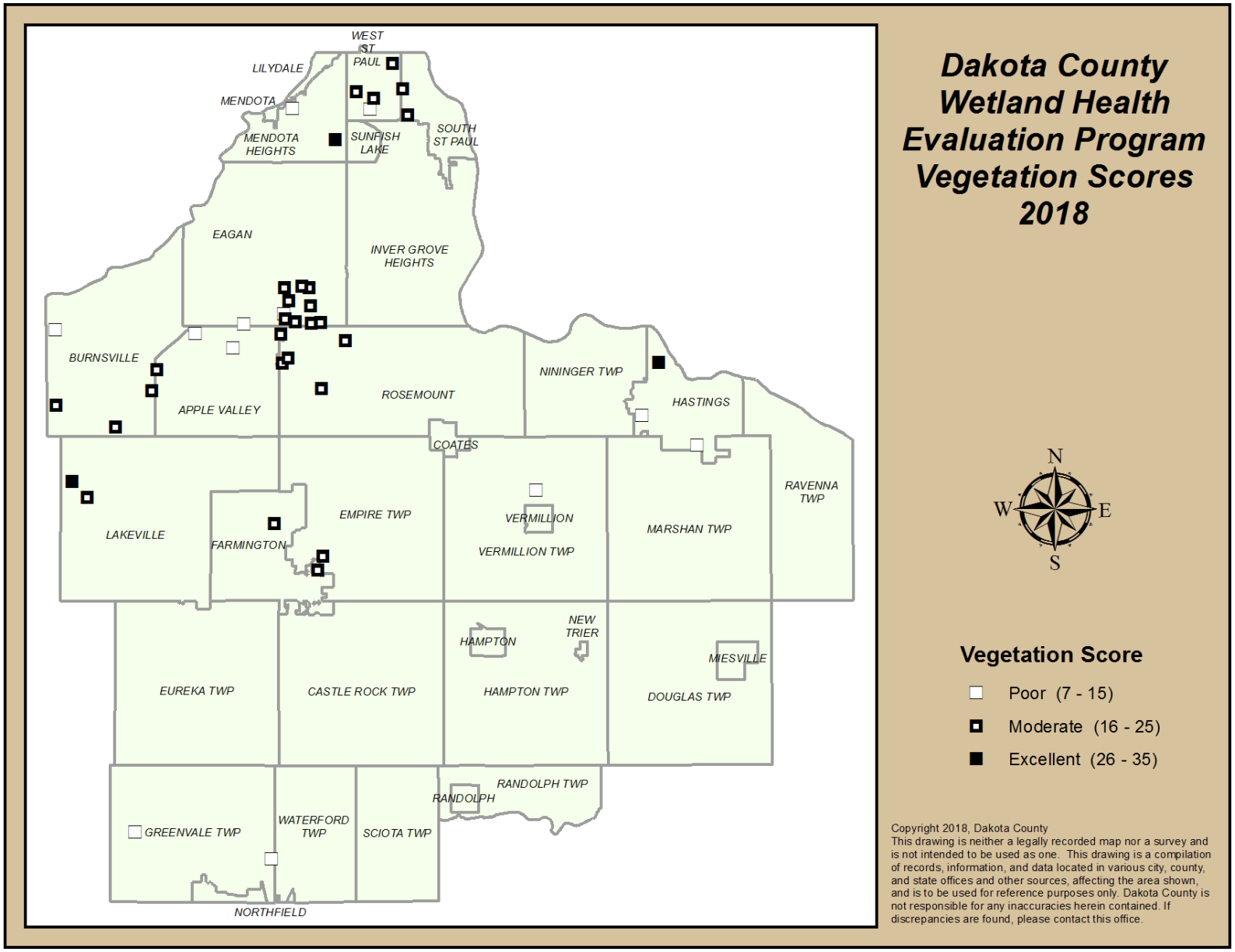


Figure 3.1.3 2018 Vegetation Scores



In an attempt to help identify why there are differences in wetland quality, different factors that impact the wetlands were evaluated.

3.1.1 Aquatic Invasive Species and Wetland Health

Invasive species are non-native organisms that spread to ecosystems beyond their natural historic range, causing harm to economic, environmental, or human health. Aquatic invasive species (AIS) are invasive species more generally found in or near water. Invasive species are often aggressive, spread quickly, and take over areas. They impact native habitat and species diversity. They may be introduced to new areas by wind, water, animals, humans, and other means of transport.

Early detection of invasive species can greatly reduce their success and spread. New infestations or smaller populations of invasive species require less resources to control, and chances of eradication are improved. Once established, invasive species are very difficult and expensive to control, and eradication is unlikely. Detecting and reporting the presence of invasive species early in their introduction to a new area is key. WHEP provides an opportunity for aquatic invasive species to be detected and reported early so that control can be implemented before they take over a wetland.

Aquatic invasive species education and early detection tools have been incorporated into WHEP, preparing WHEP volunteers as early detectors. WHEP volunteers receive AIS training including a presentation highlighting AIS to watch for, identification tips and techniques, and how to record and report AIS to authorities. Hands-on identification practice of native and non-native species is also offered at the invertebrate and vegetation trainings to heighten species recognition, demonstrate comparisons of species, and improve identification skills. WHEP volunteers also receive AIS identification materials, including the AIS Identification Guide by the University of Minnesota CFANS, and the Aquatic Invasive Species Early Detectors: A How to Guide by Minnehaha Creek Watershed District. Each team receives AIS early detection field data sheets to record findings during each wetland visit.

Invasive species that have not yet been introduced to Minnesota or exist in limited distribution, but are known to thrive in neighboring states with similar climates and ecosystems are being targeted for early detection. Highlighted species in WHEP training include starry stonewort (*Nitellopsis obtuse*), Hydrilla (*Hydrilla verticillata*), Brazilian elodea (*Egeria densa*), brittle naiad (*Najas minor*), Carolina fanwort (*Cabomba caroliniana*), water chestnut (*Trapa* natans), flowering rush (*Butomus umbellatus*), yellow iris (*Iris pseudacorus*), non-native phragmites (*Phragmites australis*), water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), and other invasive species already found in the wetlands.

WHEP teams are expected to report the presence of invasive species in the wetlands that they monitor. Findings in 2018 were as expected. Many of the WHEP wetlands have been found to contain invasive species, but no early detection species were observed in 2018. Reed canary grass (*Phalaris arundinacea*) and purple loosestrife **(***Lythrum salicaria*) are two common wetland invaders. Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), and Chinese mystery snails (*Cipangopaludina chinensis*) were also observed in wetlands monitored in 2018. Reed canary grass was found in 86 percent of the wetlands, purple loosestrife was found in 17 percent of the wetlands, Eurasian watermilfoil was found in 2 percent of the wetlands, curly-leaf pondweed was found in 5 percent of the wetlands, and Chinese mystery snails were found in 12 percent of the wetlands. In addition, buckthorn was reported in 17 percent of the wetlands. It is possible that other invasive species exist in wetlands, but were not observed near monitoring sites at each wetland. Appendix B shows the history of invasive species presence in WHEP monitored wetlands.

An analysis of variance (ANOVA) was completed to determine if the differences in wetland health scores were affected by the presence of invasive species, and statistically significant. Differences in IBI scores for wetlands with invasive species present vs. not present were not statistically significant.

3.1.2 Natural versus Altered Wetlands

Wetlands were classified as natural, altered by stormwater input, or created based on information provided in the site identification form from city staff. The average score of each site was used. In the past, WHEP team leaders have commented that the created wetlands seem to exhibit poorer insect diversity. The site averages indicate that created, stormwater, and natural wetlands are scoring similarly (Appendix B). An analysis of variance (ANOVA) was completed to determine if the differences were statistically significant. Differences in IBI scores comparing natural, created, and stormwater wetlands were not statistically significant. In addition, an ANOVA comparing IBI scores for natural, created and stormwater, showed no statistically significant difference between the three scores.

The score range between the created, stormwater, and natural wetlands is similar. The most recent invertebrate scores for each wetland show the lowest invertebrate scores for created, stormwater, and natural wetland, respectively, are 6, 6, 12. The highest invertebrate scores, respectively, are 30, 30, 28. The lowest vegetation scores for created, stormwater, and natural wetlands, respectively, are 11, 9, 11. The highest vegetation scores, respectively, are 27, 29, 27.

Wetland health scores vary from year to year. In 2018, the wetland health was not affected by the type of wetland (created, stormwater, or natural). One would expect that natural wetlands would support the richest and most diverse invertebrate and plant communities. Stormwater altered wetlands tend to have a greater short-term bounce (increase or decrease in water level) and more frequent fluctuations than natural wetlands. They are also inundated with pollutants found in stormwater. Created wetlands likely receive stormwater and thus would have some of the same impacts as stormwater wetlands and would take time to colonize. These factors are also likely to affect the type and diversity of plants found in the wetlands.

At this time, there is no statistical data indicating a decreased invertebrate community in natural versus disturbed or created wetlands. These results infer that the created wetlands are functioning similarly to the natural wetlands as far as the biological community. See Appendix C for detailed data.

3.1.3 Impervious Area in the Watershed

Data on percent impervious area (hard cover such as streets, parking lots and rooftops) in the watershed was compiled for each wetland based on the site identification forms submitted by each team sponsor. Wetlands with higher impervious areas in the watershed, likely receive more runoff and pollutants. Impervious areas ranged from 0 to 80% (Table 3.1.3). Studies have shown that stream degradation occurs at low levels of imperviousness (about 10%)[1]. A similar relationship may exist for wetlands too. Linear regressions have not shown any relationship between imperviousness and IBI scores. Watershed impervious area is likely a factor affecting wetland vegetation and invertebrate life, but there are other factors that are impacting these communities. Appendix D contains wetland and watershed data.

[1]Schueler, T. 2000. The Importance of Imperviousness, Article 1 in The Practice of Watershed Protection. Center for Watershed Protection. Ellicott City, MD.

3.1.4 Effect of Wetland Water Levels on Wetland Health

Wetland water levels fluctuate from year to year. They may fluctuate daily in response to rainfall and drought, as well. Water levels may affect site sampling placement. High water levels may push plots farther upland than normally placed. Water levels may also affect the species dominance and diversity. Wetter conditions may encourage more submergent and emergent species of vegetation. Drought, of course, may reduce the population of invertebrates. Water levels were measured by volunteer WHEP teams in 2018 within the vegetation plot sites. The lowest water level measured within the plots in 2018 was zero feet, the highest water level was 4.9 feet (1.5 m), and the average water level was 1.7 feet. A linear regression was completed to compare IBI scores to average plot depth. No significant relationship between IBI score and average plot depth was found for either invertebrates or vegetation. Results assume that vegetation and invertebrates sampling occurred in the same general vicinity of the wetland.

3.2 Is Volunteer Data Usable?

WHEP was designed with several layers of quality assurance and quality control to be able to identify and correct potential errors. This was put into place to make sure the data collected is scientifically justifiable and will be used. The WHEP protocol includes standard annual trainings; citizen monitoring leaders and team leaders that check on the team's collection methods, data entry, and metric calculations; cross-checks by other teams; and quality control checks by a professional consultant. With all of these checks in place, data users can be assured that the data and information presented is acceptable.

3.2.1 2018 Cross-checks

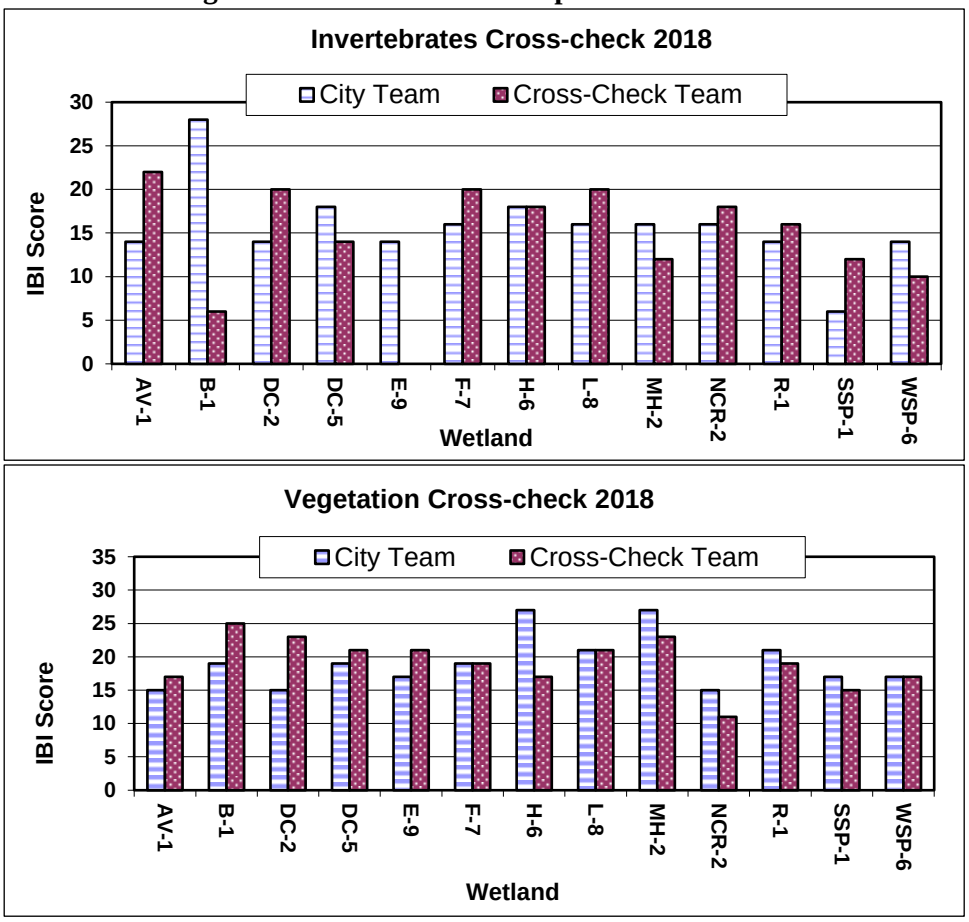
Each city team was responsible for evaluating one wetland in another city (Table 3.2.1). This citizen cross-check provides a second sample for the selected wetland. The purpose of this check is to determine if two different samples provide similar results for the vegetation and invertebrate IBI. Large wetlands and wetlands with complex plant communities may have different site scores, depending on where the samples are collected. The two samples are considered consistent if the IBI scores differ by six points or less. The majority of the samples are consistent (Table 3.2.1 and Figure 3.2.1). Invertebrate scores for AV-1 and B-1 were inconsistent, differing by 8 and 22 points, respectively. Vegetation scores for site DC-2 and H-6 were inconsistent, differing by 8 and10 points, respectively. The varied scores may indicate a difference in sampling technique, a change in conditions between sample dates, differences in identification accuracy, or some other cause. Below lists the obvious differences in scoring for those wetlands that were inconsistent. Data collected by the original City team is used for the individual wetland analysis in Section 4.0 of this report. Vegetation scores between City team and cross-check team for sites F-7 and WSP-6 were identical. Many scores were close in comparison.

- *AV-1:* The cross-check team identified a more diverse invertebrate community than the City team. This affected the Leech, Odonata, ETSD, and Total Invertebrate Taxa Metrics.
- *B-1:* The City team identified a more diverse invertebrate community than the cross-check team. This affected the Leech, *Corixidae*, Odonata, ETSD, Snail, and Total Invertebrate Taxa Metrics.
- *DC-2:* The cross-check team identified a more diverse vegetation community than the City team. This affected the Grass, *Utricularia*, and Aquatic Guild Metrics.
- *H-6:* The City team identified a more diverse vegetation community than the cross-check team. This affected the Vascular, Non-vascular, *Carex*, Aquatic Guild, and Persistent Litter Metrics.

Table 3.2.1 Citizen cross-checks (those considered inconsistent are shown in bold)

City Team	Cross-Check Team	Wetland Evaluated	Invertebrate Score Comparison		Vegetation Score Comparison	
			City	x-Check	City	x-Check
Apple Valley	Mendota Heights	AV-1	**14**	**22**	15	17
Burnsville	Eagan	B-1	**28**	**6**	19	25
Dakota County Parks Team 1	Dakota County Parks Team 2	DC-2	14	20	**15**	**23**
Dakota County Parks Team 2	Dakota County Parks Team 1	DC-5	18	14	19	21
Eagan	North Cannon River WMO	E-9	14	NA	17	21
Farmington	Hastings	F-7	16	20	19	19
Hastings	Farmington	H-6	16	18	**27**	**17**
Lakeville	Rosemount	L-8	16	20	23	21
Mendota Heights	Apple Valley	MH-2	16	12	27	23
North Cannon River WMO	Burnsville	NCR-2	14	18	15	11
Rosemount	Lakeville	R-1	14	16	21	19
South St. Paul	West St. Paul	SSP-1	6	12	17	15
West St. Paul	South St. Paul	WSP-6	14	10	17	17

Figure 3.2.1 Cross-check Comparisons of IBI Scores



3.2.2 2018 Quality Control Checks

Quality control checks were conducted at four sites for vegetation and thirteen sites for invertebrates in 2018 (Figure 3.3.2) by Fortin Consulting (FCI). The vegetation check was conducted by re-sampling the area marked off by the citizen team using the WHEP procedures and comparing results. For the invertebrates, FCI reviewed the insect samples collected and identified by the teams and completed the lab and metric sheets. The quality control review was done independently of the citizen team. The following sites were checked as a measure of quality control by FCI: AV-7, B-2, DC-5 E-43, F-7, H-6, L-8, MH-2, NCR-2, R-2, SSP-1, and WSP-6 were reviewed for invertebrate identification accuracy. B-3 L-8, R-2, and WSP-6 were reviewed for vegetation identification accuracy.

KRAEMER IN BURNSVILLE

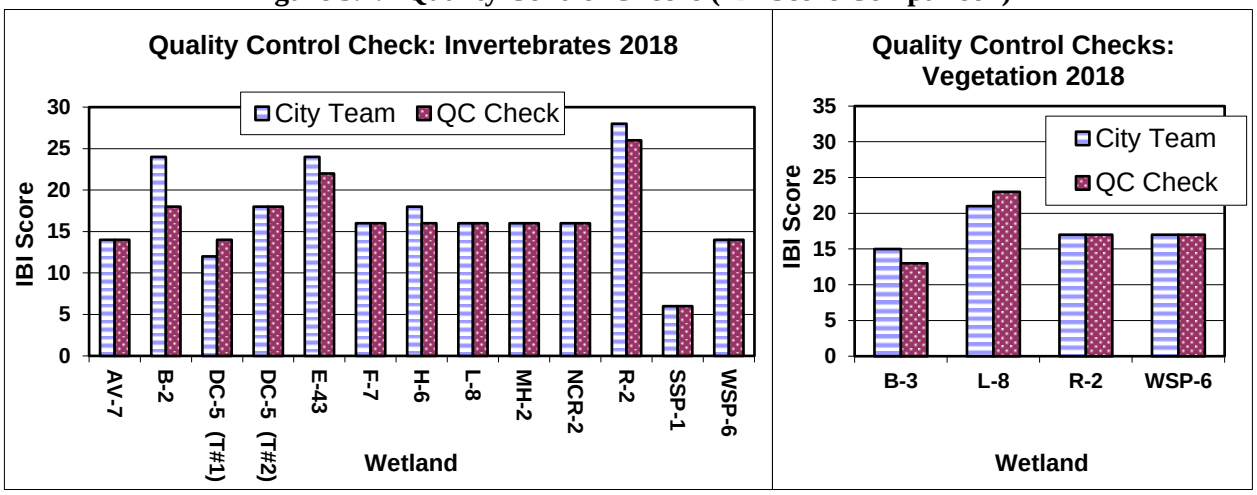
DNR #393 IN LAKEVILLE

WHITE LAKE IN ROSEMOUNT

MARTHALER PARK IN WEST ST. PAUL

All team invertebrate and vegetation scores were found to be consistent with the quality control checks. Each WHEP team did very well in both their invertebrate identification and vegetation surveys. This shows that with a high quality program that provides good training and oversight, citizen volunteers can collect good usable data.

Figure 3.2.2 Quality Control Checks (IBI Score Comparison)



WHEP also provides review of the data sheets for scoring and data transfer errors. This review is conducted by Fortin Consulting. Table 3.2.2 shows the data sheet review results. There were 18 transfer errors and 2 math errors. The transfer errors were due to either the data collected was incorrectly transferred to their proper metrics or metric scores were not successfully transferred from one set of calculations to the next. Corrections affected the scores by zero to four points. Many of these errors could be prevented by double-checking the transfer and math work on the data sheets. The quality control checks are working well. Errors are identified and corrections are made as needed.

Table 3.2.2 Data Sheet Review

		Invertebrate IBI Scores			Vegetation IBI Scores		
Team Name	**Site**	**Team**	**Review**	**Errors**	**Team**	**Review**	**Errors**
Apple Valley	AV-1	12	14	1	NA	NA	NA
	AV-7	14	14	0	15	15	0
	AV-18	20	20	0	17	17	0
	AV-20	14	16	1	17	17	0
	MH-2 cc*	12	12	0	23	23	0
Burnsville	B-1	28	28	0	19	19	0
	B-2	24	24	0	23	23	0
	B-3	24	24	0	15	15	0
	B-17	22	22	0	17	17	0
	NCR-2 cc*	18	18	0	11	11	0
Dakota Co 1	DC-2	14	14	0	NA	NA	NA
	DC-3	10	10	0	NA	NA	NA
	DC-6	11	10	1	NA	NA	NA
	DC-7	16	16	1	NA	NA	NA
	DC-5 cc*	11	12	1	NA	NA	NA
Dakota Co 2	DC-5	18	18	0	NA	NA	NA
	DC-8	14	14	0	NA	NA	NA
	DC-9	14	14	0	NA	NA	NA
	DC-10	12	12	0	NA	NA	NA
	DC-2 cc*	20	20	0	NA	NA	NA
Eagan	E-9	14	14	0	17	17	0
	E-31	22	22	0	17	17	0
	E-43	20	24	3	19	19	0
	B-1 cc*	6	6	0	23	25	1
Farmington	F-3	10	10	0	23	23	0
	F-7	16	16	0	19	19	0
	F-9	6	8	1	19	19	0
	H-6 cc*	18	18	0	19	17	1

		Invertebrate IBI Scores	Vegetation IBI Scores				
Team Name	**Site**	**Team**	**Review**	**Errors**	**Team**	**Review**	**Errors**
Hastings	H-4	10	10	0	15	15	0
	H-6	18	18	0	25	27	1
	H-56	30	30	0	13	13	0
	H-57	12	14	1	15	13	1
	F-7 cc*	18	20	1	19	19	0
Lakeville	L-7	22	22	0	27	27	0
	L-8	16	16	0	21	21	0
	R-1 cc*	16	16	0	17	19	1
Mendota Heights	MH-2	16	16	0	27	27	0
	MH-19	14	14	0	15	15	0
	AV-1 cc*	22	22	0	17	17	0
NCRWMO	NCR-1	12	12	0	15	15	0
	NCR-2	13	16	2	17	15	1
	E-9 cc*	NA	NA	NA	21	21	0
Rosemount	R-1	14	14	0	21	21	0
	R-2	28	28	0	14	17	1
	R-20	NA	NA	NA	21	21	0
	R-26	14	14	0	25	25	0
	L-8 cc*	20	20	0	21	21	0
South St. Paul	SSP-1	6	6	0	17	17	0
	SSP-3	16	16	0	17	17	0
	WSP-6 cc*	10	10	0	17	17	0
West St. Paul	WSP-3	12	12	0	15	15	0
	WSP-4	20	20	0	23	23	0
	WSP-5	16	16	0	19	19	0
	WSP-6	14	14	0	17	17	0
	SSP-1 cc*	12	12	0	15	15	0

cc*- indicates cross-check of another team's wetland

3.3 WHEP Historical Data

Since WHEP began in 1997, 193 wetlands have been sampled, but not all are sampled every year. Figures 3.3.1 and 3.3.2 provide an overall picture of wetland health in Dakota County based on the most recent sample collected for each wetland. The historical data can be found for each site since the start of the program at www.mnwhep.org. Section 4.0 includes the sites sampled in 2018 with an analysis of historical data, identifying sampling history and trends based on a trend analysis for those with adequate data. There is a spread in the distribution of poor, moderate and excellent ratings.

Figure 3.3.1 Most Recent Invertebrate Scores

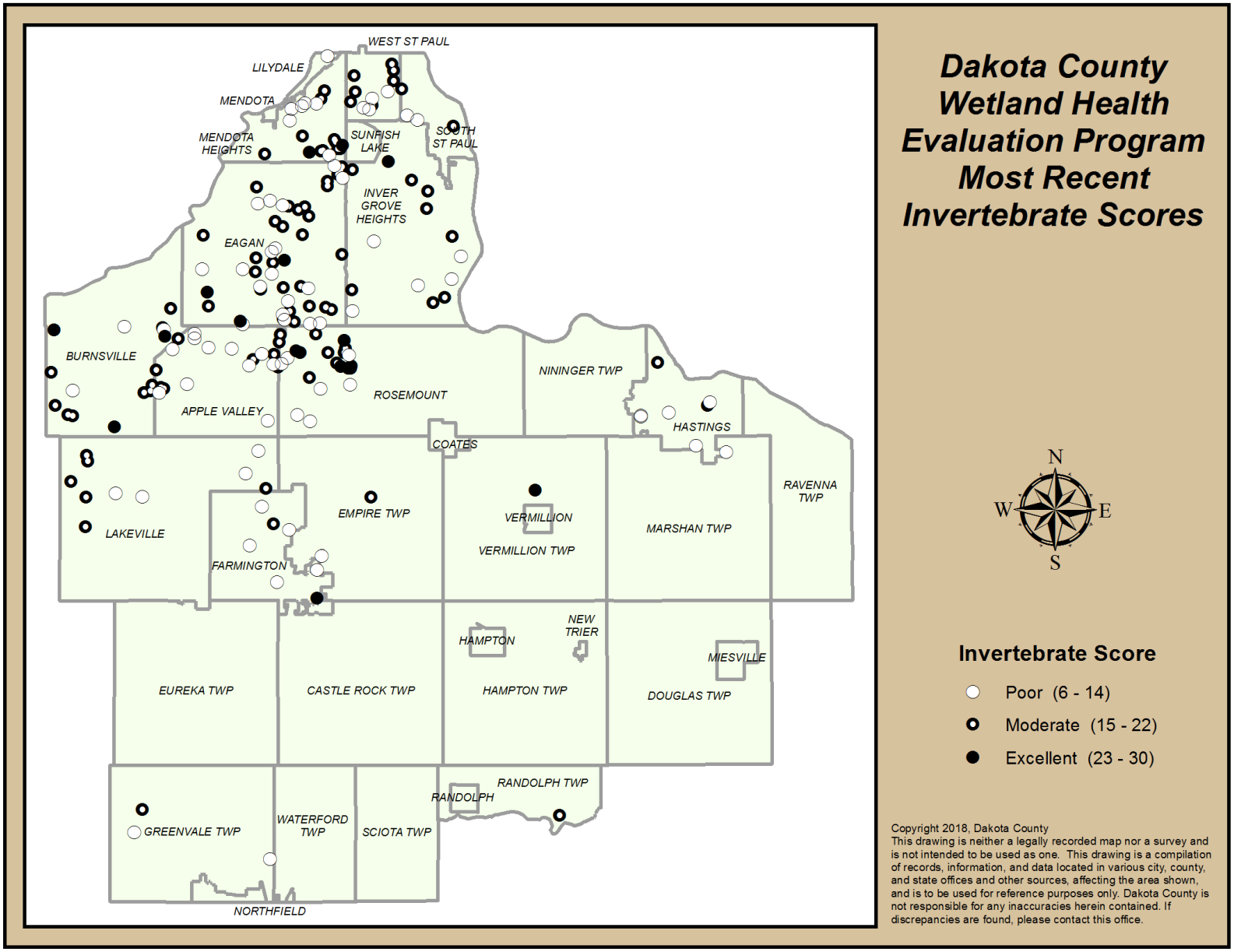
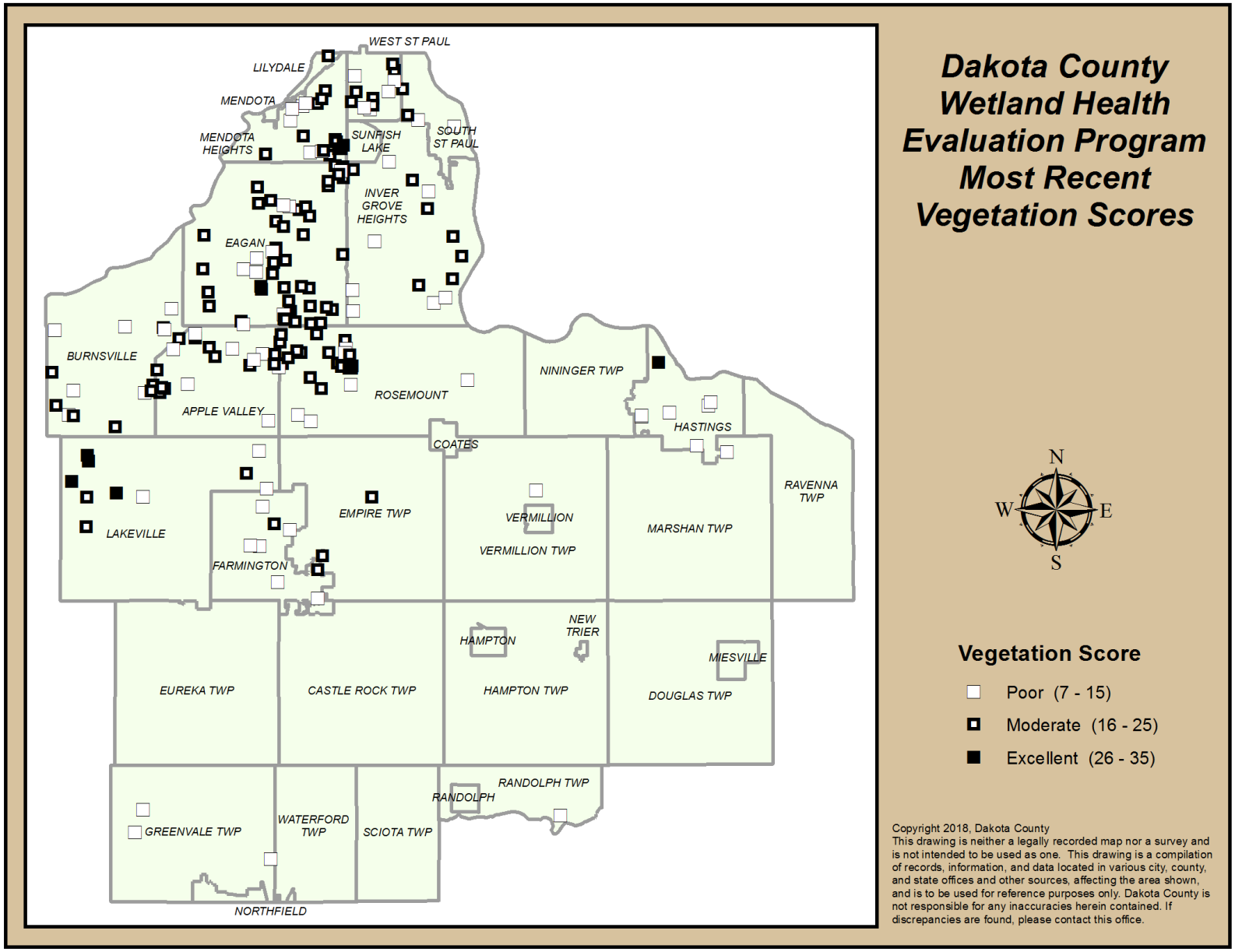


Figure 3.3.2 Most Recent Vegetation Scores



4.0 Wetland Evaluations

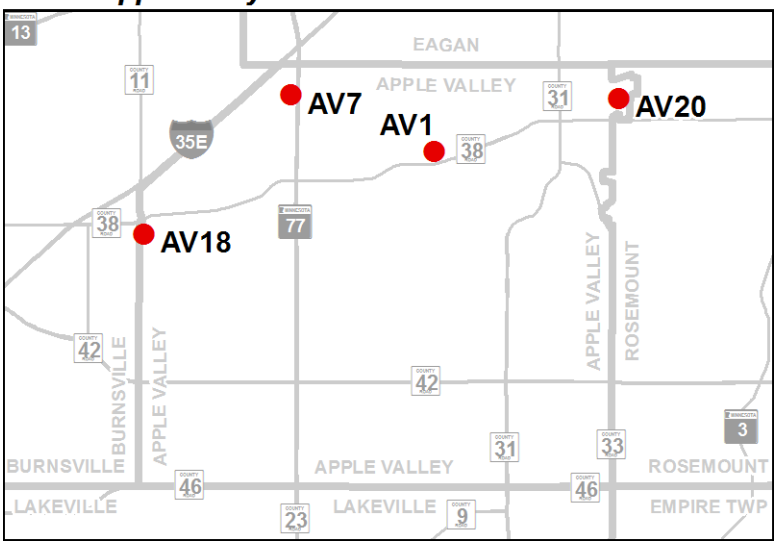
4.1 Apple Valley Wetlands

Four wetlands were monitored within the City of Apple Valley in 2018. This is the 21st year the City has participated in WHEP! Twenty wetlands have been monitored in Apple Valley since the initiation of WHEP in 1997.

Team Leader: Cindy Taintor

Team Members: Brad Blackett, Ted Ericson, Amanda Ferrill, Sam Larkin, Mikayla Lindquist, and Payton Ramburg

Apple Valley WHEP Sites Monitored in 2018



CINDY TAINTOR

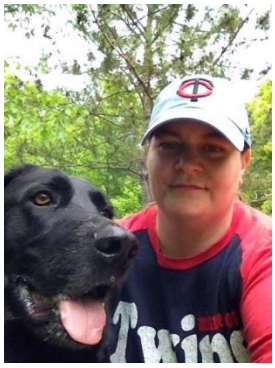
Cindy Taintor is the team leader of the Apple Valley WHEP team. This is her second year as team leader (2018); though, she has been volunteering for WHEP since 2009.

She believes, "WHEP is a unique Citizen Science opportunity to learn about wetlands and then actually go into the water to check them out." She acknowledged, "Thanks again to my team of solid volunteers who show up and work hard. The data we collect is valuable and useful to our City. I'm happy to report that again, this year, nobody fell in. There was a lot of duckweed, but not too many mosquitoes."

JESSICA SCHAUM

Jessica Schaum started with Apple Valley as their Natural Resources Coordinator four years ago, and serves as a City contact for WHEP. She remarked, "I was immediately impressed with the ongoing water quality programs and volunteer base Apple Valley is fortunate enough to have. WHEP is truly an instrumental program that allows us to track local trends and impacts over time. We utilize this data when evaluating conditions for a new road project, when a nearby site might be redeveloped, or in determining the best stormwater feature we could use upstream. As the City redevelops and older sections of town are reconstructed, we are so fortunate to have local data to help show wetland health trends before and after improvements are made. We have come to rely and depend on our volunteers for this service, and without them I'm not sure we could accomplish even half of the work on our own! I look forward to another successful year in establishing and tracking our wetland trends."

Jane Byron is the Water Quality Technician for the City of Apple Valley. Her primary role in WHEP is to assist in wetland selections and provide some of the administrative assistance needed from the City of Apple Valley. She says, "The City finds the information gathered by WHEP volunteers invaluable. In recent years, the data gathered has allowed us to supplement information from other studies on some of our most impacted wetlands to give a much more detailed picture of the quality of selected wetlands. The baseline picture painted by the information gathered will help us gauge the success of future projects to improve water quality. We cannot thank our volunteers enough for the important service they provide."

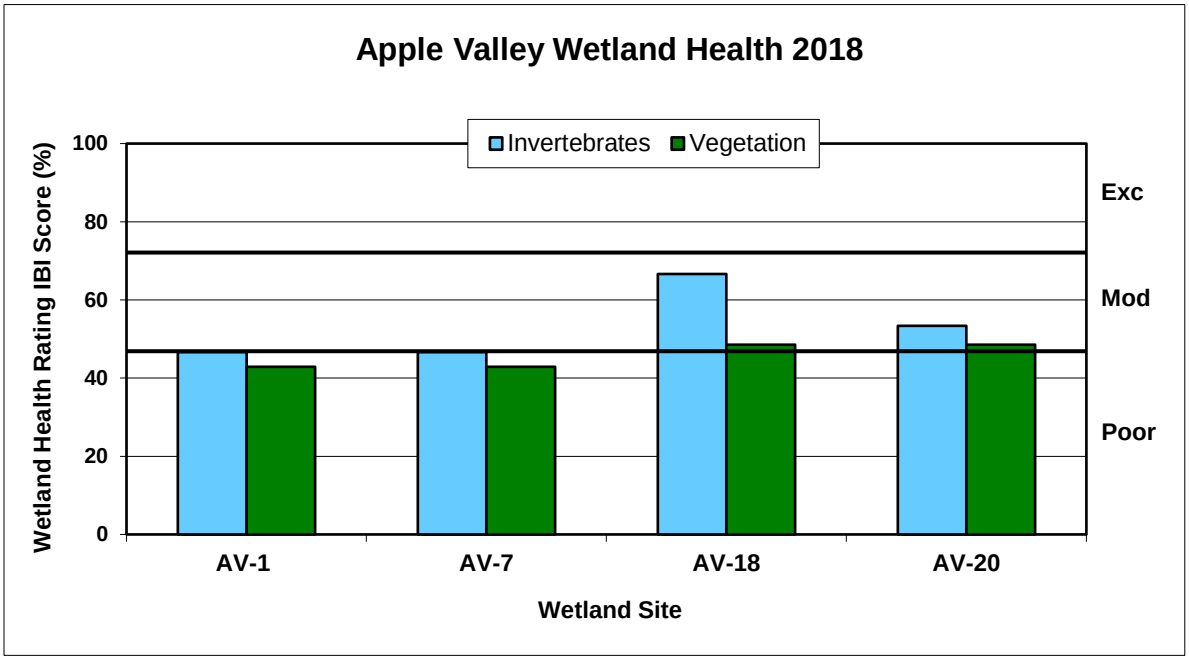


JANE BYRON

Apple Valley General Wetland Health

Figure 4.1 presents an overall view of wetland health for all of the 2018 monitoring sites in Apple Valley based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.1 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The Apple Valley wetlands exhibited poor to moderate wetland health based on both invertebrate and vegetation data, and the invertebrate and vegetation ratings supported each other in each of the wetlands; however, the invertebrates and vegetation scores for AV-18 were inconsistent and differed by 18 percent.

Figure 4.1 Apple Valley site scores (percent) for the 2018 sampling season



4.1.1 Hidden Valley (AV-1)

Hidden Valley (AV-1), also known as EVR-P53, is a 2.0-acre, type 4 wetland within the Vermillion River Watershed. It drains locally to a wetland known as EVR-53, and then through a series of wetlands and lakes. The wetland watershed is 21 acres with 15 acres of direct drainage, and is 35 percent impervious. It has two inlets along the southern border, one equalizer pipe along the eastern border, and one outlet along the western border. This wetland is part of the City's stormwater management plan, and is designated as a Manage 2 wetland with a goal to continue monitoring over time. Wetlands assigned to this category are characterized by high or exceptional restoration potential but are not located in public or open space.

The wetland is located within a privately-owned residential development and is surrounded by homes and dense lines of deciduous trees such as oak, box elder, and ash. A steep slope extends down to the wetland. Dense stands of cattails, reed canary grass, and willows line much of the wetland edge. Historic aerial photos taken from the Dakota County website show an increase in open water/ponding depth. An adjacent County trail (North Creek Greenway) was constructed in 2016. Infiltration BMPs were included during the trail construction and native seed was used to establish any areas that were disturbed adjacent to the wetland.

Wetland Health

Site Observations: The wetland slope is steep from the road to the wetland, but gentle at the water's edge. The wetland substrate is mucky with a solid bottom. There is a large vegetative buffer between the homes and the wetland. Dominant submergent vegetation present include coontail (*Ceratophyllum* sp.), water-nymph (*Najas* sp.), and pondweed (*Potamogeton* sp.). Smartweed (*Polygonum* sp.) and bulrush (*Scirups* sp.) are also present. Several species of leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans were collected and/or observed.

Table 4.1.1 Hidden Valley (AV-1) Wetland Health based on Index of Biotic Integrity (IBI)

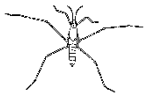
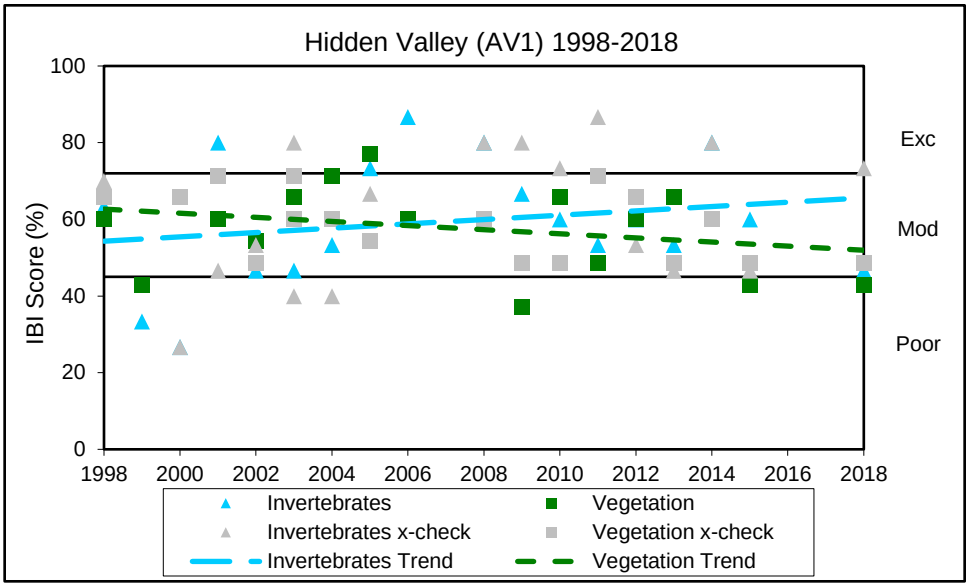
2018 Data (AV-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Cross-check Rating (IBI score)	Moderate (22)	Moderate (17)
Trend 1998-2018	Variable, but improving	Variable, but declining

Figure 4.1.1 Invertebrate and vegetation trends for Hidden Valley (AV-1)



Site Summary: Hidden Valley has been surveyed 18 times since 1998; and was last surveyed in 2015. The invertebrate and vegetation health score were consistent in 2018, both scoring poorly. The vegetation scores have been variable over the years fluctuating between moderate and poor. The invertebrate health scores appear to be following a similar fluctuation with a few exceptions. The extreme fluctuations may be due to factors such as changes in water level and plot placement. Overall, the invertebrates trend appears to be improving slightly, while the vegetation trend appears to be declining. Hidden Valley was cross-checked by another WHEP team in 2018. The scoring between the City team and cross-check team was consistent for vegetation health, but greatly inconsistent for invertebrate health, differing by 26 percent. The City team scored poor while the cross-check team scored nearly excellent for invertebrate health. The cross-check team observed a greater invertebrate diversity than the City team. This could be due to differences in plot placement.

APPLE VALLEY WHEP TEAM AT INVERTEBRATE LAB TRAINING

4.1.2 Podojil Pond (AV-7)

Podojil Pond (AV-7), also known as WVR-P6, is a 1.3-acre, type 3 wetland within the WVR-P6 subwatershed within the Vermillion River Watershed. The subwatershed has approximately 8 acres of direct drainage, and includes 25 percent impervious surface. There is one inlet along the north side of the wetland, and one outlet along the east side. This wetland is part of the City's stormwater management plan, and is designated as a Manage 2 wetland with a goal to continue monitoring over time. Wetlands assigned to this category are characterized by high or exceptional restoration potential but are not located in public or open space.

The wetland is surrounded by a residential area. Major road reconstruction is tentatively scheduled in some of the drainage area in 2020. This wetland was altered in the late 1980's or early 1990's for stormwater management. Aerial photos show that the wetland was excavated at the time.

APPLE VALLEY WHEP TEAM

Wetland Health

Site Observations: The wetland slope is moderately gentle. The substrate is mucky with sand layer below. The wetland is just to the west of Cedar Avenue, a very busy highway. Dense buffer of trees and vegetation surround much of the wetland. Residential homes exist west and south of the wetland shoreline. Duckweed (*Lemna* sp.) and water-meal (*Wolfia* sp.) cover much of the wetland surface. Smartweed (*Polygonum* sp.) and reed canary grass (*Phalaris arundinacea*) are the dominant emergent vegetation. No submergent vegetation was observed. Only leeches, snails, and true flies were collected in 2018.

Table 4.1.2 Podojil Pond (AV-7) Wetland Health based on IBI

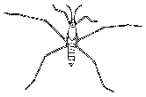
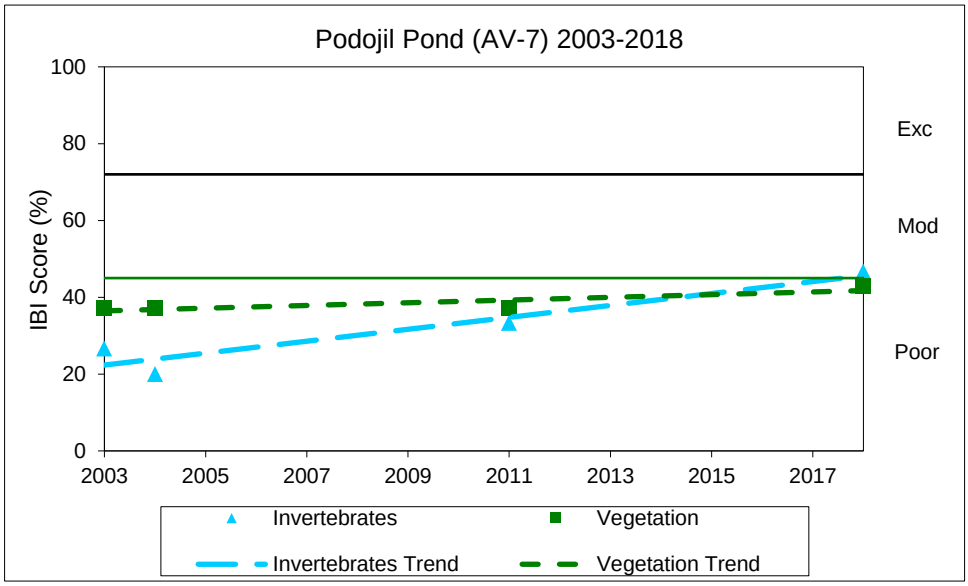
2018 Data (AV-7)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Trend 2003-2018	Improving	Stable

Figure 4.1.2 Invertebrate and vegetation trends for Podojil Pond (AV-7)



Site summary: This is the fourth time that AV-7 has been monitored since the initial survey in 2003, and was last surveyed since 2011. The invertebrate and vegetation scores were very consistent in 2018, both scoring poor health. The invertebrate scores have improved over the course of the surveys. The vegetation scores are stable. The lack of submergent and emergent vegetation is likely affecting the invertebrate community.

4.1.3 Sunset Park Pond (AV-18)

Sunset Park Pond (AV-18), also known as AL-P8, is a 1.0-acre, type 4 wetland within the Alimagnet Lake watershed within the Vermillion River Watershed. The AL-P8 subwatershed has approximately 252 acres of total drainage of which 43 acres drain directly. There are four inlets along the northeast side of the wetland, and one outlet near the western. This wetland is part of the City's stormwater management plan, and is designated as a Manage 2 wetland with a goal to continue monitoring over time. Wetlands assigned to this category are characterized by high or exceptional restoration potential but are not located in public or open space.

The wetland is surrounded by residential homes on the east and a natural park area, including Alimagnet Lake along the northern, southern, and western sides of the wetland. The park area provides a wide vegetative buffer. The City, in conjunction with VRWJPO, is planning two projects in 2019 that may impact this wetland. One project will involve installation of an iron enhanced sand filter to benefit Alimagnet Lake to reduce phosphorus along the southern edge near the Park property. The other project involves improvements to an upstream pond that will also reduce phosphorus. In 2007, approximately 1,200 cubic yards of sediment were removed from the wetland.

Wetland Health

Site Observations: The wetland slope has a steep drop-off. The substrate is very mucky. Reed canary grass (*Phalaris arundinacea*), stinging nettle (*Stachys* sp.), and jewelweed (*Impatiens* sp.) dominate the shoreline vegetation. Duckweed (*Lemna* sp. and *Spirodela* sp.) and water-meal (*Wolfia* sp.) covers the wetland surface. Dense submergent vegetation is present, including waterweed (*Elodea* sp.) and pondweed (*Potomogeton* sp.). Leeches, dragonflies, damselflies, snails, true flies, and crustaceans were observed.

Table 4.1.3 Sunset Park Pond (AV-18) Wetland Health based on IBI

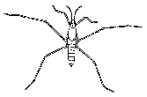
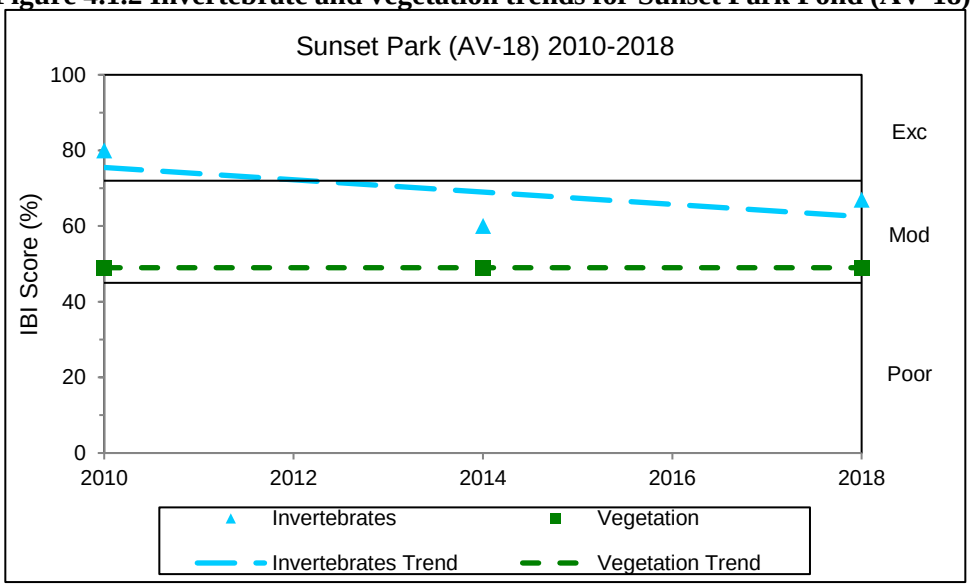
2018 Data (AV-18)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (20)	Moderate (17)
Trend 2010-2018	Not enough data	Not enough data

Figure 4.1.2 Invertebrate and vegetation trends for Sunset Park Pond (AV-18)



Site summary: This is the third time that AV-18 has been monitored since the initial survey in 2010, but has not been surveyed since 2014. The invertebrate and vegetation health both scored moderately; however, the two scores were inconsistent, differing by 18 percent. Though there was suitable invertebrate habitat available, the vegetation diversity was low in 2018. Overall, the invertebrate scores have varied slightly while the vegetation scores have remained stable. More data is needed to analyze a reliable health trend.

4.1.4 Valleywood Golf Course (AV-20)

Valleywood Golf Course (AV-20), also known as Hole 16 Pond, is a 1.5-acre type 5 wetland located within the Vermillion River Watershed. The wetland watershed directly drains approximately 12 acres. There is no impervious surface that directly affects the watershed. There are no inlets or outlets in the wetland; however, there is overland flow into and out of the wetland. This wetland is not part of the City's stormwater management plan, but is designated as a Manage 2 wetland. Wetlands assigned to this category are characterized by high or exceptional restoration potential but are not located in public or open space.

Valleywood Golf Course wetland is located within the boundaries of the City's golf course. Management of the wetland is consistent with the golf course's practices. The golf course is interested in programs like WHEP that can add to their education components.

BRAD BLACKETT

Wetland Health

Site Observations: The wetland slope is gentle, and the substrate is very mucky. Oak trees surround the wetland. Duckweed (*Lemna* sp.) and water-meal (*Wolfia* sp.) cover the surface of the wetland. Dense submergent vegetation is present, including coontail (*Ceratophyllum* sp.), waterweed (*Elodea* sp.), and pondweed (*Potamogeton* sp.). Leeches, snails, true flies, and crustaceans were observed.

Table 4.1.4 Valleywood Golf Course (AV-20) Wetland Health based on Index of Biotic Integrity

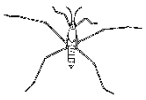
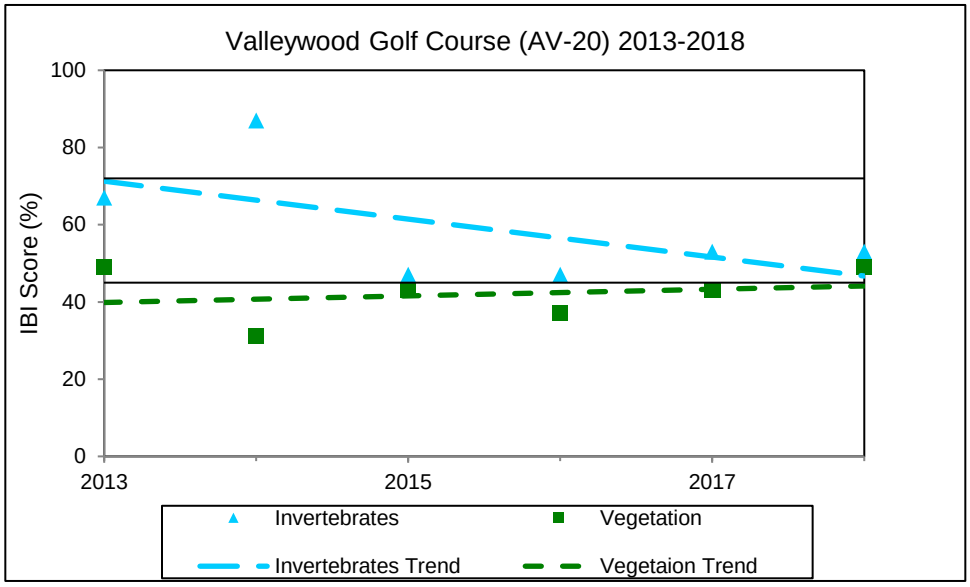
2018 Data (AV-20)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (17)
Trend 2013-2018	Declining	Stable

Figure 4.1.4 Invertebrate and vegetation trends for Valleywood Golf Course (AV-20)



Site summary: This is the sixth consecutive year that AV-20 has been monitored through WHEP. The invertebrate and vegetation health scores were consistent in 2018, both scoring moderate. Invertebrate and vegetation health scores have been stable the past four years. Overall, the invertebrate trend is declining since first monitored in 2013 while the vegetation trend remains stable.

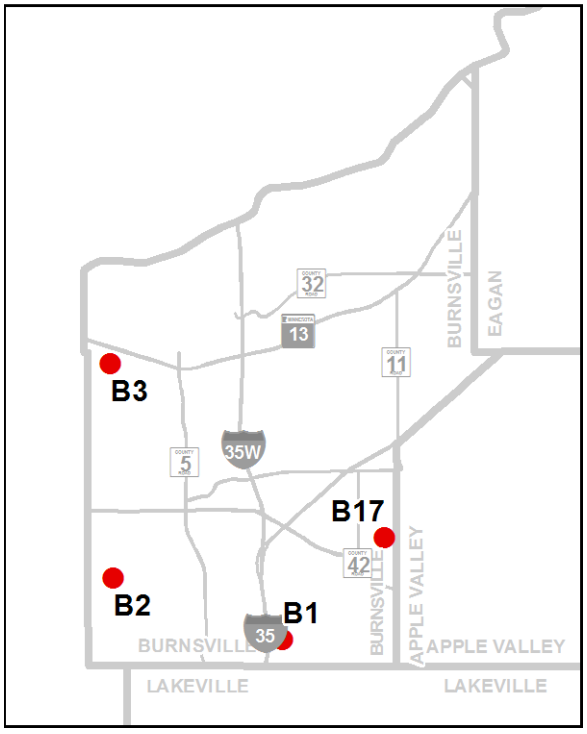
4.2 Burnsville Wetlands

Four wetlands were monitored within the City of Burnsville in 2018. This is the 22nd year the City has participated in WHEP! Sixteen wetlands have been monitored in Burnsville since the initiation of WHEP in 1997.

Team Leader: Katie Dennis

Team Members: Sophia Cajandig, Spencer Carlsgaard, Pete Curtis, Max Davisson-Kerwood, Anna Dennis, Megan Kasparek, Ashwin Nambudiripad, Godan Nambudiripad, and Carter Stodolski

Burnsville WHEP Sites Monitored in 2018



KATIE DENNIS

Hi! My name is Katie Dennis and I am the Burnsville team leader. I have been participating in WHEP for two summers now, and am excited to continue with it into the future. I am a graduate of the University of St. Thomas with a degree in Environmental Science. Most of my work as an undergrad involved water chemistry, so the WHEP program really expanded my knowledge of wetlands, as I learned a lot about macroinvertebrates and plants. One of my favorite things about WHEP is the "citizen science" aspect of it. It is great that members of the community from varying age groups can come together and collect such meaningful data for the city.

This was my first year as team leader, and I couldn't have done it without such a wonderful group of volunteers. I am lucky to have worked with such a diligent group, but also a group that created a fun atmosphere and wasn't worried about getting a little bit of mud on them. I am excited to work with everyone again!

LIZ FORBES

Liz Forbes is the City contact for the Burnsville WHEP team. Her role is to select wetlands for evaluation, provide team support as needed and help recruit volunteers.

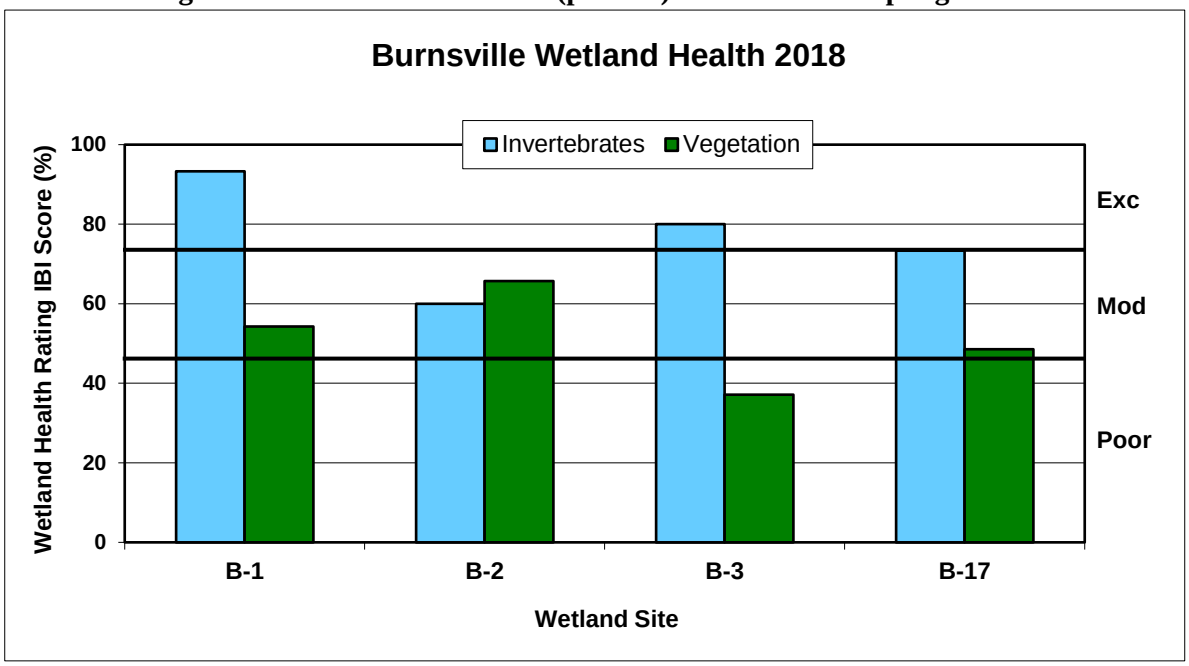
She said, "As City contact, I select the wetlands to be evaluated each year and help recruit volunteers. I've been involved with Dakota County WHEP since I began working for the City of Burnsville in 2011, though the City has participated since the program began.

"The 20 years' worth of wetland data collected by WHEP volunteers provides a valuable reference tool for the City. In addition to guiding surface water management decisions, the data comes in handy when responding to inquiries about water bodies or applying for habitat restoration grants."

Burnsville General Wetland Health

Figure 4.2 presents an overall view of wetland health for all of the 2018 monitoring sites in Burnsville based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.2 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The Burnsville wetlands exhibited poor to excellemt wetland health based on invertebrate and vegetation data. Only wetland B-3 rated poor for vegetation. B-1 and B-3 scored excellent for invertebrates. Invertebrate and vegetation scores were greatly inconsistent for B-1, B-3, and B-17, differing by 39, 43, and 24 percent, respectively.

Figure 4.2 Burnsville site scores (percent) for the 2018 sampling season



4.2.1 Crystal Lake West (B-1)

Crystal Lake West (B-1) is a one-acre, type 3 wetland located in the CL6 Drainage Area of Crystal Lake subwatershed within the Blackdog watershed. The CL6 Drainage area is 444.5 acres, and is five percent impervious. There are no inlets or outlets in the wetland. The wetland is part of the wetland management plan and is designated as an Improvement Class. The goal for the wetland is to improve its quality. The wetland has invasive species problems, including reed canary grass. There is some recreational vehicle disturbances (mostly in the winter). The wetland is very close to a bay on the west side of Crystal Lake, and is within a large, naturally vegetated, City-owned park called Crystal Lake West Park.

Wetland Health

Site Observations: This wetland is located off of a hiking trail system within a densely wooded natural area. The wetland has a gentle slope, and the substrate is very mucky. A ring of reed canary grass surrounds the wetland. The wetland surface is densely covered in duckweed (*Lemna* sp. and *Spirodela* sp.), water-

meal (*Wolfia* sp.), and white water lilies (*Nymphaea* sp.). Coontail (*Ceratophyllum* sp.) is densly present, as well. A large diversity of invertebrate taxa were collected, including leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans.

Table 4.2.1 Crystal Lake West (B-1) Wetland Health based on Index of Biotic Integrity

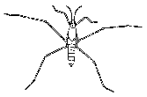
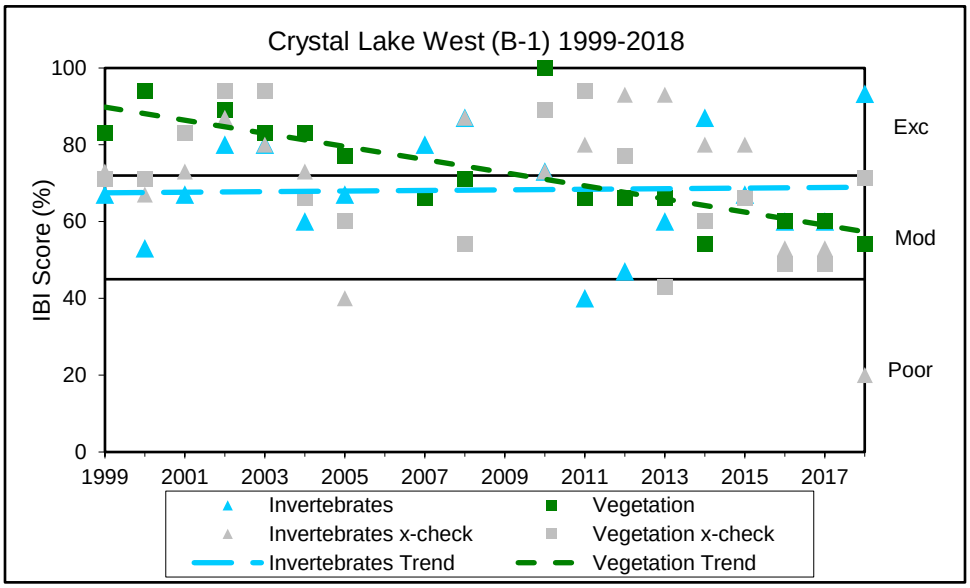
2018 Data (B-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (28)	Moderate (19)
Cross-check Rating (IBI score)	Poor (6)	Moderate (25)
Trend 1999-2018	Variable, but stable	Declining

Figure 4.2.1 Invertebrate and vegetation trends for Crystal Lake West (B-1)



Site summary: This is the eighteenth time that B-1 has been surveyed since 1999, and ninth consecutive survey since 2010 (it was not surveyed in 2006 and 2009). The invertebrate and vegetation scores are not consistent, differing by 39 percent. The invertebrate score indicates excellent health, while the vegetation score indicates moderate health. Throughout the years of monitoring, the invertebrate scores have fluctuated between poor and excellent health; however, the health trend appears stable, overall. The vegetation health scores appear to be continually declining. This site was cross-checked by another WHEP team in 2018. Scores between the City team and the cross-check team were greatly inconsistent. The invertebrate scores differed by 73 percent, and the vegetation scores differed by 17 percent. The Burnsville team found a large diversity of invertebrates, while the cross-check team found only two taxa of snails, one taxa of crustacean, and fingernail clams. These scoring differences may be due to plot placement differences. The cross-check team also noted that they had fish in the bottle traps which may have impacted

the invertebrate diversity observed. The cross-check team identified a larger diversity of woody vegetation and forbs than the City team which enhanced several metric scores.

4.2.2 Kelleher (B-2)

Kelleher (B-2), formerly known as Cam Ram, is a 0.41-acre, type 3 wetland located within the MH-3A drainage area of the Credit River Watershed. The MH-3A wetland complex drainage area is 700 acres, and has approximately 10 percent impervious surface. There are no inlets or outlets. The wetland is part of the City's wetland management plan, and is designated as Protection Class wetland with the goal to protect the wetland, maintain flood protection, control sediment, and remove nutrients.

Kelleher is a small depressional wetland located within the City's Kelleher Park which is adjacent to Murphy-Hanrehan Park. The wetland lies within an area that the City actively manages as an oak savanna. Management activities include prescribed burning, hand seeding, and buckthorn removal.

CARTER STODOLSKI, PETE CURTIS, MEGAN KASPAREK, ANNA DENNIS, AND SOPHIA CAJANDIG

Wetland Health

Site Observations: The wetland slope is gentle, and the substrate is fairly solid. The shoreline is dense with cattails (*Typha* sp.). Duckweed (*Lemna* sp.) covers the wetland surface. Water-crowfoot (*Ranunculus* sp.) dominates the submergent vegetation. Leeches, dragonflies, damselflies, caddisflies, snails, and fingernail clams were observed.

Table 4.2.2 Kelleher (B-2) Wetland Health based on Index of Biotic Integrity

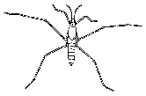
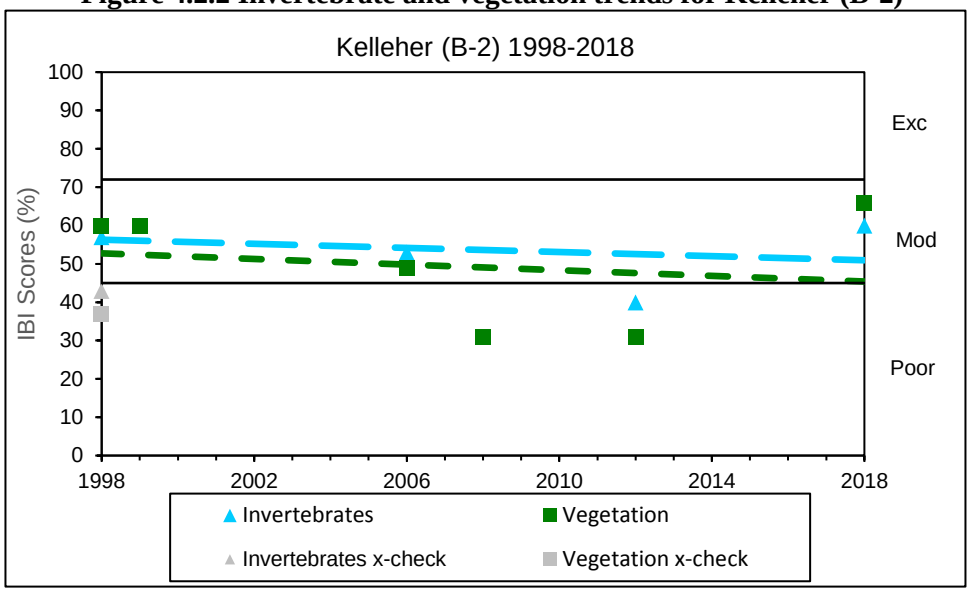
2018 Data (B-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (23)
Trend 1998-2018	Variable but stable	Overall decline, but stable since 2005

Figure 4.2.2 Invertebrate and vegetation trends for Kelleher (B-2)



Site summary: This is the sixth time that B-2 has been surveyed since 1998. Invertebrate and vegetation scores were consistent, both scoring moderate health. Both scores show improvement from previous surveys, though they are similar to the initial survey scores in 1998. Though the data is variable, overall, the health trends both appear stable. More data would help assess a more reliable health trend.

4.2.3 Kraemer Preserve (B-3)

B-3, also known as Kraemer Preserve, is a restored public water wetland in the City of Burnsville. It is a 29.7-acre, type 3 wetland located within the NW21 drainage area of Northwest Subwatershed (1,404 acres) of the Lower Minnesota Watershed (40,960 acres). The NW21 drainage area is 93 acres and approximately 30 percent impervious. The wetland is part of the City's stormwater management plan, and is designated as Protection Class wetland. It has one inlet on the south side and one inlet on the east side. It also has one outlet in the northwest corner and one outlet on the north side. The wetland is part of the City's stormwater management plan, and is designated as Protection Class with a wetland management goal to protect the wetland, maintain flood protection, control sediment, and remove nutrients.

The large wetland was installed in 1997 to mitigate for wetland disturbances by Kraemer & Sons, Inc. Land use in the watershed is mainly residential and industrial. The upland buffer has been restored to prairie and some stormwater ponds are in place to protect the wetland. Upland vegetation is managed through burning, spraying, and interseeding. A gravel path encircles the wetland. It is a protected wetland and provides migratory bird habitat. Invasive species are cause for concern.

Wetland Health

Site Observations: This is a large wetland surrounded by a walking trail. A wide, dense stand of cattail surrounds the wetland, encroaching 50 to 100 meters from the shore to the open water. There is no standing water in the cattails. There is an approximately two foot drop off from the edge of the cattail into the open water. The substrate is very mucky making it difficult to move. Duckweed (*Lemna* sp. and *Spirodela* sp.) covered the wetland surface. Coontail (*Ceratophyllum* sp.) and pondweed (*Potamogeton* sp.), were present. Several taxa of dragonflies, damselflies, mayflies, caddisflies, snails, and true flies were recorded. Chinese mystery snail and banded mystery snails were also observed.

Table 4.2.3 Kraemer Preserve (B-3) Wetland Health based on Index of Biotic Integrity

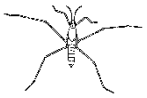
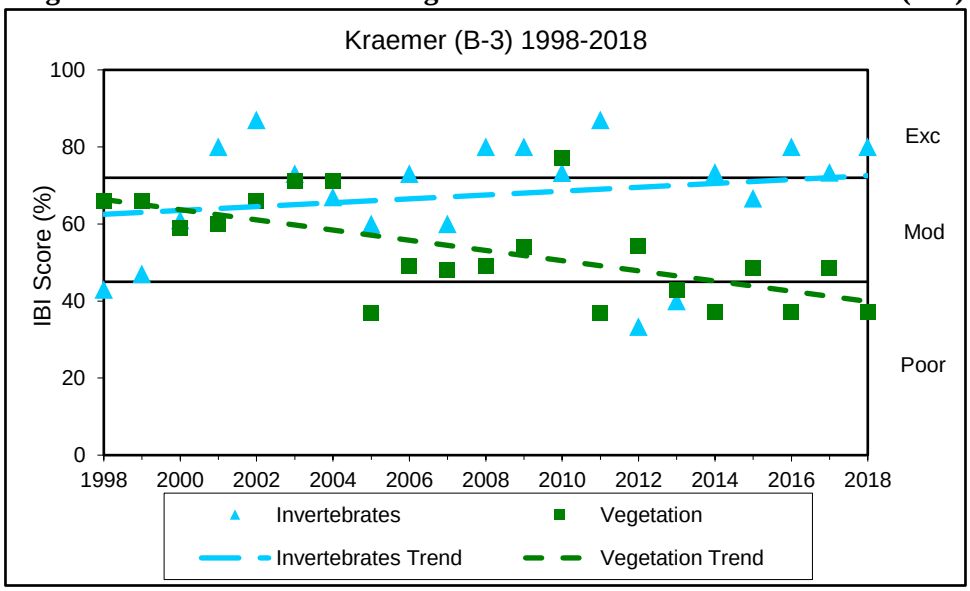
2018 Data (B-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (24)	Poor (13)
Trend 1998-2018	Stable	Overall decline, but stable since 2005

Figure 4.2.3 Invertebrate and vegetation trends for Kraemer Preserve (B-3)



Site summary: This is the 21st consecutive year of sampling for Kraemer Preserve (B-3), and was first surveyed in 1998. Invertebrate and vegetation scores have remained inconsistent since 2014 with invertebrates scoring higher (excellent or nearly excellent) than vegetation (poor or nearly poor). Despite a couple of years scoring poor, in 2012 and 2013, the invertebrates trend appears to be stable. The overall vegetation trend implies decreasing health; however, it has remained stable since 2005 (prior to 2005

vegetation scores were high moderate). The wide cattail ring impedes plot placement, eliminating the potential to include emergent forbs and grasses, and limiting the vegetation diversity; however, the dense population of submergent vegetation provides habitat benefiting the invertebrate population.

4.2.4 Alimagnet ROW (B-17)

Alimagnet Powerline ROW (B-17), also identified as pond LA4-C in the City's NPDES plan, is a 2.8-acre, type 5 wetland located within the Alimagnet Lake Subwatershed (1,239 acres) of the Vermillion River Watershed. The wetland drainage area is 20 acres, and has 10 percent impervious surface. The wetland has no inlets or outlets. It is designated as a Protection Class wetland and is being managed to maintain or improve existing habitat.

Alimagnet Powerline ROW is a large, round, open water wetland within a naturally vegetated area of Alimagnet Park. An unpaved trail runs 30 feet to the north side of the wetland. A large powerline right-of-way exists at the east side of the wetland. Disturbance of the area due to clearing activities under the powerline are of concern.

Wetland Health

Site Observations: The wetland has a fairly gentle slope and a solid substrate. There is open water all the way to the shore. Coontail (*Ceratophyllum* sp.), water-celery (*Vallisneria americana*), pondweed (*Potamogeton* sp.) and duckweed (*Lemna* sp.) were present. Very few grasses and emergent vegetation were observed. Leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans were observed.

GODAN NAMBUDIRIPAD, SOPHIA CAJANDIG, KATIE DENNIS, AND MEGAN KASPAREK

Table 4.2.4 Alimagnet ROW (B-17) Wetland Health based on Index of Biotic Integrity

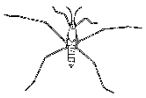
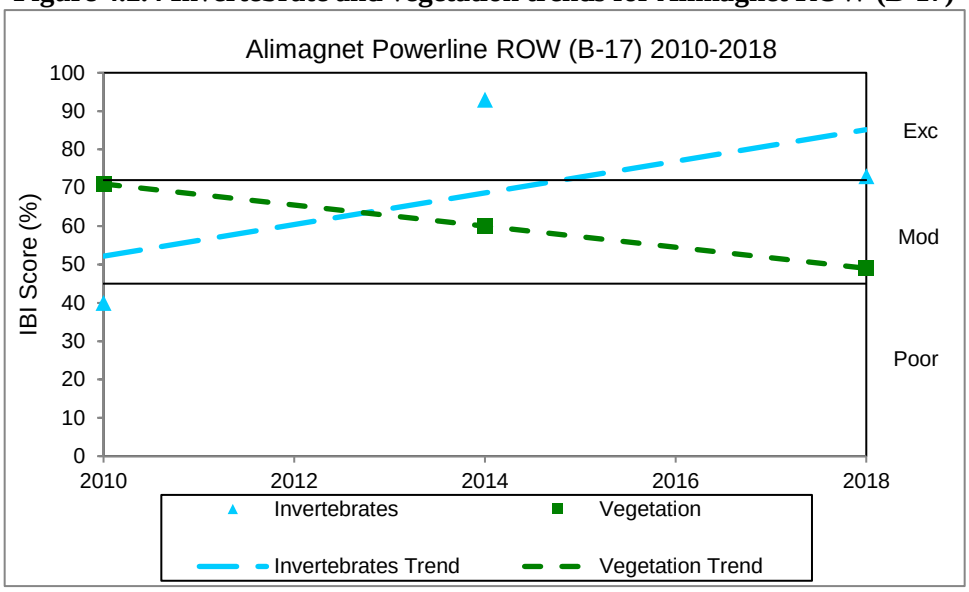
2018 Data (B-17)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (17)
Trend 2010-2018	Not enough data	Not enough data

Figure 4.2.4 Invertebrate and vegetation trends for Alimagnet ROW (B-17)

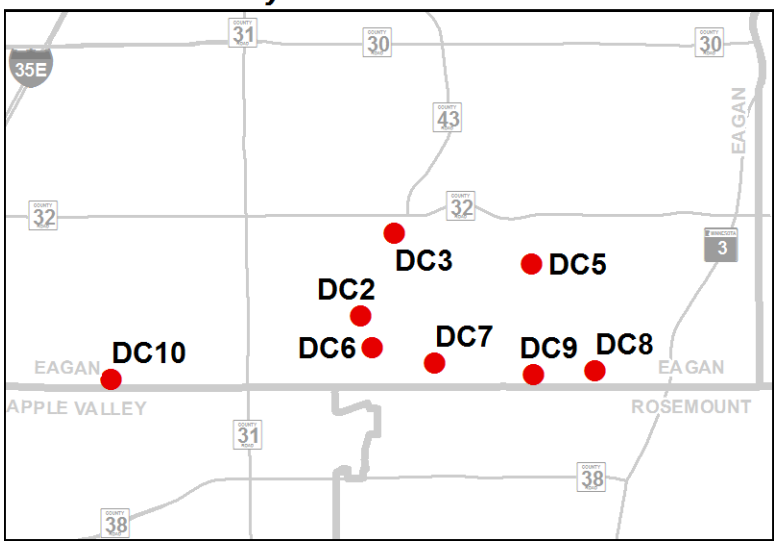


Site summary: This is the third time that Alimagnet ROW has been surveyed since 2010. The invertebrate and vegetation scores were inconsistent with each other, differing by 24 percent. Invertebrates scored excellent health while vegetation scored moderate health. More data is necessary to determine a reliable health trend.

4.3 Dakota County Parks Wetlands

Two teams monitored eight wetlands for Dakota County Parks in 2018. This is the fourth year that Dakota County has monitored wetlands with WHEP. Ten wetlands have been monitored for the Parks Department since 2015.

Dakota County WHEP Sites Monitored in 2018



Team Leaders:
Brad Ohmann (Team 1) and
Dianne Rowse (Team 2)

Team 1 Members:
Rachel Crownhart, Pat Graham, Doris Ikier, Betsy Lehman, Lauren Meckle, Sarah Pronschinske, Nicole Sanchez, and Joe Walton

Team 2 Members: Tamara Few, Alisa Gerhold, Mike Lynn, Jeff Richards, Nick Rowse, Greg Searle, and Jenna Venem

This is Brad's second year as a WHEP team leader for Dakota County Parks Department. His passion for aquatic ecosystems has persisted outside of school through internships at both the Como Zoo and Northern Aquaculture Demonstration Facility. He commented, "My time at the School of Environmental Science really cemented my passion for the environment, and it combined with my passion for aquatic environments this seemed like a perfect fit. I'm thankful for having an amazing group of volunteers and Dakota County contacts that made my transition to a leadership position simple."

BRAD OHMANN

DIANNE ROWSE

Dianne Rowse is the team leader for Dakota County Parks - Team 2. She led the Farmington and Burnsville teams between 1998 and 2008, and then took a break from WHEP to lead the statewide dragonfly survey for two years. She returned to WHEP-Burnsville in 2016, and is excited to lead the new Dakota County Parks Team with the enhanced plant survey focus.

Dianne is a retired Professional Naturalist who enjoys wading into richly diverse wetlands and sharing the experience with others. She says, "I am delighted to have a dedicated team of enthusiastic citizen scientists. I hope they return in 2019!"

MEGHAN MANHATTAN WITH QUINN JONES

Meghan Manhattan is Dakota County Parks' WHEP contact. She said, "Dakota County Parks' mission is to enrich lives by providing high quality recreation and education opportunities in harmony with natural resource preservation and stewardship. We're currently managing over $2 million in natural resource restoration projects across 800 acres within our park system. We're committed to ongoing monitoring of our restorations to ensure that we achieve positive outcomes for wildlife and vegetation in our park system.

"We began our partnership with WHEP in 2015 at one wetland site, Buck Pond, planned for restoration the following year. The data we received helped inform our restoration approach at that site. Since then, we expanded to four locations within areas of our parks where we're actively doing restoration. WHEP is a great resource for important water quality measures, and it is a great complement to our other vegetation and wildlife monitoring programs. We also love that this program engages volunteers in such a meaningful way."

Rapid Floristic Quality Assessment (rFQA)

In 2018, the Dakota County Parks Department implemented a more extensive vegetation survey method for wetlands in County parks, replacing the traditional WHEP vegetation protocol with the Rapid Floristic Quality Assessment method (rFQA). Dakota County Parks sponsored two teams to monitor eight wetlands. The two Dakota County Parks teams cross-checked each other for both macroinvertebrates (using standard WHEP protocols) and plants (using rFQA protocols).

Rapid Assessment Methods (RAMs) are wetland monitoring methods designed to be completed relatively quickly. The Floristic Quality Assessment (FQA) is a vegetation assessment tool that rates a plants quality by its preference of habitat and its tolerance to disturbance; however, the FQA method typically requires the experience of highly skilled botanists.

MPCA merged the concept of RAMs with the FQA method to develop the Rapid Floristic Quality Assessment (rFQA) method. This method is a vegetation survey that uses a specific plant list and meandering style survey technique. The plant list is simplified to include common and easier to identify species of vegetation (60 species). The survey areas may vary in size and shape, perhaps including an entire wetland basin. Plant communities are defined and mapped within the survey area. During a timed survey, the plant species are noted within each defined plant community. The goal is for moderately trained and/or experienced naturalists to be able to complete the surveys.

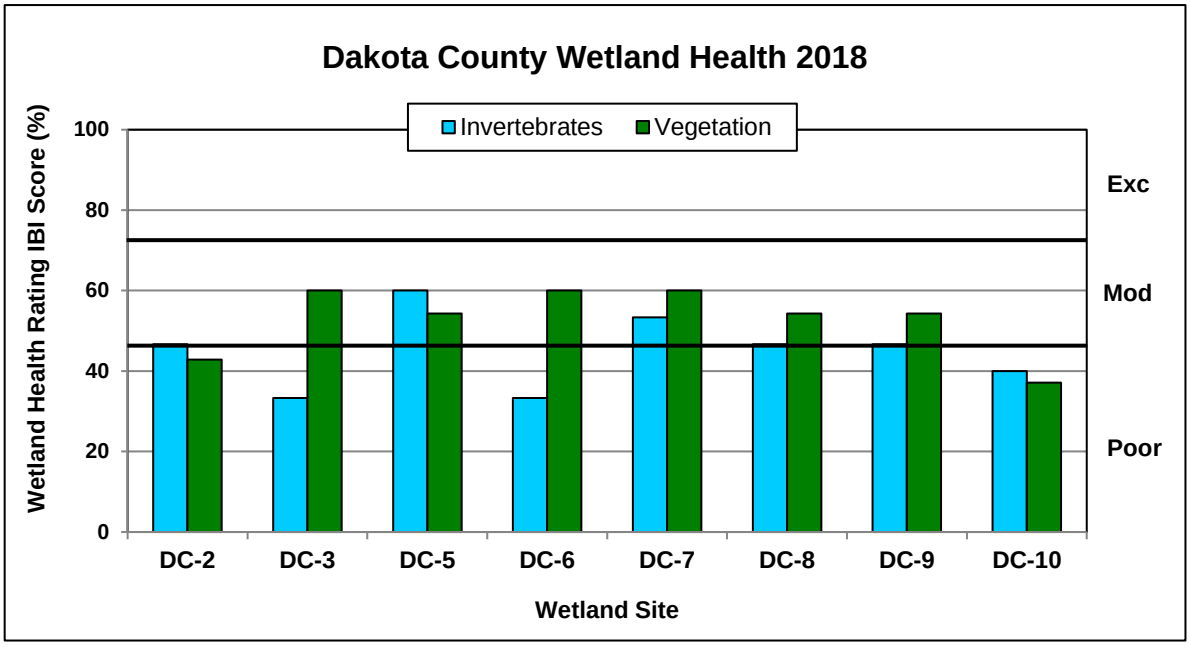
In order to compare data results between the rFQA and the standard WHEP vegetation method, WHEP scores were generated from the rFQA data. Only data from three specific plant communities (which were chosen as the most comparable to WHEP wetland types) were used to generate and compare the data: shallow marsh, deep marsh, and shallow open water plant communities. The cover classes per method are fairly similar and simple to compare.

Dakota County Parks General Wetland Health

GREG SEARLE AND NICK ROWSE

Figure 4.3 presents an overall view of wetland health for all of the 2018 monitoring sites in Dakota County Parks based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.3 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The Dakota County wetlands exhibited poor to moderate wetland health based on invertebrate and vegetation data. Invertebrate and vegetation scores for DC-3 and DC-6 were inconsistent, both differing by 27 percent. DC-2 and DC-10 scored poor for both invertebrates and vegetation.

Figure 4.3 Dakota County Parks site scores (percent form) for the 2018 sampling season



4.3.1 Buck Pond (DC-2)

Buck Pond (DC-2) is a 1.6-acre, type 3 wetland located in the Lower Minnesota River watershed. The pond's watershed is approximately 12 acres with zero impervious surface. It is a small, round pond/wetland located near the center of Lebanon Hills Regional Park. It's an isolate terrene basin, within 700-1200 feet of larger lakes to the east and south. It is classified as "shallow marsh" and a "freshwater emergent wetland". It is surrounded by smooth brome-dominated uplands and overgrown savanna/woodland. It was likely grazed historically. The wetland is dominated by reed canary grass, and deposition from the surrounding land has caused build-up in the wetland covering the native emergent vegetation with fine sands.

Dakota County began implementing major ecological restoration of this wetland in December 2015 and continued through June 2018. In December of 2015, the wetland was scraped 1.5 feet deep from the wetland edge in hopes that it would remove the rhizomatous root system of reed canary grass, and to expose and reestablish the native wetland seed bank. Prior to the scrape, there was very low plant diversity within the basin and very little native emergent vegetation; however, following the scrape in June 2016, the native seedbank began emerging during the growing season. Data collected before, during, and after the restoration will monitor the effects of the project on the wetland. A Natural Resources System Management Plan for Dakota County, along with an individual Management Plan for Lebanon Hills Regional Park addresses water quality, lake quality, and other data.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is solid with very little muck. A gas pipeline construction project was observed on the north side of Buck Pond. Submergent and emergent vegetation is prevalent, including: pondweed (*Potamogeton* sp.), Sago pondweed (*Stuckenia* sp.), and bladderwort (*Utricularia* sp.). Duckweed (*Lemna minor*) is present along the edges of the wetland. Leeches dragonflies, caddisflies, snails, true flies, and crustaceans were present. Tadpoles and salamanders were found in the bottle traps.

Table 4.3.1 Buck Pond (DC-2) Health based on Index of Biotic Integrity

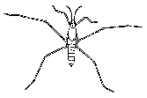
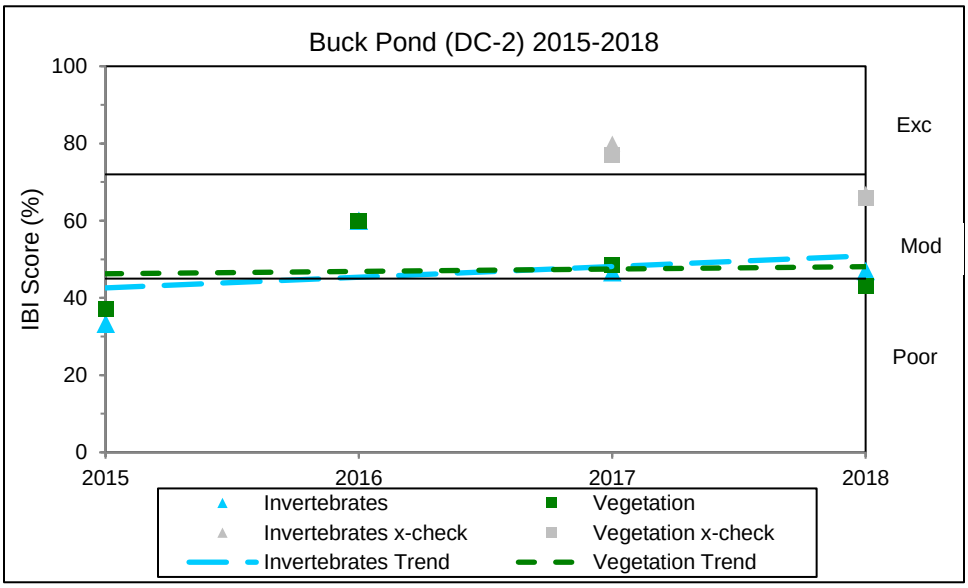
2018 Data (DC-2)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (23)
Trend 2015-2017	Stable	Stable

Figure 4.3.1 Invertebrate and vegetation trends for Buck Pond (DC-2)



Site summary: This is the fourth consecutive year that Buck Pond has been monitored by WHEP. The invertebrate and vegetation scores were consistent, and both indicate poor wetland health. The scores have remained stable, with the exception of a higher rating for both invertebrates and vegetation in 2016. More years of monitoring is needed to determine more reliable wetland health trends. The rFQA data results indicate "Good Overall Condition". This wetland was cross-checked by another WHEP team in 2018. The scores between teams were inconsistent for both invertebrates and vegetation, differing by 20 percent and 23 percent, respectively. The scores of the cross-check team indicate moderate wetland health for both invertebrates and vegetation. The cross-check team did identify a larger diversity of invertebrates, which enhanced their invertebrates score. The Dakota County Team #1 noted salamanders in their bottle traps which may have impacted the invertebrate diversity. The vegetation species identified by the two teams were quite different. The cross-check team identified a larger diversity of species, including bladderwort which enhanced their vegetation health score.

JEFF RICHARDS, TAMARA FEW, AND MIKE LYNN

4.3.2 Tamarack Swamp (DC-3)

Tamarack Swamp (DC-3) is a 7.7-acre, type 3 wetland located in the Lower Minnesota River watershed. The wetland's watershed is approximately 40 acres with zero impervious surface. No large scale alterations to the historic hydrology of the swamp have been detected, and efforts have been made throughout the history of the park to protect this unique feature from human impact.

Tamarack Swamp is a 24-acre basin that contains a remnant Tamarack Swamp in Lebanon Hills Regional Park. It is the southernmost example of tamarack swamp remaining in Minnesota. Surrounding the swamp are oak woodland and oak forest plant communities. The natural area is comprised of a matrix of glacial moraine hills, plains and kettle hole lakes and ponds. The dominant land cover types pre-settlement would have been primarily oak forest, shallow lakes and wetlands, and prairie/savanna.

Dakota County Natural Resource Department's primary goal is to create conditions in this wetland that favor tamarack regeneration through the removal of shrubs and invasive herbaceous species within the swamp, and to buffer the swamp by removing invasive species from the adjacent plant communities with the swamp watershed. Monitoring will give the County baseline data and on-going data collection in the following years. Minnesota County Biological Survey surveyed the park, including the Tamarack Swamp, and found the swamp to be of moderate biological diversity significance. This wetland has also been monitored by MPCA for the past decade. A Natural Resources System Management Plan for Dakota

County, along with an individual Management Plan for Lebanon Hills Regional Park addresses water quality, lake quality, and other data.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is mucky. A stand of trees exists west of the wetland. Duckweed (*Lemna* sp.) and water-meal (*Wolfia* sp.) cover the wetland surface. Water plantain (*Alisma* sp.), arrowhead (*Sagittaria* sp.), spikerush (*Eleocharis* sp.), sago pondweed (*Stuckenia* sp.), and bladderwort (*Utricularia* sp.) were prevelant. Leeches, snails, midges, and scuds were observed.

Table 4.3.2 Tamarack Swamp (DC-3) Health based on Index of Biotic Integrity

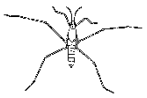
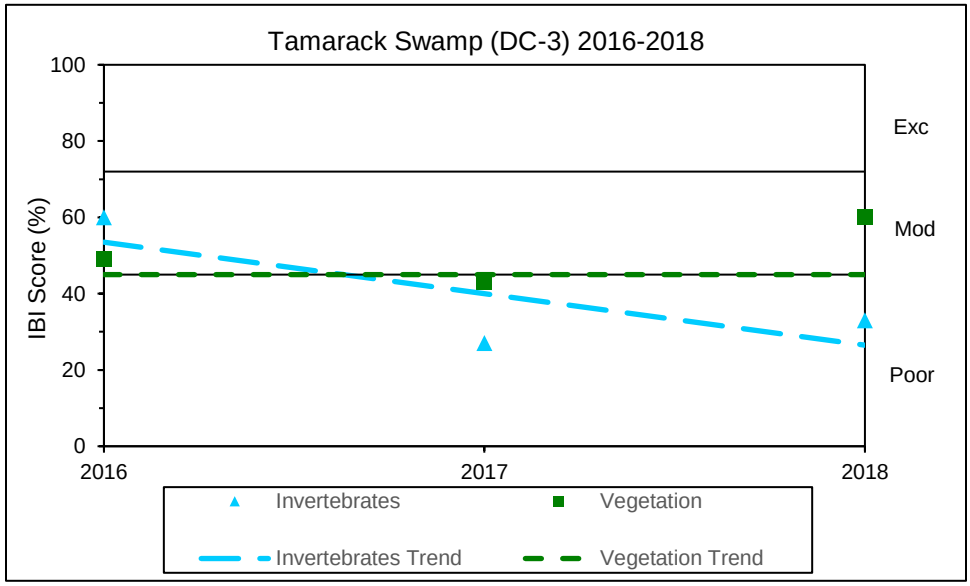
2018 Data (DC-3)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (10)	Poor (21)
Trend 2016-2018	Not enough data	Not enough data

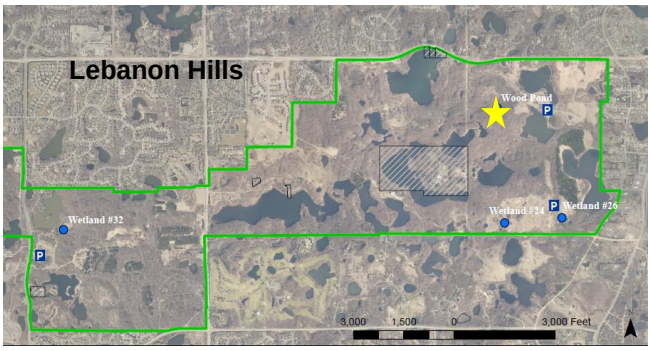
Figure 4.3.2 Invertebrate and vegetation trends for Tamarack Swamp (DC-3)



Site summary: This is the third year that Tamarack Swamp has been monitored by WHEP. The invertebrate and vegetation scores were not consistent with each other, differing by 27 percent. The invertebrate health rated poor while the vegetation health rated moderate. More years of monitoring is needed to determine reliable wetland health trends. The invertebrate diversity appears to have declined since 2016, in which dragonflies and damselflies were also present, as well as more taxa of snails and true flies. The rFQA data results indicate "Good Overall Condition".

4.3.3 Wood Pond (DC-5)

Wood Pond (DC-5) is a 0.8-acre, type 3 wetland located in the Lower Minnesota River watershed. The pond's watershed is approximately 22 acres with no impervious surface. Water flows into Wood Pond from Cattail Pond and seep from the surrounding area. The water eventually drains into Schultz Lake.

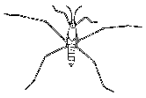


Wood Pond is near a restored and maintained prairie. Historically, the area was used for grazing. A Natural Resources System Management Plan is being completed for Dakota County, along with an individual Management Plan for Lebanon Hills Regional Park. The plan will address water quality, lake quality, and other data.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is mucky. A hiking trail runs along the northern portion of the wetland. Coontail (*Ceratophyllum* sp.) dominates the wetland vegetation. Duckweed (*Lemna* sp.), water lily (*Nymphaea* sp.), bladderwort (*Utricularia* sp.), and pondweed (*Potamogeton* sp.) were also present. Leeches, dragonflies, beetles, true bugs, snails, and crustaceans were observed.

Table 4.3.3 Wood Pond (DC-5) Health based on Index of Biotic Integrity

2018 Data (DC-5)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (19)
Cross-check Rating (IBI score)	Poor (14)	Moderate (21)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that Wood Pond has been monitored by WHEP. The invertebrate and vegetation scores were consistent with each other, both indicating moderate wetland health. More years of monitoring is needed to determine reliable wetland health trends. This wetland was cross-checked by another team in 2018. The invertebrate scores were inconsistent with each other, differing by 13 percent. The Dakota County Team #2 identified a larger diversity of invertebrates. The cross-check team noted a large presence of fish. The submergent and floating vegetation identified by each team was similar. The rFQA data results indicate "Fair Overall Condition".

4.3.4 BB's Wetland (DC-6)

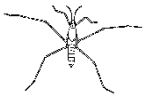
BB's Wetland (DC-6) is a 1.2-acre, type 5 wetland located in the Lower Minnesota River watershed. There is a natural inlet on the west end of the wetland, as well as a natural overflow/outlet on the west end.

This wetland is within Lebanon Hills Regional Park. There is very little disturbance, with natural oak forest surrounding the wetland. This wetland is significant due to the presence of Blanding's turtles that live in the area throughout most of the year. The County Parks have been tracking a female Blanding's turtle in the vicinity of the wetland.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is very mucky. A hiking trail runs along the northern portion of the wetland. Cattail (*Typha* sp.), coontail (*Ceratophyllum* sp.), spikerush (*Eleocharis* sp.), and reed canary grass (*Phalaris arundinacea*) dominates the wetland vegetation. Bladderwort (*Utricularia* sp), burreed (*Sparganium* sp.), sedges (*Carex* sp.), and bulrush (*Scirpus* sp.) were also present. Dragonflies, damselflies, snails, and crustaceans were observed.

Table 4.3.4 BB's Wetland (DC-6) Health based on Index of Biotic Integrity

2018 Data (DC-6)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (10)	Moderate (21)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that BB's Wetland has been monitored by WHEP. The invertebrate and vegetation scores were inconsistent with each other, differing by 27 percent. The invertebrate score indicates poor wetland health while the vegetation score indicates moderate wetland health. More years of monitoring are needed to determine reliable wetland health trends. A storm event prior to invertebrate sampling may have affected the score. The rFQA data results indicate "Fair Overall Condition".

4.3.5 Lilypad Pond (DC-7)

Lilypad Pond (DC-7), formerly known as E-29, is a 2.35-acre wetland located in the Lower Minnesota River watershed. It is delineated as a type 3 (shallow marsh) and type 5 (shallow open water) wetland. Water flows into Lilypad Pond from Dakota Lake. A natural outflow/outlet exists on the west end of the wetland.

This wetland is within Lebanon Hills Regional Park. There is very little disturbance, with natural oak forest surrounding the wetland. The portion of the wetland defined as shallow marsh includes excellent vegetative diversity. It is considered high quality with a management goal to protect and maintain health. The portion of the wetland defined as shallow open water (i.e. shallow lake) is considered moderate quality with a management goal to protect the area from reed canary grass and cattail invasion.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is solid with a layer of muck. A hiking trail runs along the northern portion of the wetland. Arrowhead (*Saggitaria* sp.) and sedges (*Carex* sp.) dominated the wetland vegetation. Water plantain (*Alisma* sp.), horsetail (*Equisetum* sp.), jewelweed (*Impatiens* sp.), cattail (*Typha* sp.), and duckweed (*Lemna* sp.) were also present. Leeches, dragonflies, damselflies, snails, true bugs, and crustaceans were observed.

Table 4.3.5 Lilypad Pond (DC-7) Health based on Index of Biotic Integrity

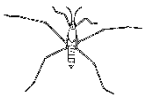
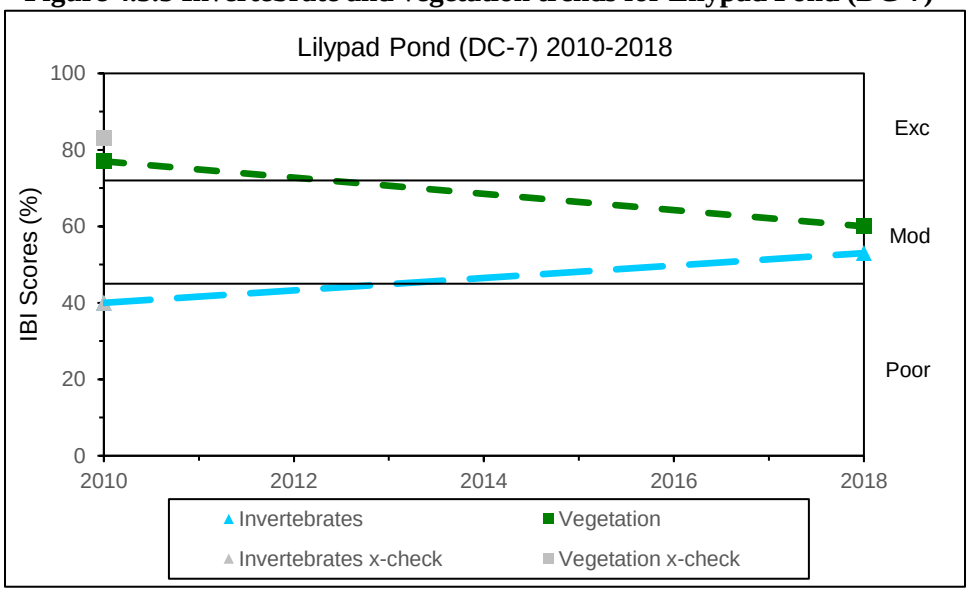
2018 Data (DC-7)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (21)
Trend 2010-2018	Not enough data	Not enough data

Figure 4.3.5 Invertebrate and vegetation trends for Lilypad Pond (DC-7)

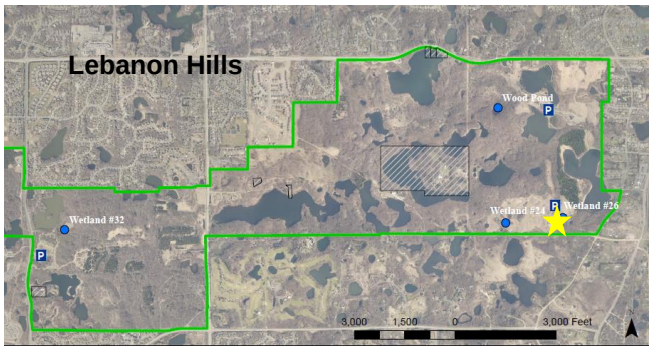


Site summary: This is the second year that Lilypad Pond has been monitored by WHEP. It was first monitored in 2010 by the Eagan Team. The invertebrate and vegetation scores were consistent with each other, both indicating moderate wetland health. More years of monitoring are needed to determine reliable wetland health trends. The rFQA data results indicate "Fair Overall Condition".

4.3.6 Star East (DC-8)

Star East (DC-8) is a 0.7-acre, type 6, shrub swamp wetland located in the Lower Minnesota River watershed. Water flows into the wetland from Star Pond West on its south side. There is a natural outlet on the east side of the wetland.

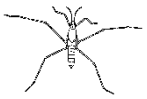
This wetland is within Lebanon Hills Regional Park. It is surrounded by quaking aspen and a restored prairie. It is considered a high quality wetland.



Wetland Health

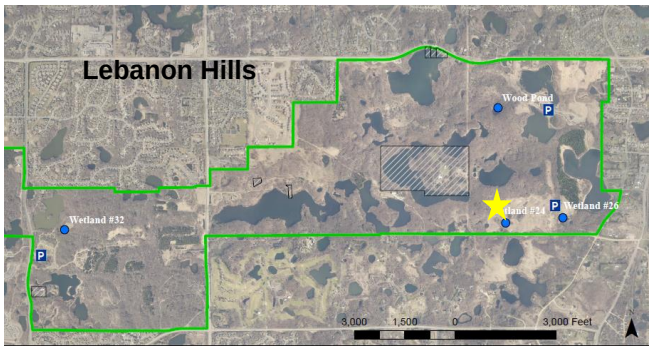
Site Observations: The wetland slope is gentle, and the wetland substrate is somewhat mucky. A ring of cattails (*Typha* sp.) and reed canary grass (*Phalaris arundinacea*) surround the wetland. Duckweed (*Lemna* sp.) covers the wetland surface. Bladderwort (*Utricularia* sp.) is also present. Leeches, dragonflies, damselflies, snails, and crustaceans were observed.

Table 4.3.6 Star East (DC-8) Health based on Index of Biotic Integrity

2018 Data (DC-8)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (19)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that Star East has been monitored by WHEP. The invertebrate and vegetation scores were consistent with each other, even though the invertebrates score indicates poor wetland health while the vegetation score indicates moderate wetland health. More years of monitoring are needed to determine reliable wetland health trends. The rFQA data results indicate "Fair Overall Condition".

4.3.7 Star West (DC-9)



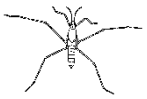
Star West (DC-9) is a 0.8-acre, type 5 wetland located in the Lower Minnesota River watershed. Water flows into the wetland from a stream/ditch on the north side. Water flows out of the wetland from a natural outlet on the south side of the wetland, and toward Star Pond East from a natural outlet on the northeast side.

This wetland is within Lebanon Hills Regional Park. A dirt road (120th Street) lies nearby to the south of the wetland. The wetland is in good condition. A fringe of hybrid cattail lines the southern shoreline. Reed canary grass is also present in the wetland.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is somewhat mucky. Cattail (*Typha* sp.) and reed canary grass (*Phalaris arundinacea*) surround the wetland. Water milfoil (*Myriophllum* sp.) and bladderwort (*Utricularia* sp.) dominate the submergent vegetation. Duckweed (*Lemna* sp.) covers the wetland surface. Leeches, dragonflies, damselflies, mayflies, snails, true flies, and crustaceans were observed.

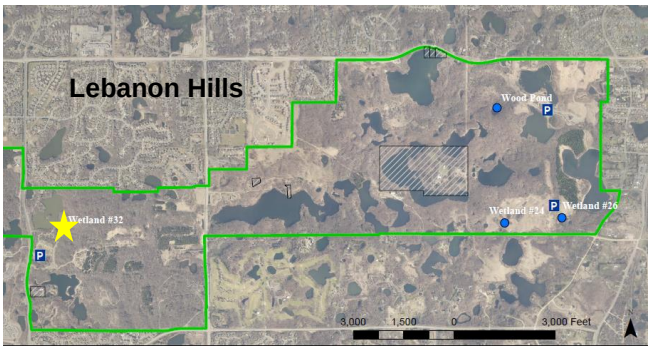
Table 4.3.7 Star West (DC-9) Health based on Index of Biotic Integrity

2018 Data (DC-9)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (19)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that Star West has been monitored by WHEP. The invertebrate and vegetation scores were consistent with each other, even though the invertebrates score indicates poor wetland health while the vegetation score indicates moderate wetland health. More years of monitoring are needed to determine reliable wetland health trends. The rFQA data results indicate "Fair Overall Condition".

4.3.8 Duck Pond (DC-10)

Duck Pond (DC-10) is a 4.0-acre wetland located within the Lower Minnesota River watershed. It is delineated as a type 1 and type 2 wetland. There are no apparent inlets or outlets.

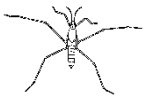


The wetland is within Lebanon Hills Regional Park and surrounded by oak forest. Past disturbance is evident by the almost total dominance of reed canary grass. It is suspected that the land was formerly used for agriculture. The wetland management goal is to control the reed canary grass.

Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is solid. A sheen of oil coated the wetland surface. Very low diversity of vegetation observed. Reed canary grass (*Phalaris arundinacea*) dominated the wetland vegeation. Duckweed (*Lemna* sp.) covered some of the wetland surface. No submergent vegetation was observed. The invertebrate dipnet sample was also very sparse and slow to drain. One family of leeches, one family of dragonflies, two families of snails, one family of true flies, and one family of crustaceans were observed.

Table 4.3.8 Duck Pond (DC-10) Health based on Index of Biotic Integrity

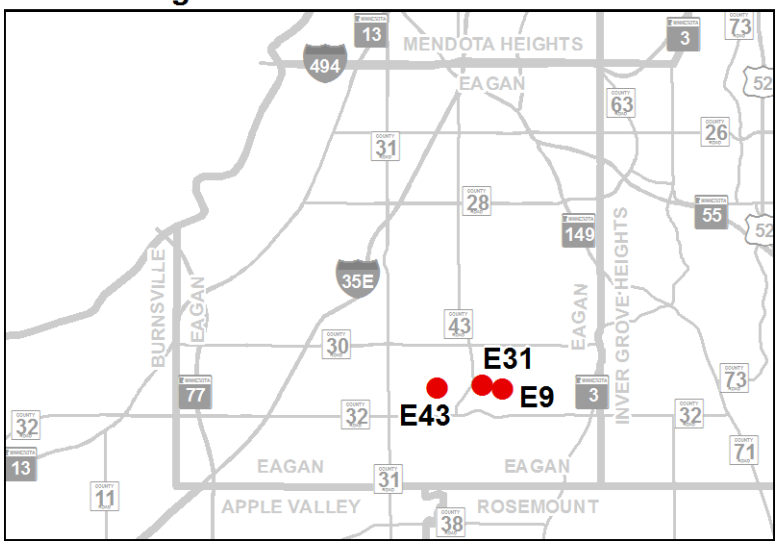
2018 Data (DC-10)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (12)	Poor (13)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that Duck Pond has been monitored by WHEP. The invertebrate and vegetation scores were consistent with each other, both indicating poor wetland health. More years of monitoring are needed to determine reliable wetland health trends. The rFQA data results indicate "Fair Overall Condition".

4.4 Eagan Wetlands

Three wetlands were monitored within the City of Eagan in 2018. The City has 21 years of data! Forty-two wetlands have been monitored in Eagan since the initiation of WHEP in 1997.

Eagan WHEP Sites Monitored in 2018



Team Leaders: Marianne McKeon

Team Members: Kenneth Britton, Rita Britton, Grant Davisson, Nicole Deziel, Catherine Geier, Robert Giefer, Craig Harnagel, Bill Larson, Autumn Lauer, Donna Matuszewski, Ava McKeon, Will McKeon, Mark Niznik, John Porter, Brenda Price, Susan Renaud, Joe Schulte, Blake Undem, and Cathy Undem

Marianne McKeon has been involved in WHEP since 2007, and has been Eagan's team leader for the past eight years. She commented, "I feel like I have more fun every year leading WHEP and look forward to spending my summers in the wetlands with my volunteers. I love watching new citizen scientists discover the wetlands and especially what's hiding below the surface. I couldn't ask for a more dedicated and efficient team!

MARIANNE MCKEON

JESSIE KOEHLE

Jessie Koehle is the Water Resources Specialist for the City of Eagan, and has a background in aquatic biology and fisheries management. She explained, "I have been involved with selection of Eagan's WHEP sites since I joined the City of Eagan in 2007. Throughout the year, I communicate frequently with Marianne to help plan and strategize the WHEP sampling season. Whenever I am able to meet volunteers in the field, I enjoy getting to know them and practicing my plant and invertebrate identification. We are building a group of wetland ambassadors that are an invaluable resource to our program and the Eagan community.

"At the City of Eagan, WHEP data is used as a qualitative, informative source of support for protection or improvement as needed for development projects, as well as historical recordkeeping for future changes. We have a unique challenge of tracking the health of our 820-some natural waterbodies! It can be difficult to choose just a few to sample, but we feel it's a good problem to have. Thanks to all the WHEP staff and volunteers for your dedication and time spent on this excellent program."

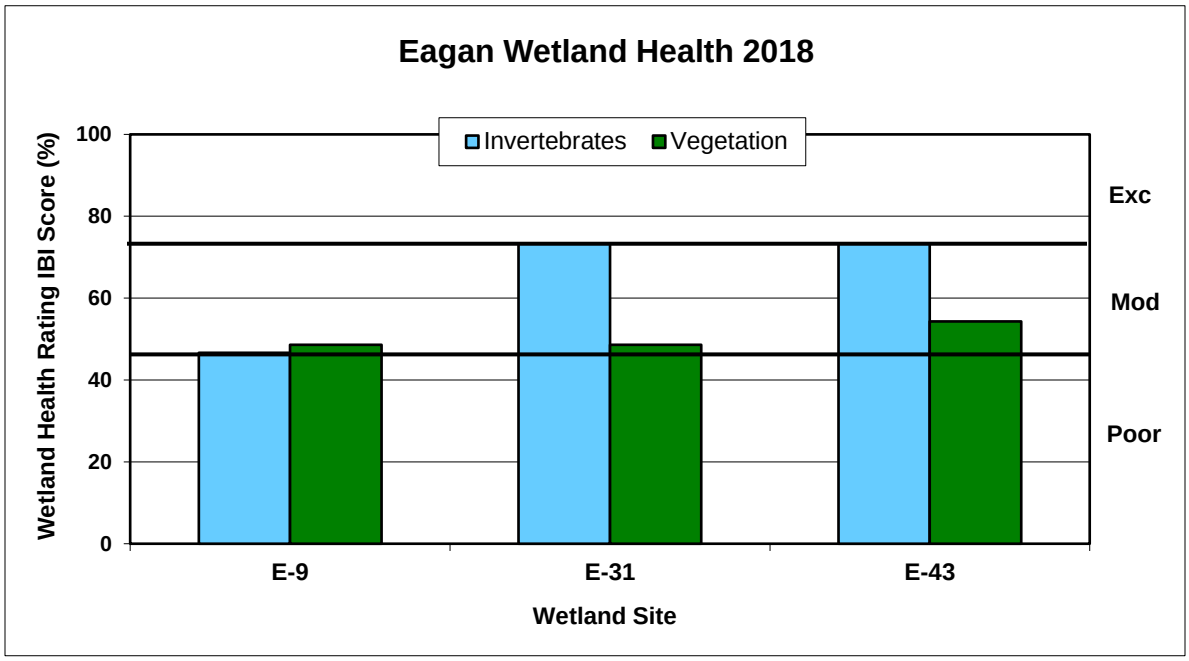
Since 1999, Eric Macbeth has managed Eagan's water resources programs that focus on protecting and improving lakes, conserving wetlands, and preventing stormwater pollution. "The City of Eagan has supported WHEP from the beginning, when we helped develop the program with Dakota County in 1997," he says. "WHEP gives residents a wonderful opportunity to be involved and learn about wetlands. Volunteers literally get their hands wet," he says. "With over 700 lakes and wetlands and over 400 storm basins in Eagan, most residents live very near surface water or regularly visit parks with wetlands. WHEP helps strengthen our community's appreciation of these resources and enhances public support of our programs."

ERIC MACBETH

Eagan General Wetland Health

Figure 4.4 presents an overall view of wetland health for all of the 2018 monitoring sites in Eagan based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.4 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. Three wetlands were monitored in the City of Eagan in 2018. The invertebrates and vegetation scores for E-31 and E-43 were inconsistent, differing by 24 percent and 19 percent, respectively.

Figure 4.4 Eagan site scores (percent form) for the 2018 sampling season



4.4.1 LP-50 (E-9)

LP-50 (E-9), also known as Wilderness Run Pond, is a 1.5-acre, type 3 wetland within the Eagan-Inver Grove Heights Watershed. Its watershed is 25 acres including approximately 20 percent impervious surface. There is one inlet on the east side of the wetland, and one outlet on the south side of the wetland. The wetland is part of the City's stormwater management plan. The City has a general wetland management plan. The management goal is to protect the wetland from stormwater impacts, manage the wetland in compliance with all regulations and according to community values and priorities, and enhance the function, value, and ecological diversity, as opportunities arise.

The wetland is predominantly hilly and wooded. Existing multi-family homes, and the City's Walnut Hill Park are nearby.

Wetland Health

Site Observations: This is a small pond surrounded by woods and thick vegetation. The wetland substrate is solid beneath a floating bog.

Table 4.4.1 LP-50 (E-9) Wetland Health based on Index of Biotic Integrity

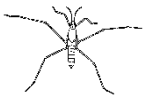
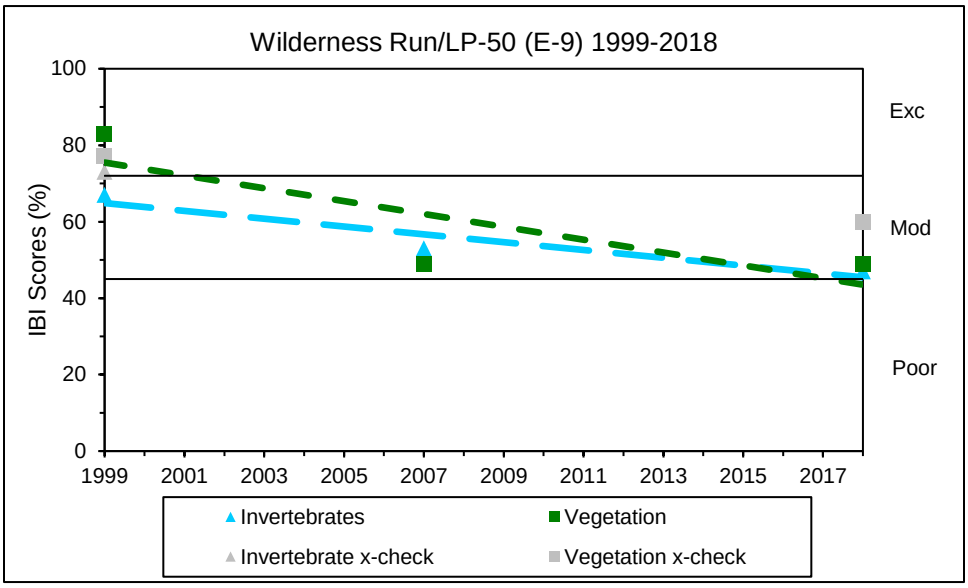
2018 Data (E-9)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (17)
Cross-check Rating (IBI score)	NA	Moderate (21)
Trend 1999-2018	Not enough data	Not enough data

Figure 4.4.1 Invertebrate and vegetation trends for LP-50 (E-9)



Site summary: This is the third time that LP-50 has been surveyed since 1999, and the first time since 2007. The invertebrates and vegetation scores were consistent, even though the invertebrates score indicates poor wetland health while the vegetation score indicates moderate wetland health. The scores have declined since the original data was collected in 1999. More years of data will determine reliable health trends. This site was cross-checked by another WHEP team in 2018. Unfortunately, the cross-check team was unable to survey the wetland for invertebrates. The vegetation scores between the two teams were inconsistent, differing by 11 percent. The City team identified a much greater diversity of vegetation including woody, grasslike, and forb species; however, the cross-check team identified bladderwort (*Utricularia* sp.) and non-vascular vegetation which enhanced the vegetation score.

Front: Marianne McKeon
Middle row: Autumn Lauer, Brenda Price, Nicole Deziel, Catherine Geier, Cathy Undem
Back row: Rita Britton, Mark Niznik, Bob Giefer, Bill Larson, Craig Harnagel, Blake Undem

4.4.2 LP-69.1 (E-31)

LP-69.1 (E-31), formerly known as Walnut Hill Park Pond is a 0.6-acre, type 5 wetland within the Eagan-Inver Grove Heights Watershed. The watershed is 20 acres with approximately 10 percent impervious surface. There is one inlet on the north side of the wetland, and one outlet on the far southeast side. The wetland is included in the City's stormwater management plan. The City has a general wetland management plan. The management goal is to protect the wetland from stormwater impacts, manage the wetland in compliance with all regulations and according to community values and priorities, and enhance the function, value, and ecological diversity, as opportunities arise.

The wetland is surrounded by flat, grassy parkland and paved walking trails. A twenty-foot wide no-mow buffer and 10-year old native planting which is minimally maintained, surround the wetland. The adjacent land is slightly sloped.

Wetland Health

Site Observations: The wetland is immediately next to a playground. It is surrounded by maple, oak, and walnut trees. Coontail (*Ceratophyllum* sp.), water-nymph (*Najas* sp.), and pondweed (*Potamogeton* sp.) dominated the submergent vegeation. Duckweed (*Lemna* sp.) covered much of the wetland surface. Burreed (*Sparganium* sp.) was also present. Very little emergent vegetation is present. Leeches, dragonflies, damselflies, caddisflies, snails, and crustaceans were observed. Ducks and songbirds were also observed.

Table 4.4.2 LP-69.1 (E-31) Wetland Health based on Index of Biotic Integrity

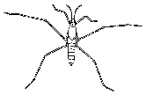
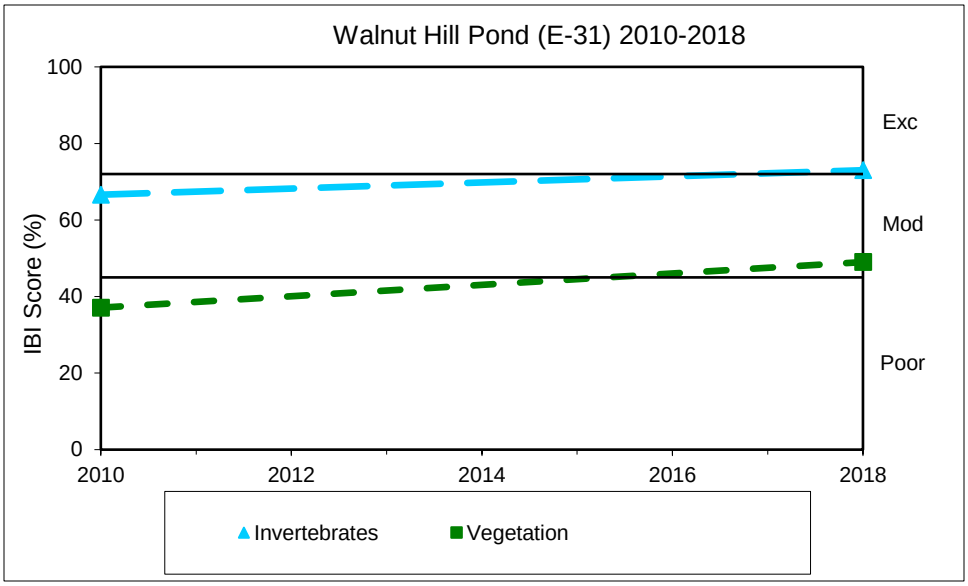
2018 Data (E-31)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (17)
Trend 2010-2018	Not enough data	Not enough data

Figure 4.4.2 Invertebrate and vegetation trends for LP-69.1 (E-31)



Site summary: This is the second time that LP-69.1 has been surveyed since 2010. Invertebrate and vegetation scores were inconsistent, differing by 24 percent, even though both scores indicate moderate wetland health. The vegetation was dense and offered satisfactory invertebrate habitat; however, its overall diversity was low. More years of data will help determine reliable health trends.

4.4.3 Pond LP-41 (E-43)

Pond LP-41 (E-43) is a 4.0-acre, type 5 wetland within the Eagan-Inver Grove Heights Watershed. The wetland watershed is 37 acres and approximately 30 percent impervious. There is one inlet on the east side of the wetland, and one outlet on the west side. The wetland is part of the City's stormwater management plan. The City has a general wetland management plan. The management goal is to protect the wetland from stormwater impacts, manage the wetland in compliance with all regulations and according to community values and priorities, and enhance the function, value, and ecological diversity, as opportunities arise. This wetland is subject to DNR regulations.

The surrounding area includes a residential neighborhood and Oak Chase Park. It is immediately surrounded by woods and moderately to steeply sloped land. The City plans to apply alum to the wetland in 2019 as part of a comprehensive plan to improve Carlson Lake, which is impaired and downstream.

Wetland Health

Site Observations: The surrounding area was clear-cut and mowed prior to the vegetation survey. An increase in sediment and water level drop was noted between the invertebrate and vegetation surveys. Coontail (*Ceratophyllum* sp.) dominated the vegetation. Rare occurance of water-nymph (*Najas* sp.), pondweed (*Potamogeton* sp.), and duckweed (Lemna sp.) were represented. Only one emergent forb was documented (*Bidens* sp.). Leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans were observed.

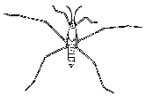
BILL LARSON

NICOLE DEZIEL

KEN BRITTON

NICOLE DEZIEL, KEN BRITTON, AND BILL LARSON

Table 4.4.3 LP-41 (E-43) Wetland Health based on Index of Biotic Integrity

2018 Data (E-43)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (19)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first year that LP-41 has been surveyed. The invertebrate and vegetation scores were consistent with each other, both indicating moderate wetland health. More years of data will determine reliable health trends.

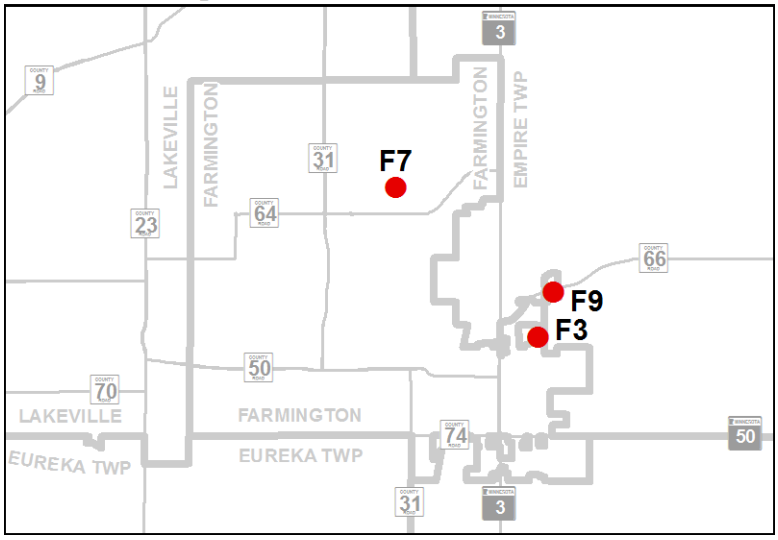
4.5 Farmington Wetlands

Three wetlands were monitored within the City of Farmington in 2018. The City has 21 years of data! Nine wetlands have been monitored in Farmington since the initiation of WHEP in 1997.

Team Leader: Rick Schuldt

Team Members: Rollie Greeno, Josiah Hakala, Chan Harries, Denise Hennigar, Katie Koch-Laveen, and Marcia Richter

Farmington WHEP Sites Monitored in 2018



RICK SCHULDT

Rick Schuldt has been involved with the Farmington WHEP Team since 2010. This was his third year as Team Leader. Rick is a retiree of the U.S. Fish and Wildlife Service and for many years worked throughout the Great Lakes in the Service's Sea Lamprey Control Program. He spent many years evaluating the effects of a chemicals fed into streams to eliminate larval sea lampreys and the effects of those chemicals on non-target organisms. He enjoys seeing the changes in wetland life from year to year.

Rick commented, "The Farmington Team has been small over the years, but regular participation by core members allowed for timely gathering and processing of the data. This year we had a potential of 17 members at the start of the year although only seven had participated by seasons end. The team is blessed to have a cadre of retired high school teachers and others with a strong background in scientific sampling procedures and plant and animal identification. Each member brings unique skills to the team and volunteering of their time is greatly appreciated. Their expertise is especially helpful in guiding new members. After discussions with the Farmington head of Public Works, we agreed to replace the Mystic Meadows site (F-8). That site required slogging through a quarter mile of very tall cattails. We selected a more accessible site off Cambodia Avenue (F-9). This year was an especially wet one and we were even forced to work in the rain to retrieve bottle traps. We again coordinated processing of invertebrate samples with the Apple Valley Team at a local high school lab."

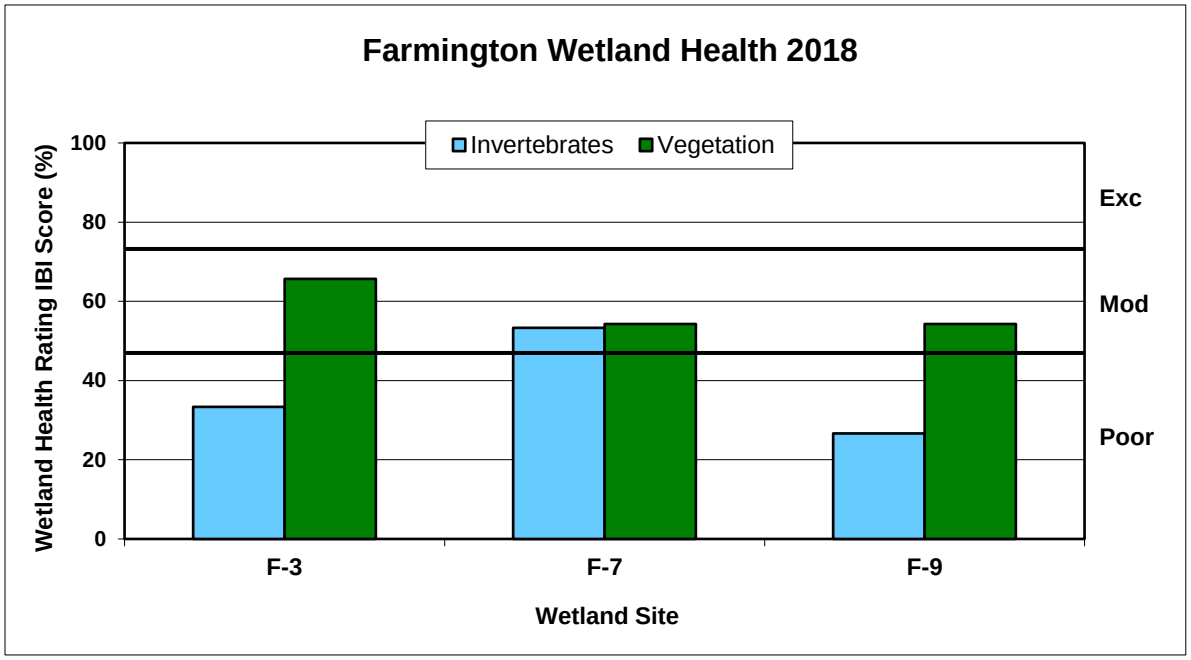
TOM HOFFMAN

Tom Hoffman is the City of Farmington's Public Works Coordinator. This was his first year administrating the WHEP program for the City of Farmington. He stated, "Farmington is a growing community and expects to continue to grow in the future. WHEP is used to monitor wetland areas where there will be future development. We can then look back and compare the pre-construction conditions to post construction development. This helps us understand the impacts of development on our natural resources and if there are any additional BMP's we need to implement in order to better protect them. By utilizing our dedicated volunteers, the City is able to gather more detailed information than we would otherwise be able. WHEP is a great partnership that helps get citizens involved along with providing detailed information on the state of the City's wetlands."

Farmington General Wetland Health

Figure 4.5 presents an overall view of wetland health for all of the 2018 monitoring sites in Farmington based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.5 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. Scores for the three wetlands indicate poor to moderate wetland health. Invertebrate and vegetation health scores were inconsistent for F-3 and F-9, differing by 33 and 27 percent, respectively.

Figure 4.5 Farmington site scores (percent) for the 2018 sampling season



4.5.1 Kral Pond (F-3)

F-3, also known as Kral Pond, is a 10-acre, type 4 wetland located within the Vermillion River Watershed. The wetland watershed is 41.8 acres and 6.6 percent impervious. There is one inlet in the southwest corner, one inlet in the northeast corner, and one outlet on the north end of the wetland. It is obvious, based on its shape, that this wetland has been altered in the past, likely to accommodate farming practices. Kral Pond is included in the City's wetland management plan and is designated as a Manage 2 wetland. Manage 2 wetlands have usually been altered by human activities. These wetlands have low to medium floral diversity and wildlife habitat components, and are slightly susceptible to impacts from stormwater. There is development to the north, south, and west, and agriculture to the east. Wetland buffers are in place. The wetland management goal is to document how land uses impact the man-made wetlands.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is firm to slightly mucky. This is a large wetland with extensive stands of cattail. The sampling location is adjacent to a road which provides easy access for fishing and non-motorized watercraft. Sampling has not provided a great variety of invertebrates over the years owing to the lake-like habitat. This results in IBI scores in the poor range most years. The team finds a rich variety of aquatic plants at the site each year, including: pondweed (*Potamogeton* sp.), water-nymph (*Najas* sp.), horned pondweed (*Zannichellia palustris*), bladderwort (*Utricularia* sp.), duckweed (*Lemna* sp. and *Spirodela* sp.) and water-meal (*Wolfia* sp.). Invasive plants including Eurasian water-milfoil (*Myriophyllum spicatum*) and reed canary grass (*Phalaris arundinacea*) are present. Dragonflies, damselflies, mayflies, snails, and scuds were observed.

Table 4.5.1 Kral Pond (F-3) Wetland Health based on Index of Biotic Integrity

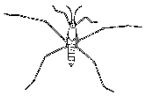
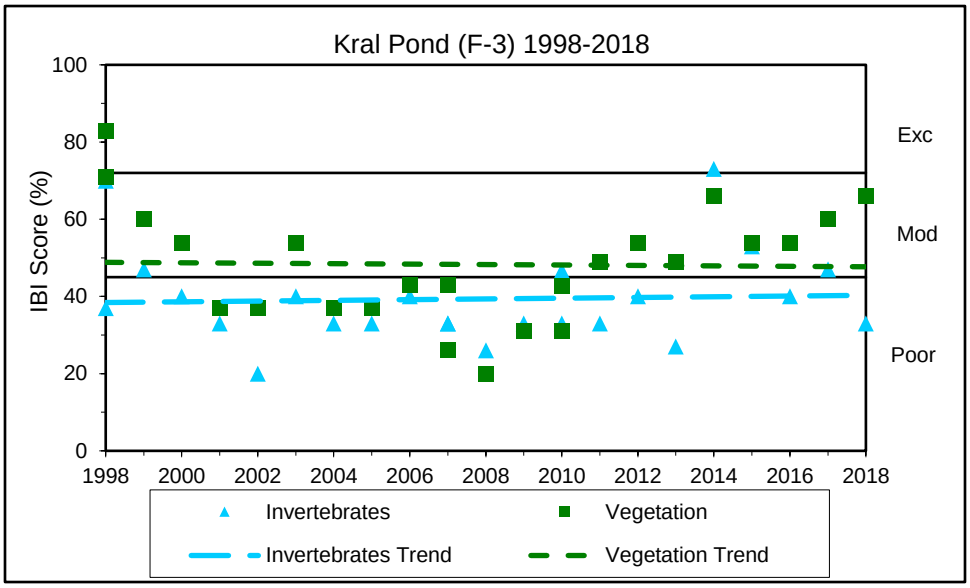
2018 Data (F-3)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (10)	Moderate (23)
Trend 1998-2018	Stable, but variable	Stable, but variable

Figure 4.5.1 Invertebrate and vegetation trends for Kral Pond (F-3)



Site summary: Kral Pond has been monitored for 21 consecutive years. The invertebrate and vegetation scores were inconsistent in 2018, differing by 33 percent. Invertebrates score indicated poor wetland health while the vegetation score indicated moderate wetland health. The data throughout the years has been variable; gradually decreasing from 1998 to 2008 and then improving from 2008 to 2018. Vegetation scores are more often higher than invertebrate scores; however, invertebrate and vegetation scores are consistent with each other for many of the years of data and follow a similar pattern, with the exception of 2018 in which the invertebrate score declined. The long-term health trends are stable. The area was historically agricultural. Development surrounding the wetland may have impacted the wetland. In some cases, conversion from agriculture to residential development can improve water quality since stormwater treatment is added. The fluctuation in the health trend may be in response to development in the area.

4.5.2 Autumn Glen (F-7)

Autumn Glen (F-7) is a 2.9-acre wetland within the Vermillion River Watershed. The wetland watershed is ten acres and four percent impervious. There is one inlet in the northwest corner of the wetland along Dunbury Avenue and one outlet in the northeast corner. The wetland is included in the City's stormwater management plan; however, it does not have a designated classification. The wetland management goal is to understand the health of a wetland surrounded by forest, agriculture, and residential homes in an area with potential development. There is development to the north and west, and forest and agriculture to the east. Man-made ponds lie to the north and south. The water ultimately flows to North Creek.

Autumn Glen is located within a trail system, but is not easily spotted from the trail. Tall grasses (including reed canary grass) and tree lines obstruct views. The wetland is approximately 50 meters from the trail.

ROLLIE GREENO AND DENISE HENNIGAR

ROLLIE GREENO, MARCIA RICHTER, AND DENISE HARRIGAR

Wetland Health

Site Observations: The wetland slope is gentle, and the substrate is moderately mucky. A bicycle path runs along the south side of the wetland separated by a wide stand of reed canary grass. Reed canary grass surrounds the wetland. Low water has created problems in past years but frequent rains this year led to much higher than normal water levels. The site provides ideal breeding habitat for frogs, and attracts hungry egrets and great blue herons. Sedges (*Carex* sp.), bulrush (*Scirpus* sp.), coontail (*Ceratophyllum* sp.), pondweed (*Potamogeton* sp.), duckweed (*Lemna* sp.), and water-meal (*Wolfia* sp.) were present. Tadpoles have filled the bottle traps in the past, but were nearly absent in 2018. This type of wetland provides for an abundance of beetles, bugs, snails, and especially leeches. Other high scoring invertebrates are not nearly as common. Leeches, dragonflies, mayflies, caddisflies, snails, true flies, and crustaceans were observed in 2018.

Table 4.5.2 Autumn Glen (F-7) Wetland Health based on Index of Biotic Integrity

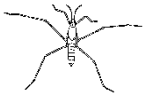
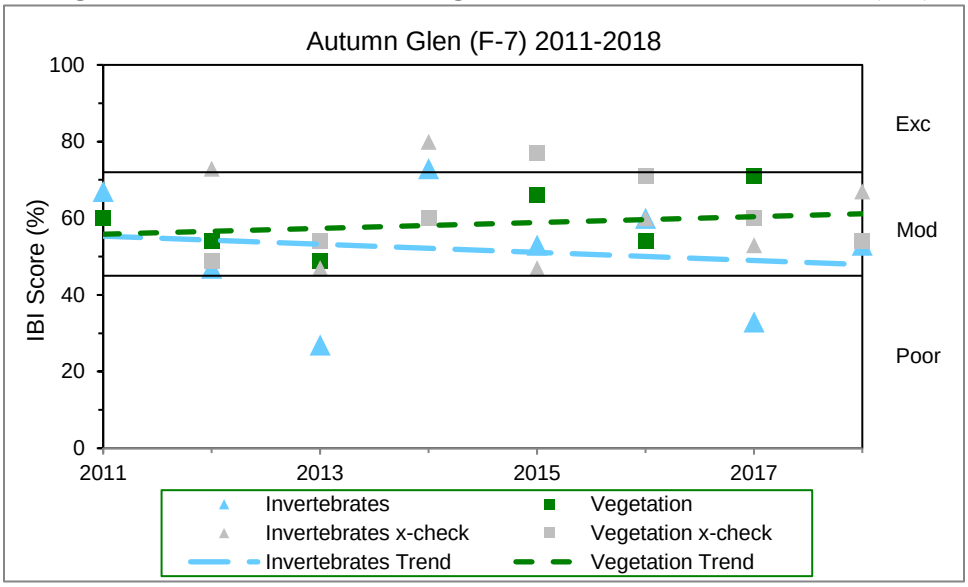
2018 Data (F-7)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (19)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (19)
Trend 2011-2018	Variable	Improving

Figure 4.5.2 Invertebrate and vegetation trends for Autumn Glen (F-7)



Site Summary: This is the eighth consecutive year that Autumn Glen has been monitored. The invertebrate and vegetation scores are consistent with each other, both indicating moderate wetland health. Though the data is somewhat variable, the health trends appear stable. This wetland was cross-checked by another WHEP team in 2018. The invertebrate scores between teams are not consistent, differing by 13 percent. The two teams identified different invertebrate taxas. The City team found mayflies and caddisflies, and the cross-check team found dragonflies and damselflies. Both teams identified a large population and diversity of leeches. The cross-check team collected a smaller Corixidae proportion than the City team, enhancing the invertebrate score. The teams found similar vegetation presence, and their vegetation scores were identical.

4.5.3 Cambodia Avenue (F-9)

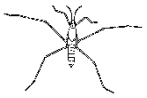
Cambodia Aveune (F-9) is a 5-acre, type 5 wetland within the Vermillion River Watershed. The wetland drainage area is 24 acres with 9 percent impervious surface. There is one inlet on the southwest corner of the wetland and one outlet in the northeast end of the wetland. It is included in the City's Stormwater Management Plan, and is designated as a Manage 2 wetland. The management goals are to monitor and document how different land uses impact man-made wetlands over time.

A wide buffer zone with native vegetation surrounds the wetland. Much of the surrounding area is agricultural land; however, development of residential homes exist to the north and west of the wetland.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is fairly mucky with a lot of roots. It is a small, though fairly deep wetland, with open water surrounded by concentric rings of white water lilies (*Nymphaea* sp.) and cattails (*Typha* sp.). The wetland is bordered by farm land to the south and east and housing tracts to the north and west. The sampling site is in a circle of open water at the center of the wetland. Bulrush (*Scirpus* sp.), reed canary grass (*Phalaris arundinacea*), slender Riccia (*Riccia fluitans*), coontail (*Ceratophyllum* sp.), pondweed (*Potamogeton* sp.), duckweed (*Lemna* sp. and *Spirodela* sp.) were present. The water level was high, at the time of invertebrate sampling, due to 4-5 inches of rain. Only one species of dragonfly, two species of mayflies, and scuds were observed.

Table 4.5.3 Cambodia Avenue (F-9) Wetland Health based on Index of Biotic Integrity

2018 Data (F-9)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (8)	Moderate (19)
Trend 2018	Not enough data	Not enough data

Site Summary: This is the first time that Cambodia Avenue wetland has been surveyed for WHEP. Invertebrate and vegetation scores were inconsistent with each other, differing by 27 percent. The invertebrate score indicates poor wetland health while the vegetation score indicates moderate wetland health. Heavy rains may have impacted the invertebrate sampling. More years of data are needed to determine a reliable health trend.

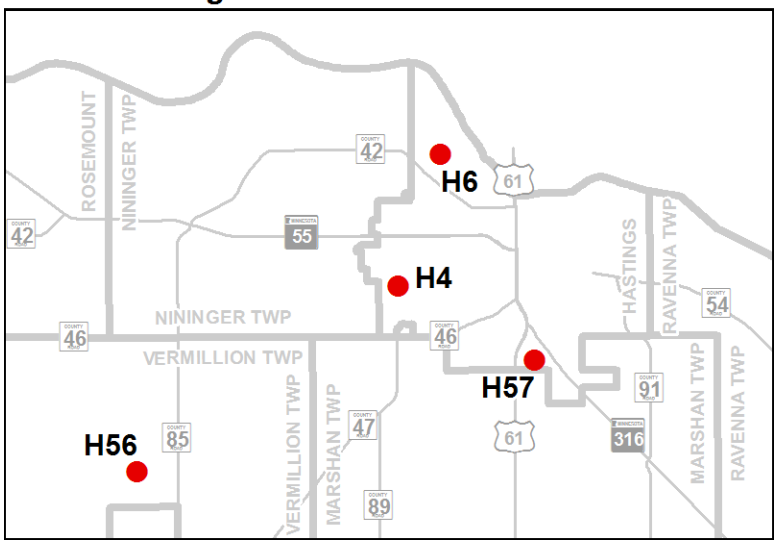
4.6 Hastings Wetlands

Four wetlands were monitored within the City of Hastings in 2018. The City has 20 years of data! Nine wetlands have been sampled in the City of Hastings through the WHEP program since 1999.

Team Leader: Jessie Eckroad

Team Members: Alex Franzen, Mike Nelson, and Dwight Smith

Hastings WHEP Sites Monitored in 2018



JESSIE ECKROAD

Jessie Eckroad is an environmental educator at Carpenter St. Croix Valley Nature Center and has been the WHEP Hastings Team leader for four years. "I love WHEP because it provides me the opportunity to spend time outdoors and connect with other people who are passionate about the environment," she says. "It also gives me a chance to contribute to the well-being of my community!" Even though she loves the research and science facets of WHEP, her favorite part of her experience has been building relationships with the members of her team. "The people I've met through WHEP aren't just colleagues, they are my friends, and I am so happy to have them in my life."

JOHN CAVEN

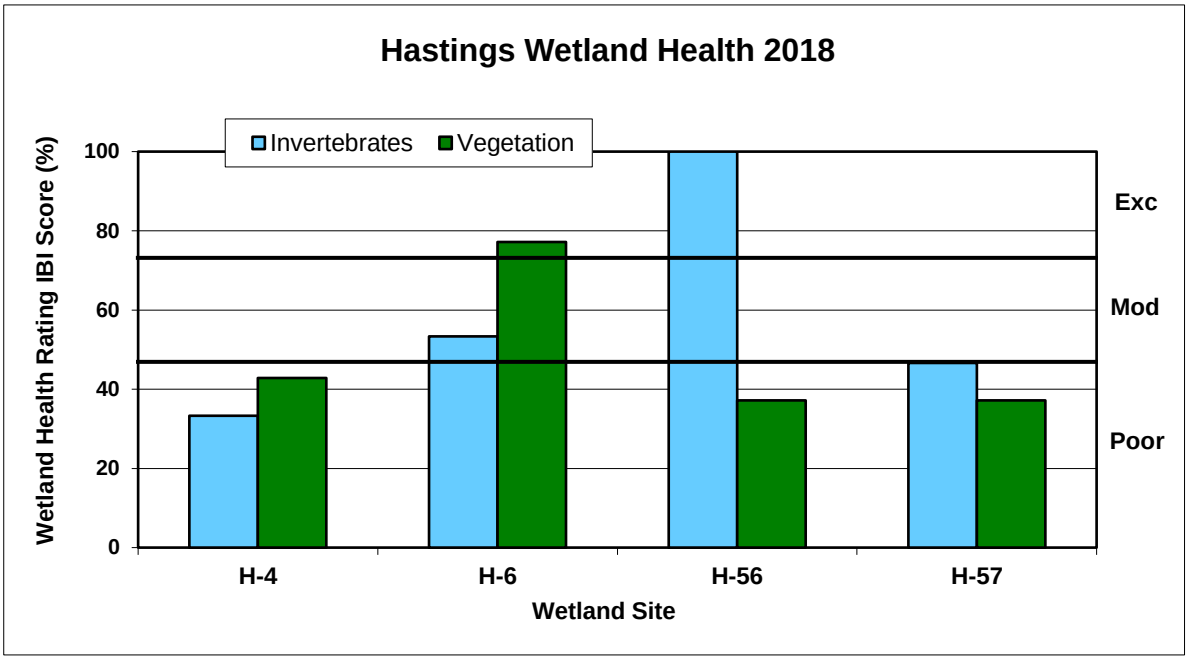
John Caven is the Assistant City Engineer for the City of Hastings. He has been the WHEP City contact and administrator since 2010. His role includes selecting the wetlands to be monitored as well as being a communication link for the City. He said, "Once again the volunteers have done a fabulous job. The City appreciates all the hours spent collecting the data that makes this report so valuable."

Hastings General Wetland Health

Figure 4.6 presents an overall view of wetland health for all of the 2018 monitoring sites in Hastings based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.6 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The wetlands showed poor to excellent wetland health in 2018. Invertebrate and vegetation scores for H-6 and H-56 were inconsistent, differing by 24 and 63 percent, respectively. H-56 scored excellent for invertebrates in 2017 and 2018.

WHEP TEAMS PARTICIPATING IN TRAINING SESSIONS

Figure 4.6 Hastings site scores (percent) for the 2018 sampling season



4.6.1 Stonegate Treated Wetland (H-4)

H-4, also known as Stonegate Treated, is the second cell of a two-celled stormwater management system created to treat runoff from surrounding residential development. It is a 1.2-acre, type 4 stormwater detention pond located within the Vermillion River Watershed. The watershed is nine to ten acres, and is 30 to 40 percent impervious. The wetland has one inlet in the southeast corner and one outlet on the north end. It is part of the stormwater management plan, and is designated as a Stormwater Detention Pond. It serves as a storm water detention pond within a developed neighborhood. The goal for the wetland is to improve water quality of the stormwater runoff before it adversely affects the Vermillion River.

The watershed is primarily residential with private property on three sides and a public trail along the south side of the wetland. Private landowners within the Wyndham Hills Neighborhood Association manage their own frontages of the pond with rip-rap, mowing, and chemical use. Several property owners demonstrate good management practices by maintaining shoreland buffers to protect water quality and provide wildlife habitat. In 2004, the Wyndham Hills Neighborhood Association partnered with the City of Hastings and the DNR to provide native plantings around the pond. A private trail access divides Stonegate pond from another pond just south of the site. Some concerns compromising the health of the pond include invasive species, mowing too close to the water's edge, and the use of chemicals on adjacent shoreline turf.

Wetland Health

Site Observations: The wetland slope is steepe. The substrate is moderately firm with some mud. The vegetation around the wetland was different from prior years. The team noted that the neighborhood association removed vegetative buffers and many trees. The monitoring site was relocated to find a more relevent location. The team noted that the wetland was stinky in 2018. Cattail (*Typha* sp.) dominated the vegetation. Only a rare fragment of pondweed (*Potamogeton* sp.) was found to represent the submergent vegetation in the plot. Emergent vegetation, woody species, and reed canary grass (*Phalaris arundinacea*) dominated the vegetation. Leeches, mayflies, snails, true flies, and scuds were observed.

Table 4.6.1 Stonegate Treated (H-4) Health based on Index of Biotic Integrity

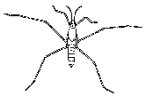
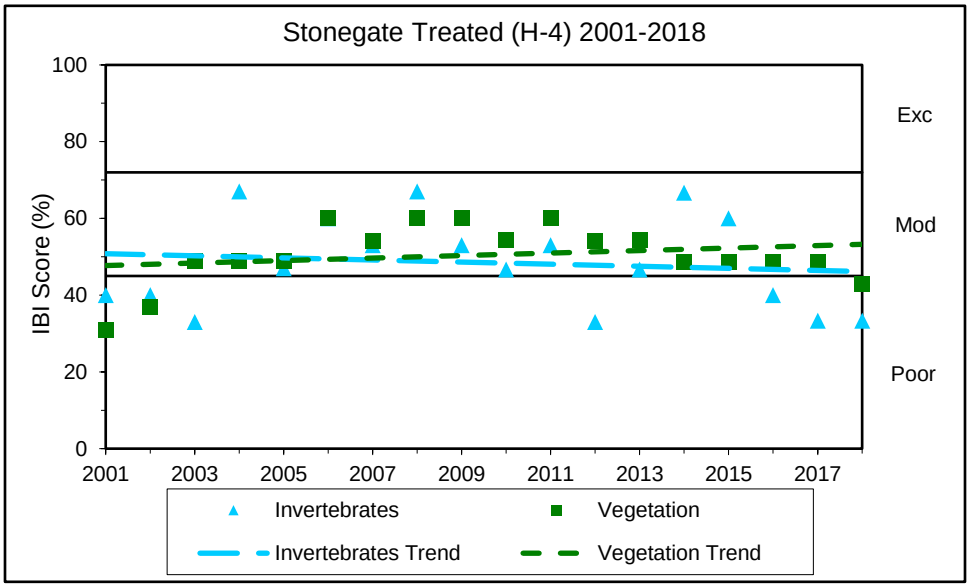
2018 Data (H-4)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (10)	Poor (15)
Trend 2001-2018	Variable, but stable	Stable

Figure 4.6.1 Invertebrate and vegetation trends for Stonegate Treated (H-4)



Site summary: This is the eighteenth consecutive year that Stonegate Treated has been surveyed. The invertebrates and vegetation scores were consistent in 2018, both indicating poor wetland health. The vegetation trend appears stable; however, may be gradually declining since 2011. Varying strategies of shoreline management per residence may be affecting vegetation scores. The invertebrate data varies from year to year; however, the trend analysis indicates stable invertebrate health. The invertebrate health has scored poor the past three years. The City team speculates that changes in the nearshore vegetation are affecting invertebrate habitat.

4.6.2 Lake Rebecca Wetland (H-6)

Lake Rebecca, H-6, also known as Rebecca EM 1&2, is a public water wetland in the City of Hastings. It is a 19-acre, type 5 open water wetland located in the Vermillion River Watershed. The wetland drainage area is 56 acres, and is 1 percent impervious. The wetland has two stormwater inlets along the southwest shoreline and one controlled outlet on the southeast end. The wetland is part of the City's stormwater management plan, and is designated as a High Quality Wetland. It is being managed as a wildlife habitat area and for recreational use. A natural shoreline buffer zone exists along much of the lake's perimeter. The Mississippi River Flats Natural Resource Management and Restoration Plan was adopted in December 2002. One of the inflow areas to the lake is fitted with a series of sediment control structures. These are maintained by the City Public Works Department. The City Parks Department operates an aeration system during the winter season to benefit the game fish.

The wetland is an emergent marsh and shoreline/floodplain forest. Spring fed water from the bluffs helps maintain water levels. Jaycee Park provides access for recreation on the lake, including a boat launch. Diversion of stormwater into the lake and an impervious parking lot/boat launch adjacent to the eastern edge of the lake are of growing concern. Purple loosestrife and zebra mussels are present and compromise the health of the lake.

Wetland Health

Site Observations: The wetland slope is moderate, but many submerged logs create tripping hazards. The substrate is very mucky in the shallow areas, but more solid in deeper water. Access to the monitoring site is via the bikepath on the levee that divides the Mississippi River and Lake Rebecca. The slope from the bike path to the water is very steep and is covered with tall grasses and forbs. The team noted that the water appears very clear, and their bottletraps and dipnet samples included large populations of Ostracods. Sedges (*Carex* sp.), reed canary grass (*Phalaris arundinacea*), coontail (*Ceratophyllum* sp.), pondweed (*Potamogeton* sp.), duckweed (*Lemna* sp.), and water-meal (*Wolfia* sp.) dominated the vegetation. Several small samples of emergent forbs were also present. Dragonflies, damselflies, caddisflies, snails, true flies, and scuds were observed.

Table 4.6.2 Lake Rebecca (H-6) Wetland Health based on Index of Biotic Integrity

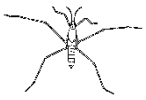
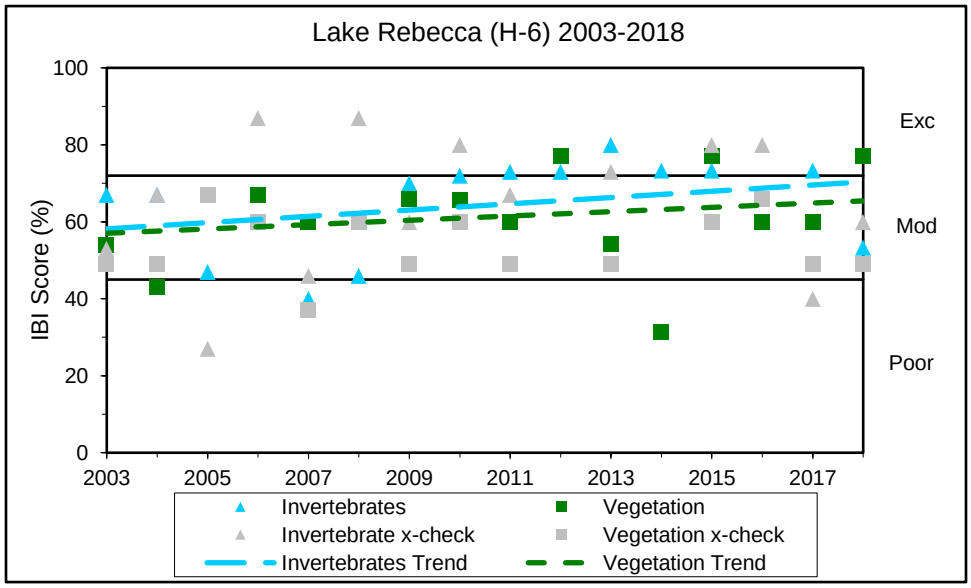
2018 Data (H-6)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (16)	Excellent (27)
Cross-check Rating (IBI score)	Moderate (18)	Moderate (17)
Trend 2003-2018	Stable	Variable, stable

Figure 4.6.2 Invertebrate and vegetation trends for Lake Rebecca (H-6)



Site summary: This is the sixteenth consecutive year of monitoring for Lake Rebecca. Invertebrate and vegetation scores are inconsistent, differing by 24 percent. Invertebrate score indicates moderate wetland health while the vegetation score indicates excellent wetland health. There was a lot of variability in the invertebrate data prior to 2009; however, data from 2009 until 2017, the invertebrate health has remained stable with moderate to excellent health. In 2018, the invertebrate score declined. The vegetation data is variable; however, the long term trend appears stable. This wetland was cross-checked by another WHEP team in 2018. The vegetation scores between the two teams were inconsistent, differing by 28 percent. The City team identified a larger diversity of vegetation including several more emergent plants. This may have been due to differences in the placement of the vegetation plots.

4.6.3 180th Street Marsh (H-56)

H-56, also known as 180th Street Marsh, is a 20-acre type 5 open water wetland located in the Vermillion River Watershed. The wetland drainage area is 340 acres, and is less than one percent impervious. The wetland has one inlet on the west side. It also has one outlet that flows south to the Vermillion River from a culvert under 180th Street. This wetland is not part of the City's stormwater management plan; it is in Dakota County and not under the management of the City.

The wetland is a part of several natural ponds in this agricultural area. The ponds partially cover several parcels of land, each parcel owned by a different party. Management practices are dependent on individual property owners. The landowner has not communicated any plans on management of the wetland. There is a concern that when the ponds are dry, the landowners may put the land into production. Farming practices to the south restrict any above ground outflow to the Vermillion River. Wildlife management is

protected through the Farmland and Natural Area Program. The wetland management goal is for agriculture to continue on surrounding land, and wildlife habitat management to be practiced in the wetland areas.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is somewhat solid with matted vegetation. The water level appeared low (0.3-0.7 meters deep) in 2018. Reed canary grass (Phalaris arundinacea) dominate the shoreline. Willows (*Salix* sp.), bur-reed (*Sparganium* sp.), arrowhead (*Sagittaria* sp.), coontail (*Ceratophyllum* sp.), pondweed (*Potamogeton* sp.), duckweed (*Lemna* sp. and *Spirodela* sp.), and water-meal (*Wolfia* sp.) make up the majority of the vegetation diversity. Many taxa of leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans were observed.

Table 4.6.3 180th Street Marsh (H-56) Wetland Health based on Index of Biotic Integrity

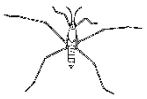
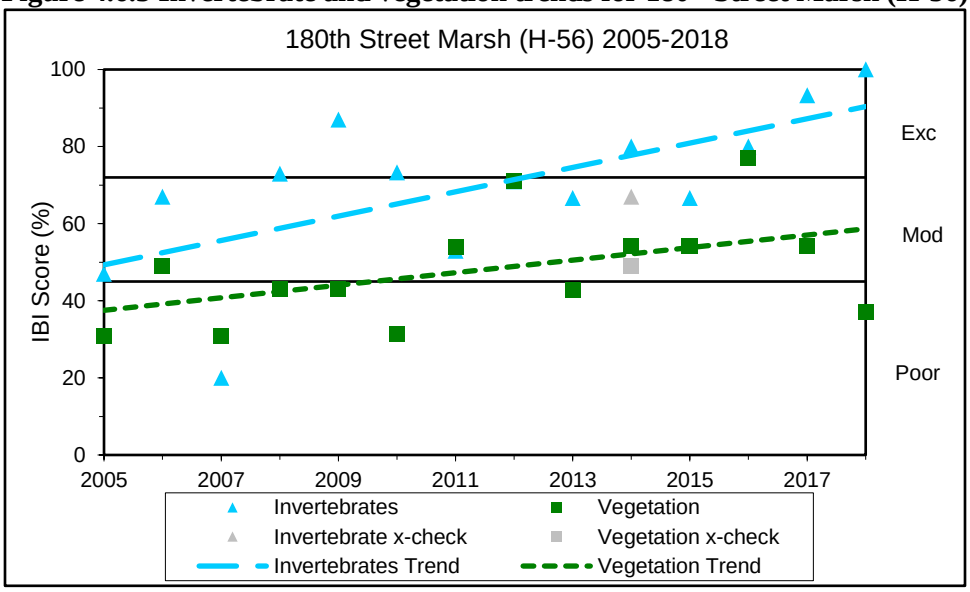
2018 Data (H-56)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (30)	Moderate (13)
Trend 2005-2018	Improving	Variable, but improving

Figure 4.6.3 Invertebrate and vegetation trends for 180th Street Marsh (H-56)



Site summary: This is the fourteenth consecutive year that H-56 has been monitored. The invertebrate and vegetation scores are very inconsistent, differing by 63 percent. The invertebrate score indicates excellent health while the vegetation score indicates poor health. Though vegetation abundance provided habitat to

support a healthy invertebrate population, it lacked diversity. Both health trends appear to be improving, despite a few variances in some years.

4.6.4 Cari Park Pond (H-57)

Cari Park Pond (H-57) is a 0.78-acre stormwater detention pond located in the Vermillion River Watershed. The wetland drainage area is 29 acres, and 14 percent impervious. The wetland has four inlets of which three are located on the east side of the pond and one on the west side. It also has one outlet on the west side. This wetland is part of the City's stormwater management plan. It is a man-made sedimentation pond that was constructed in 1989. It is designated as a Medium Quality Wetland. It serves as a stormwater detention pond within a developed neighborhood. The goal for the wetland is to improve water quality of the stormwater runoff before it adversely affects the Vermillion River. The City has erosion control regulations in place to minimize the impacts of development within the watershed.

Private landowners within the Cari Park neighborhood manage their own frontages of the pond with rip-rap, mowing, and chemical use. On the south and east sides of the pond, a City bituminous path connects the neighborhoods through Cari Park. Cari Park offers recreational opportunities on the south side of the pond. A bike trail runs along the south and east sides of the pond.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is very mucky. The wetland is surrounded by residential homes, and a nearby park. Trees overhang portions of the wetland shoreline. Cattails (*Typha* sp.) dominated the shoreline. Duckweed (*Lemna* sp.) covered much of the wetland surface. A few emergent plants were observed. No submergent vegetation was found in the vegetation plot. Leeches, dragonflies, snails, true flies, and scuds were observed. There was a lot of trash and the wetland was smelly (similar notes in 2016, 2017, 2018). Chinese mystery snails were found.

Table 4.6.4 Cari Park Pond (H-57) Wetland Health based on Index of Biotic Integrity

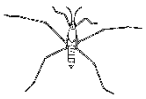
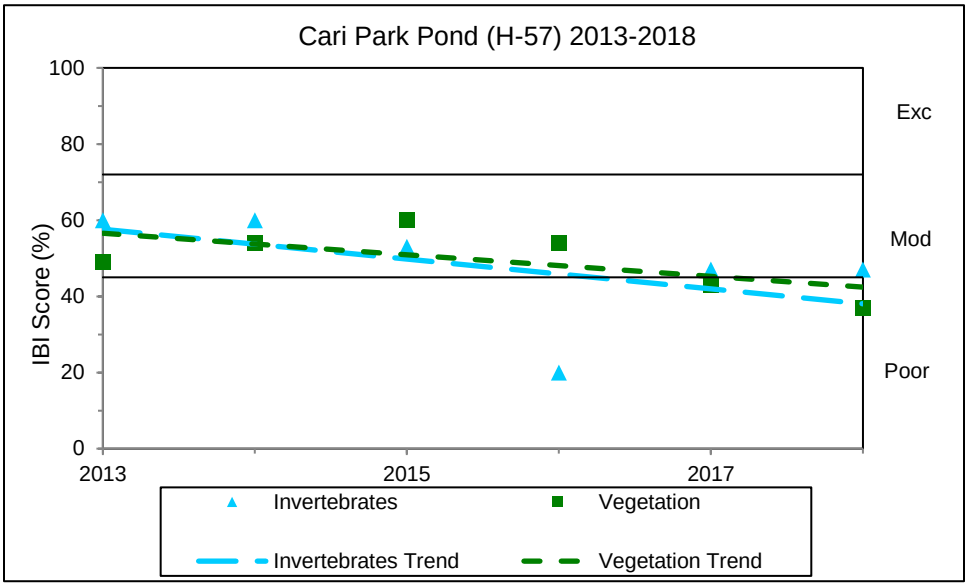
2018 Data (H-57)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Poor (13)
Trend 2013-2018	Slight decline	Slight decline

Figure 4.6.4 Invertebrate and vegetation trends for Cari Park Pond (H-57)

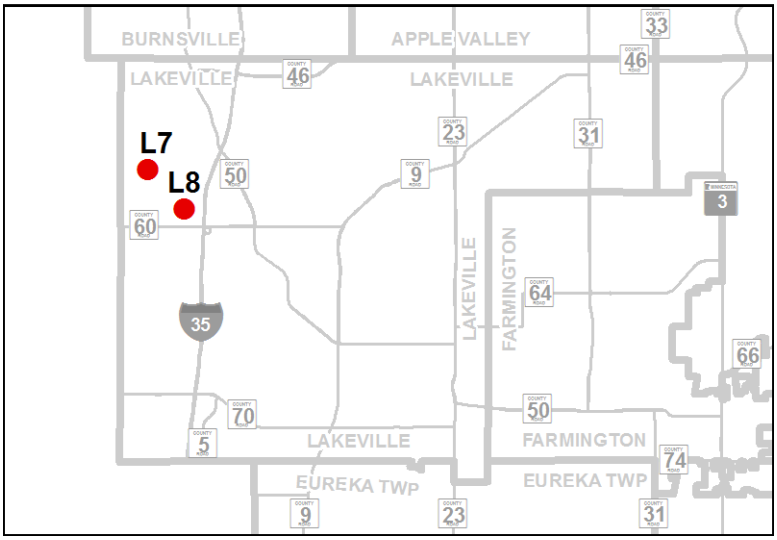


Site summary: This is the sixth consecutive year that Cari Park Pond has been monitored. The vegetation and invertebrate scores were consistent with each other in 2018, both indicating poor wetland health. Both invertebrates and vegetation scores appear to be gradually declining each year.

4.7 Lakeville Wetlands

Two wetlands were monitored within the City of Lakeville in 2018. The City has 21 years of data! Ten wetlands have been sampled in the City of Lakeville through the WHEP program since 1998.

Lakeville WHEP Sites Monitored in 2018



Team Leader: Steve Weston

Team Members: Kurt Engen, Danyel Hinson, Emma Hinson, Nikhil Kapur, David Leard, Thomas Oelkers, Naseema Omer, Emily Pfieffer, Monica Rauchwarter, Nora Renner, Ella Renner, Thomas Renner, and Laura Wolf

STEVE WESTON

Steve Weston has participated in WHEP for over 16 years. He describes himself as a naturalist, and says, “I am best known for my bird observations, but people who join me on field trips realize that I am really interested in all components of the environment. I have little formal biological training.”

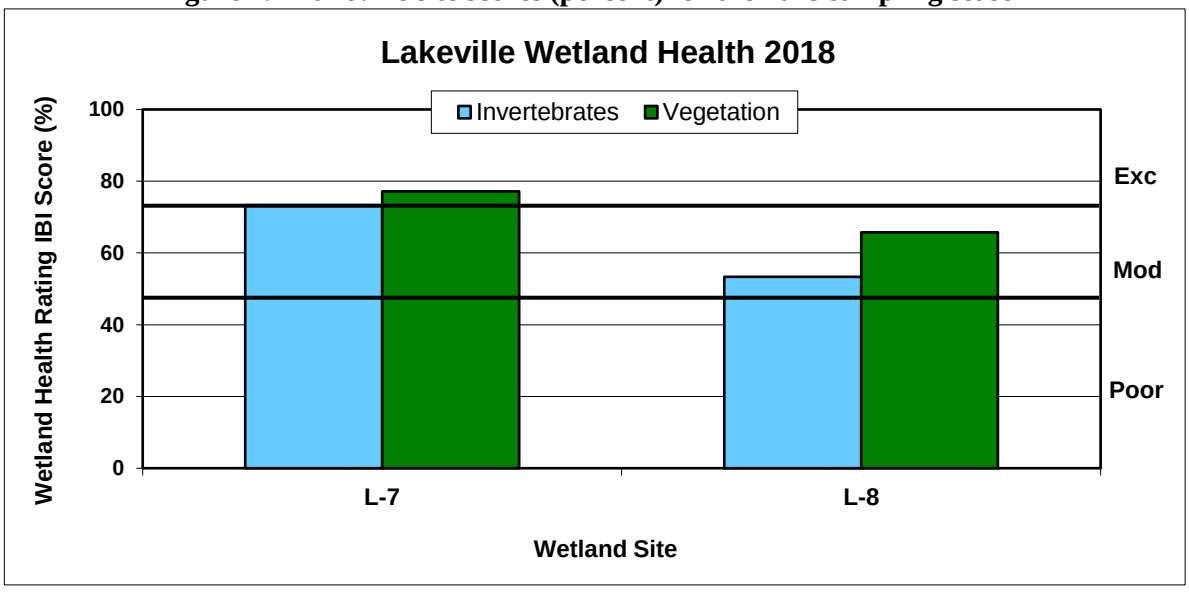
ANN MESSERSCHMIDT

Ann Messerschmidt is the WHEP contact at the City of Lakeville. Her role is to determine which wetlands should be monitored by WHEP volunteers as well as review the collected data. She uses the data to compare to past years data and see what changes are occurring with the wetlands. She says, "Over time, we hope to be able to see trends in the data." Ann believes, "The WHEP program is a great opportunity for residents interested in the natural environment to learn about wetland plants and invertebrates. This is a valuable asset to the volunteers. Because of the work by the volunteers, the community as a whole can now find in-depth information about the connections of the environment to its inhabitants and how that reflects the overall health of the system. This helps residents of our community learn how their actions can directly affect water quality."

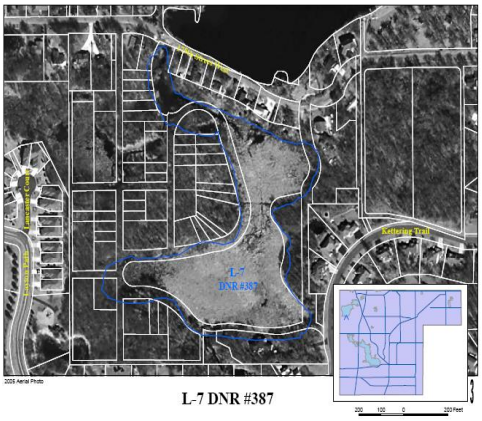
Lakeville General Wetland Health

Figure 4.7 presents an overall view of wetland health for all the 2018 monitoring sites in Lakeville based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.7 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. Though both invertebrate and vegetation scores for site L-8 indicate moderate wetland health, they were inconsistent, differing by 13 percent.

Figure 4.7 Lakeville site scores (percent) for the 2018 sampling season



4.7.1 DNR Wetland #387 (L-7)



L-7 DNR #387

L-7, also known as DNR #387, is a ten-acre, type 4 wetland located in the Orchard Lake subwatershed within the Black Dog Watershed. The Orchard Lake subwatershed is 506.6 acres with 105.5 acres of direct drainage. It is 29 percent impervious, and both publicly and privately owned. It has one inlet in the southeast corner of the wetland off of Kettering Trail and two outlets along the north side near Orchard Lake. The wetland is part of the City's stormwater management plan. The wetland designation is to preserve. The management goal is to actively protect and preserve the functions and values of the wetland. A woodland buffer surrounds most of the west side of the wetland, with woodland buffers between the few properties along the north and southeast wetland boundary. In an effort to improve water quality of Orchard Lake, an aeration system was installed in L-7 in 2010. There are four diffuser heads installed near the north outlet into Orchard Lake. The goal is to precipitate phosphorous out of the water column and drop it out into the sediments in L-7 so that less phosphorous will enter into Orchard Lake. The aeration system is scheduled to run from April to October annually.

Wetland Health


LAKEVILLE TEAM

Site Observations: The slope is gentle and the substrate muddy. The wetland is dominated by cattails (*Typha* sp.), reed canary grass (*Phalaris arundinacea*), and purple loosestrife (*Lythrum salicaria*). The wetland displays a large diversity of other vegetation, as well, including: sedges (*Carex* sp.), rushes (*Elocharis* sp.), bladderwort (*Utricularia* sp.), arrowhead (*Sagittaria* sp.), water plantain (*Alisma* sp.), Iris (*Iris* sp.), burreed (*Sparganium* sp.) and duckweed (*Lemna* sp.). Leaves of the Purple Loosestrife show significant damage from biological control insects that were introduced to control this exotic invasive. Several taxa of leeches, caddisfly, snails, true flies, and crustaceans were observed.

Table 4.7.1 DNR 387 (L-7) Health based on Index of Biotic Integrity

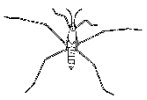
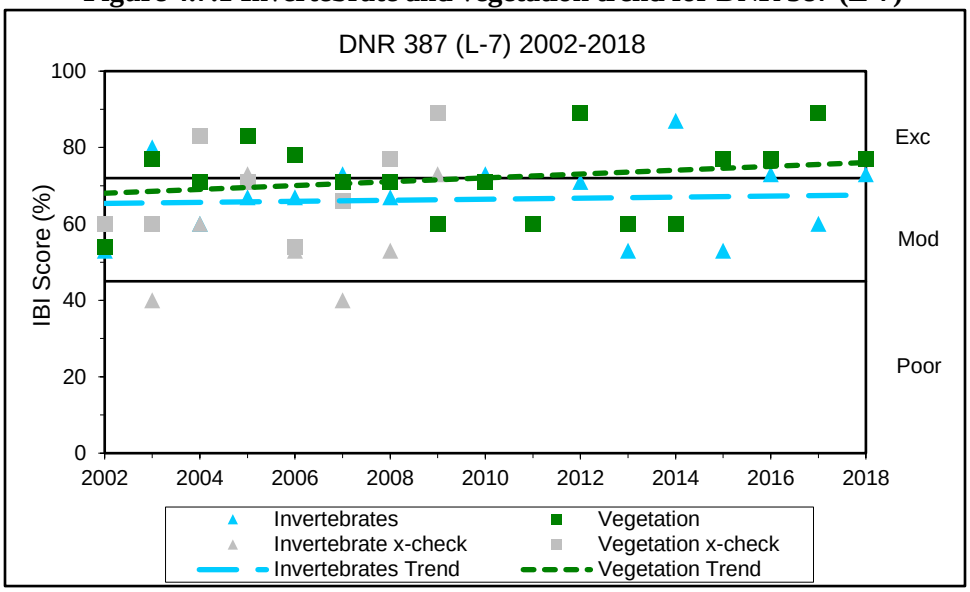
2018 Data (L-7)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (22)	Excellent (27)
Trend 2002-2018	Variable	Variable

Figure 4.7.1 Invertebrate and vegetation trend for DNR 387 (L-7)



Site summary: This is the seventeenth consecutive year that DNR 387 has been monitored. The invertebrate and vegetation scores were consistent in 2018, even though the invertebrate score indicated moderate wetland health and the vegetation score indicated excellent wetland health. Both invertebrate and vegetation scores appear variable from year to year.

4.7.2 DNR #393 (L-8)

L-8 DNR #393

L-8, also known as DNR #393, is a 9.6-acre, type 5 wetland located in the Lake Marion subwatershed of the Vermillion River Watershed. The wetland drainage area is 74.7 acres, and 17 percent impervious. It is a publicly owned wetland. It has one non-stormwater inlet on the west side, and one outlet on the south side. There is a structure on the west side of the wetland that is connected to another wetland; however, it does not receive stormwater. The wetland is included in the City's stormwater management plan and is designated to preserve. The wetland management plan is to actively protect and preserve the function and values of the wetland to the maximum extent feasible. The wetland is within a residential neighborhood where development began in 2003 and ended in 2008. A conservation easement of varying widths exists along all sides of this wetland, with vegetative buffer.

LAKEVILLE TEAM CONDUCTING VEGETATION SURVEY

Wetland Health

Site Observations: The wetland slope is gentle at the shoreline, but moderate in the water. The substrate is solid, but covered with

some mud. Willows and aspens grow near the water. Rushes (*Eleocharis* sp.), bulrush (*Scirpus* sp.), reed canary grass (*Phalaris* arundinacea), smartweed (*Polygonum* sp.), arrowhead (*Sagittaria* sp.), water milfoil (*Myriophyllum* sp.), water-nymph (*Najas* sp.), pondweed (*Potamogeton* sp.), bladderwort (*Utricularia* sp.), and duckweed (*Lemna* sp. and *Spirodela* sp.) were observed. Leeches, dragonflies, damselflies, mayflies, snails, true flies, and scuds were present. A resident commented that there are game fish including northern pike in the wetland.

Table 4.7.2 DNR Wetland 393 (L-8) Health based on Index of Biotic Integrity

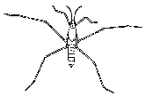
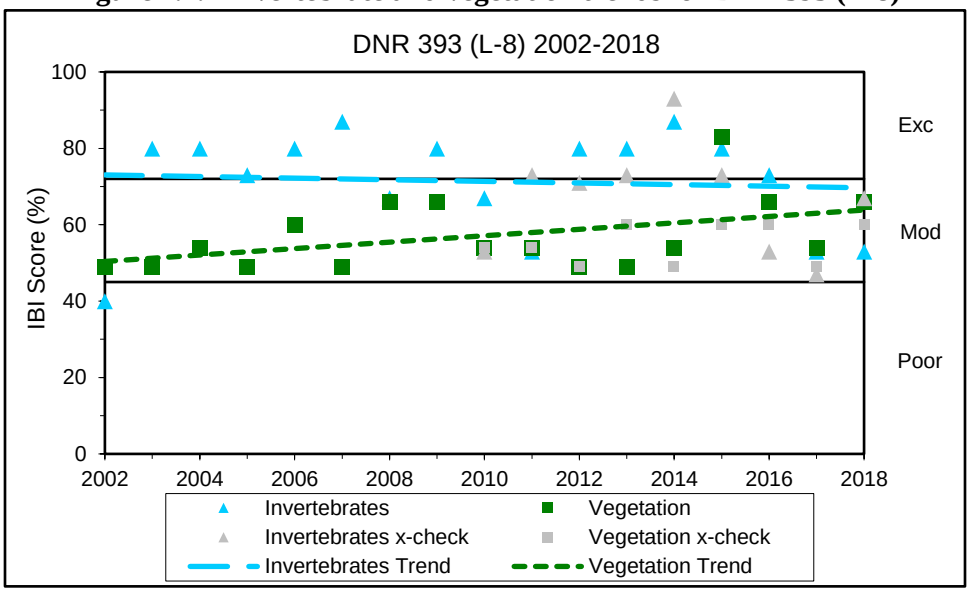
2018 Data (L-8)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (23)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (21)
Trend 2002-2018	Stable	Stable

Figure 4.7.2 Invertebrate and vegetation trends for DNR 393 (L-8)



Site summary: DNR 393 has been monitored 17 consecutive years. The invertebrate and vegetation scores were inconsistent, differing by 13 percent; however, both scores indicate moderate wetland health. Despite a high score in 2015, the vegetation scores have remained fairly stable. The invertebrate scores were stable and rated excellent for most years; however, the scores declined the past two years. This wetland was cross-checked by another WHEP team in 2018. The invertebrate scores between the two teams were inconsistent with each other, differing by 14 percent. The cross-check team identified a larger diversity of invertebrates, showing the invertebrate score to be more similar to past years of data. The teams identified very similar plant species.

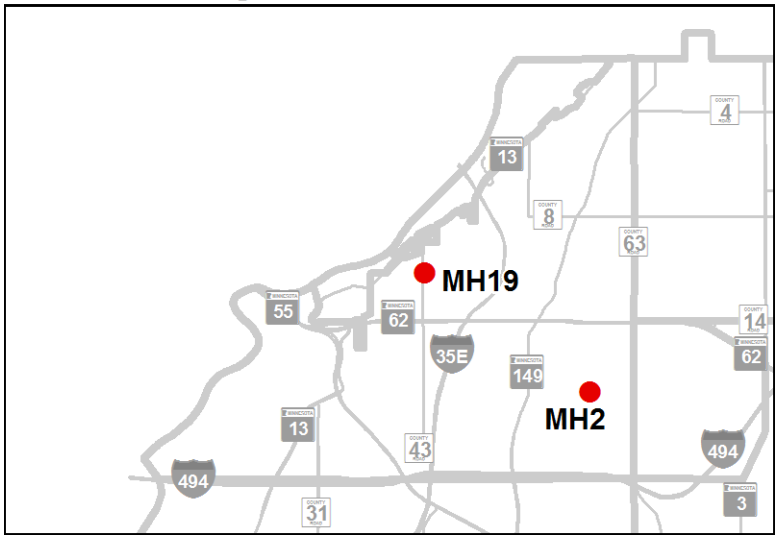
4.8 Mendota Heights Wetlands

Two wetlands were monitored within the City of Mendota Heights, in 2018. The City has 21 years of WHEP data! Eighteen wetlands have been monitored in Mendota Heights since the start of the WHEP program.

Team Leader: Darcy Tatham

Team Members: John Bottomley, James Chastek, Cory Fleming, Corrine Geiger, Norm Geiger, Alison Hruby, Jessica Larson, Rachel Quick, Marjorie Savage, Michelle Skog, Mary Stade, and Noelle Wang

Mendota Heights WHEP Sites Monitored in 2018



DARCY TATHAM

Mendota Heights' team leader, Darcy Tatham, has been part of the WHEP for more than 18 years. She stated, "Throughout my many years of being team leader, one of the things I like about the WHEP program is that our volunteers often are multi-generational. For a couple of years, I had an 83-year old gentleman on the team who was very keen to learn. I can only aspire to be that enthusiastic when I get to that age.

"Many years we have had a few middle-school and high school students on the team. This past year was no different. Noelle, a high school student and our youngest volunteer this past year, asked some very interesting and observant questions, especially about the macroinvertebrates. Some of the questions we would have answers to, but not to all of them. Several of her questions would have the seasoned volunteers, including myself, look at each other for support and then sheepishly answer that we didn't know the answer. The questions begged us to dig deeper. Everyone has a part and no question is dumb. We all work, learn, and have fun together as a team and there's always the opportunity to learn more."

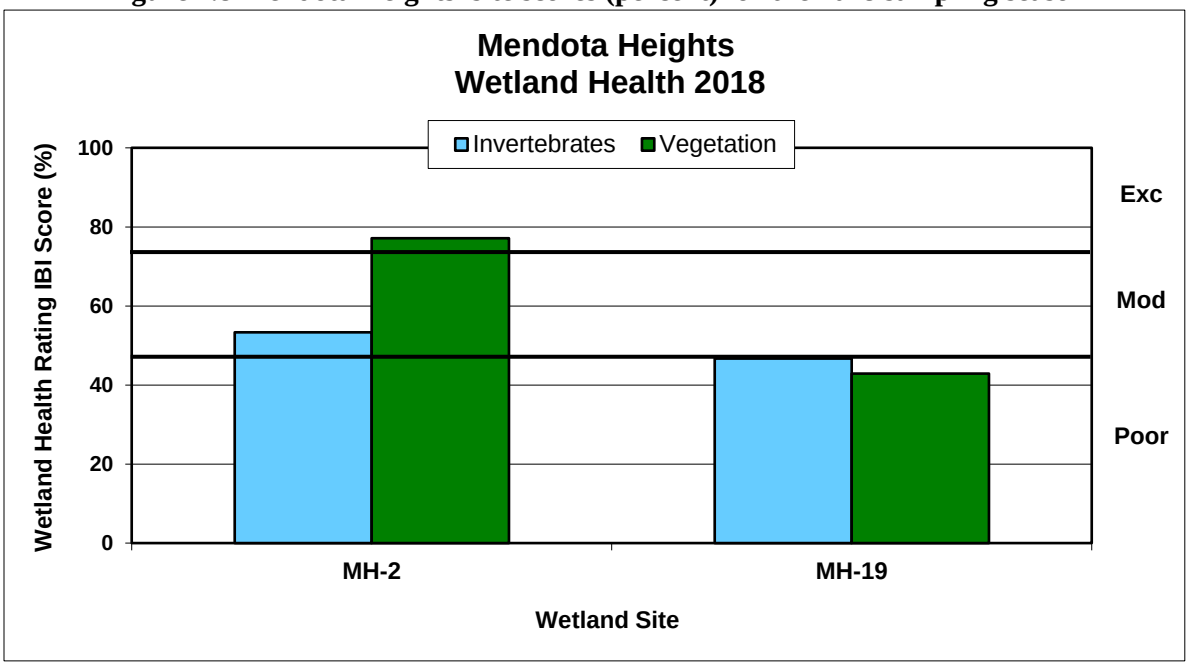
RYAN RUZEK

Ryan Ruzek has been involved in WHEP since 2005. He is currently the Public Works Director for Mendota Heights and selects and coordinates the wetlands to be monitored. Ryan has served as a volunteer on the Mendota Heights team in the past to gain a better understanding of the program. He commented, "Mendota Heights monitors two wetlands every year. One wetland is monitored year after year, and the city selects a second wetland where future BMP's are proposed to be installed. The City will then monitor that wetland again to see if the BMP was a success. WHEP has also been a great community involvement and education tool. Residents regularly stop by and inquire about the project."

Mendota Heights General Wetland Health

Figure 4.8 presents an overall view of wetland health for all of the 2018 monitoring sites in Mendota Heights based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.8 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. Two wetlands were monitored in 2018. Invertebrate and vegetation scores for MH-2 were inconsistent with each other, differing by 24 percent. MH-19 scored poor wetland health for both invertebrates and vegetation.

Figure 4.8 Mendota Heights' site scores (percent) for the 2018 sampling season



4.8.1 Copperfield (MH-2)

Copperfield (MH-2) is a 5.8-acre, type 5 wetland within the Lower Mississippi River watershed. Its watershed is 965.4 acres and is 30.1 percent impervious. There is one inlet in the northeast corner of the wetland, one inlet in the southeast corner, and one inlet in the southwest corner. There is one outlet in the northwest corner, near Huber Drive. The wetland is included in the City's stormwater management plan and is designated as NWI-PABG. The pond serves as a natural resource with a surrounding paved trail and gravel nature trail. The wetland management goal is to maintain water quality and flood rate control. Many of these ponds receive surface runoff from residential and road development. The two wetlands are connected when water levels are high.

This area is a City-owned open space, and is intended for educating the public on native plantings and the importance of water management. The pond is located in a wooded area with mature trees. Some invasive buckthorn and garlic mustard are present in the area. The surrounding area includes residential neighborhoods in Mendota Heights.

MENDOTA HEIGHTS TEAM MEMBERS AT WHEP INVERTEBRATE TRAINING

Wetland Health

Site Observations: Copperfield is part of a chain of ponds within an established neighborhood, but is City-owned with no houses around it. The wetland slope is gentle, and the substrate is very mucky. There were many fish and tadpoles in the bottle traps in 2018. Duckweed (*Lemna* sp. and *Spirodela* sp.), white water-lily (*Nymphaea* sp.), and water-meal (*Wolfia* sp.) covered the wetland surface. Coontail (*Ceratophyllum* sp.), water-nymph (*Najas* sp.), pondweed (*Potamogeton* sp.), and bladderwort (*Utricularia* sp.) were also present. Purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*) were also observed. Dragonflies, snails, midges, and scuds were present.

Table 4.8.1 Copperfield (MH-2) Wetland Health based on Index of Biotic Integrity

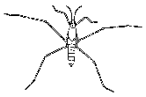
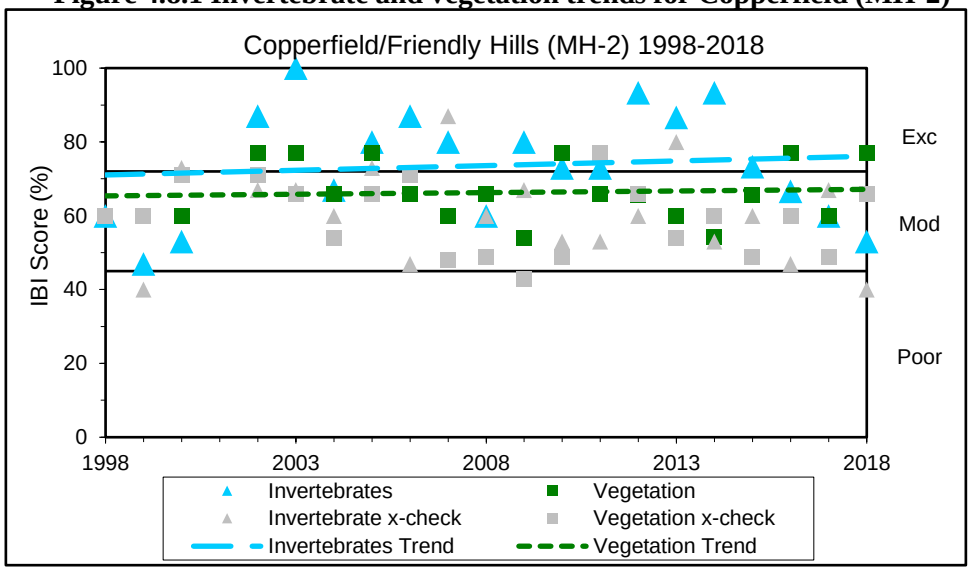
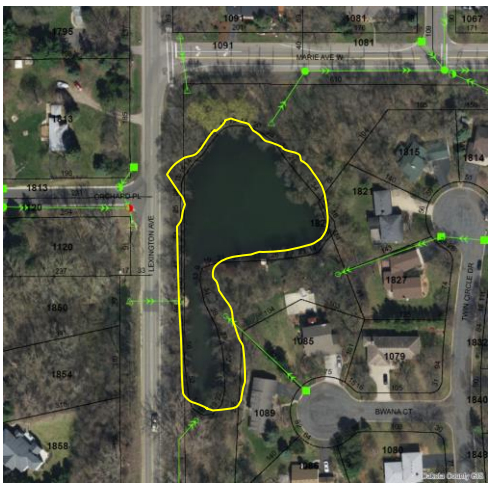
2018 Data (MH-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Excellent (27)
Cross-check Rating (IBI score)	Poor (12)	Moderate (23)
Trend 1998-2018	Variable	Variable

Figure 4.8.1 Invertebrate and vegetation trends for Copperfield (MH-2)



Site Summary: This is the 20th year that MH-2 has been monitored since 1998. There is a lot of variability in the data throughout the years of monitoring. In 2018, the invertebrate and vegetation scores were inconsistent, differing by 24 percent. This wetland was cross-checked by another WHEP team in 2018. The invertebrate and vegetation scores for the cross-check team were also inconsistent. In addition, the scores between the two teams were inconsistent; the invertebrate scores differed by 13 percent, and the vegetation scores differed by 11 percent. The City team identified a larger diversity of invertebrates than the cross-check team, including: bugs, beetles, mayflies, and caddisflies. The City team found bladderwort (Utricularia sp.) which enhanced their vegetation score over the cross-check team. Otherwise, the two teams observed very similar plant species.

4.8.2 Lexington Marie (MH-19)



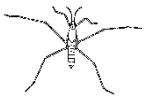
Lexington Marie (MH-19) is a 1.1-acre, type 4 wetland located within the Lower Mississippi River Watershed. The watershed is 46.5 acres and 30.1 percent impervious. There is one inlet on the west side of the wetland, one inlet on the south side, two inlets on the east side, and one inlet on the northwest side. There is also one outlet on the north side of the wetland. Lexington Marie is part of the City's stormwater management plan, and is designed for stormwater treatment. The wetland management goal is to maintain water quality and flood rate control.

This area is a City-owned space, intended to educate the public on native plantings and the importance of water management. The pond is located in a wooded area with mature trees. Some invasive buckthorn and garlic mustard are present in the area. Improvements to the pond are planned for 2019 which may include dredging and vegetation management.

Wetland Health

Site Observations: The wetland slope is moderate. The wetland substrate is somewhat mucky, but is uneven and littered with many tree branches. The wetland is surrounded by overhanging trees and shrubs. Coontail (*Ceratophyllum* sp.), water-nymph (*Najas* sp.), and small amounts of duckweed (*Lemna* sp. and *Spirodela* sp.) were observed. Leeches, dragonflies, damselflies, snails, true flies, and scuds were collected. Ducks, frogs, turtles, hummingbirds, and fish were observed. Algae is present. An aerator is in operation.

Table 4.8.2 Lexington Marie (MH-19) Wetland Health based on Index of Biotic Integrity

2018 Data (MH-19)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Trend 2018	Not enough data	Not enough data

Site summary: This is the first time that Lexington Marie wetland has been monitored for WHEP. The invertebrate and vegetation scores are consistent with each other, both scores indicating poor wetland health. More years of data collection will help determine a more reliable health trend.

4.9 North Cannon River Watershed Management Organization

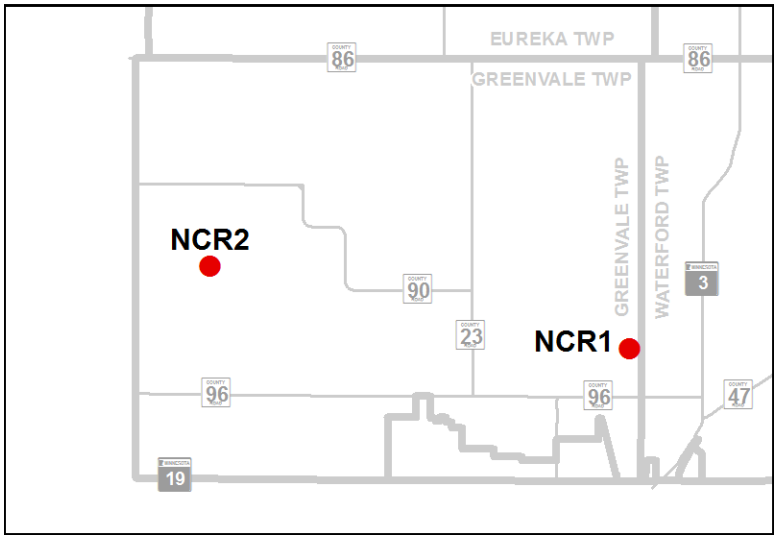
Two wetlands were monitored for North Cannon River Watershed Management Organization in 2018. This is the second year that North Cannon River WMO has monitored wetlands with WHEP.

Team Leaders: Tom Loretto

Team Members:

Ambria Kuchinko, Ruby Loretto, Reef Loretto, and Makeen Loretto

North Cannon River WMO WHEP Sites Monitored in 2018



TOM LORETTO WITH SON, MAKEEN

Tom Loretto is the team leader for North Cannon River Watershed Management Organization. Tom stated, "I have worked with WHEP for two summers (since 2017). My family has a partnership with Main Street Project – a regenerative agriculture non-profit based in Northfield. Main Street Project has a partnership with Dakota County; I was put in touch with WHEP through our work with Dakota County's conservation easement program. The southern end of the land we lease to Main Street Project for their demonstration farm is classified RIM (Reinvest in Minnesota) land by the Minnesota Board of Water and Soil Resources. One of our WHEP wetlands is on this RIM land. This year we had a small but enthusiastic crew of volunteers on our WHEP wetlands. Our forays in waders, in the muck, through the canary grass and cattails, proved most enjoyable to our team, as

it was a marked departure from their normal routine. For our 2017 work, I used GIS to map the data we collected. I hope to continue that with the 2018, and future data that we can collect, so that we are in good position to monitor the health trends of RIM and other wetlands within the Cannon River watershed.

ASHLEY GALLAGHER

Ashley Gallagher is a Resource Conservationist for Dakota County Soil and Water Conservation District. She explained, "We serve as the Administrator for the North Cannon River Watershed Management Organization (NCRWMO). The NCRWMO is a watershed in the southern part of Dakota County. A Board of managers with representation from eight townships and three cities oversees watershed management and planning in the North Cannon River Watershed area. One goal within the NCRWMO watershed management plan is 'to inform landowners, children, and local units of government, about the watershed and human impacts on water quality and quantity, and to invite public participation in watershed management processes.' In 2017, the Board decided to participate in WHEP for the first time. They are pleased with the way the program uses volunteers to conduct the monitoring, which helps increase public awareness of the watershed and the issues it faces. NCRWMO chose the same two wetlands to be monitored in 2018 in order to establish some trends in data. In the future this data can help the NCRWMO achieve another goal, which is 'to protect wetlands from destruction or deterioration due to development, drainage, agriculture, and other adverse activities'."

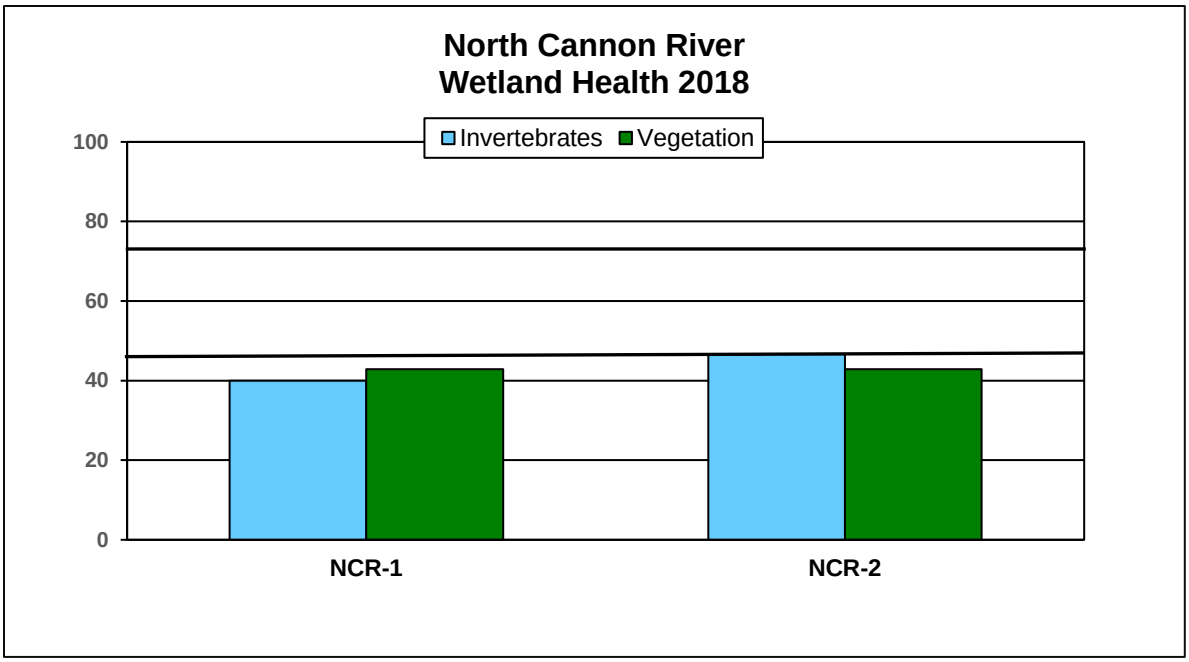
North Cannon River WMO General Wetland Health

Figure 4.9 presents an overall view of wetland health for all the 2018 monitoring sites in North Cannon River WMO based on the scores for invertebrates and vegetation presented as a percent. Figure 4. 9 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. Invertebrate and vegetation scores for each site were consistent with each other, and all scores indicated poor wetland health.

NORTH CANNON RIVER WMO TEAM AT WHEP INVERTEBRATE TRAINING

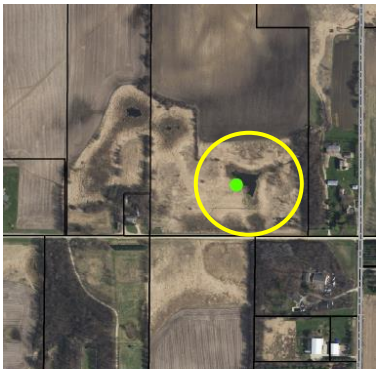
REEF LORETTO, MAKEEN LORETTO, TOM LORETTO, AMBRIA KUCHINKO

Figure 4.9 North Cannon River WMO site scores (percent) for 2018



4.9.1 Loretto Wetland (NCR-1)

Loretto Wetland (NCR-1), formerly known as Wasner, is a 0.5-acre, type 4 wetland within the Cannon River watershed. The wetland watershed is 160 acres with four percent impervious surface. A wetland restoration was completed in 1996. The wetland management goal is to maintain the wetland and determine the effectiveness of the restoration.



This wetland is located within the Greenvale Township in southwest Dakota County. The surrounding area is predominately agricultural. There is potential for future development in the area.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is mucky. Cattails (*Typha* sp.), reed canary grass (*Phalaris arundinacea*), and duckweed (*Lemna* sp. and *Spirodela* sp.) dominate the near shore. Pondweed (*Potamogeton* sp.), bur-reed *(Sparganium*), water plantain (*Alisma* sp.), and water-meal (*Wolfia* sp.) were also present. Leeches, dragonflies, caddisflies, and snails were present. The wetland smells like rotten eggs.

Table 4.9.1 Loretto Wetland (NCR-1) Wetland Health based on Index of Biotic Integrity

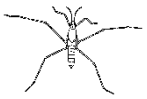
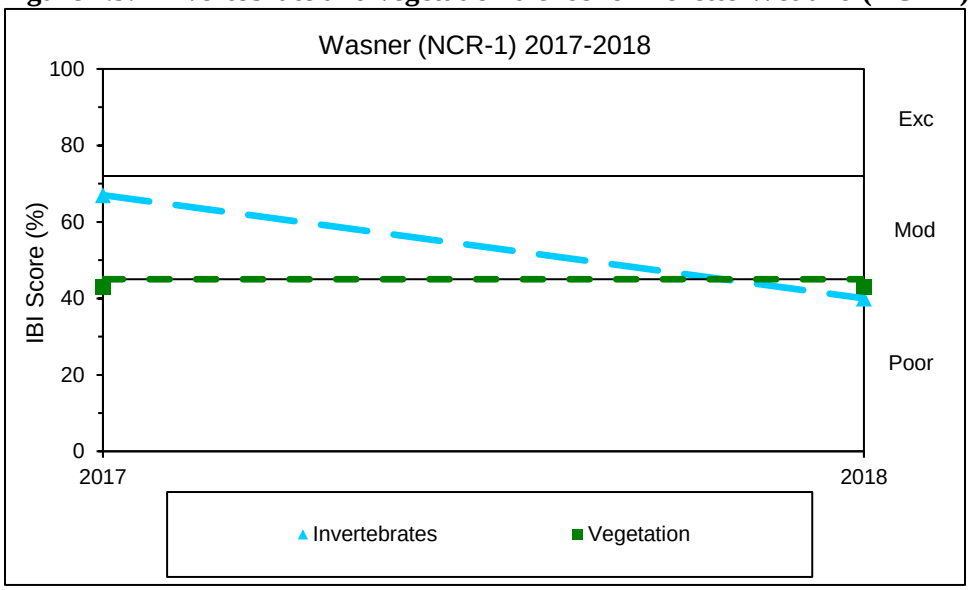
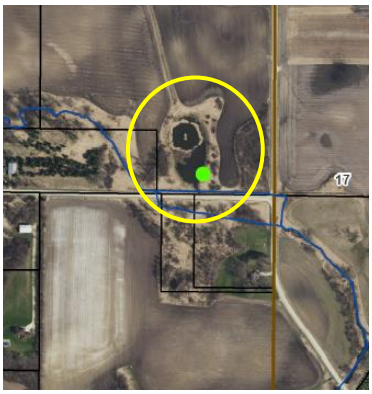
2018 Data (NCR-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (12)	Poor (15)
Trend 2017-2018	Not enough data	Not enough data

Figure 4.9.1 Invertebrate and vegetation trends for Loretto Wetland (NCR-1)



Site summary: This is the second year that Loretto Wetland has been monitored by WHEP volunteers. The invertebrate and vegetation health scores were consistent, both indicating poor wetland health. The invertebrate score declined from 2017 while the vegetation score remained stable. More years of data will help determine a more reliable health trend.

4.9.2 Peterson (NCR-2)



Peterson (NCR-2) is a 2-acre, type 5 wetland within the Cannon River watershed. The wetland watershed is 55 acres with no impervious surface. It is an excavated wetland. The wetland may be affected by the flow changes of nearby Dutch Creek.

This wetland is located within the Greenvale Township in southwestern Dakota County. The surrounding area is predominately agricultural.

Wetland Health

Site Observations: The wetland slope is deep entering from the roadside ditch. The wetland substrate is firm, but covered in six inches of mud. Water is flowing in the roadside ditch adjacent to the wetland. Cattails (*Typha* sp.) and reed canary grass (*Phalaris arundinacea*) surround this open water wetland in the middle of farm fields. Coontail (*Ceratophyllum* sp.) and pondweed (*Potamogeton* sp.) dominate the submergent vegetation. Duckweed (*Lemna* sp.) and water-meal (*Wolfia* sp.) cover the surface of the wetland. Leeches, water boatman, dragonflies, snails, true flies, and scuds were collected.

Table 4.9.2 Peterson (NCR-2) Wetland Health based on Index of Biotic Integrity

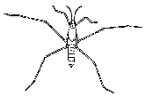
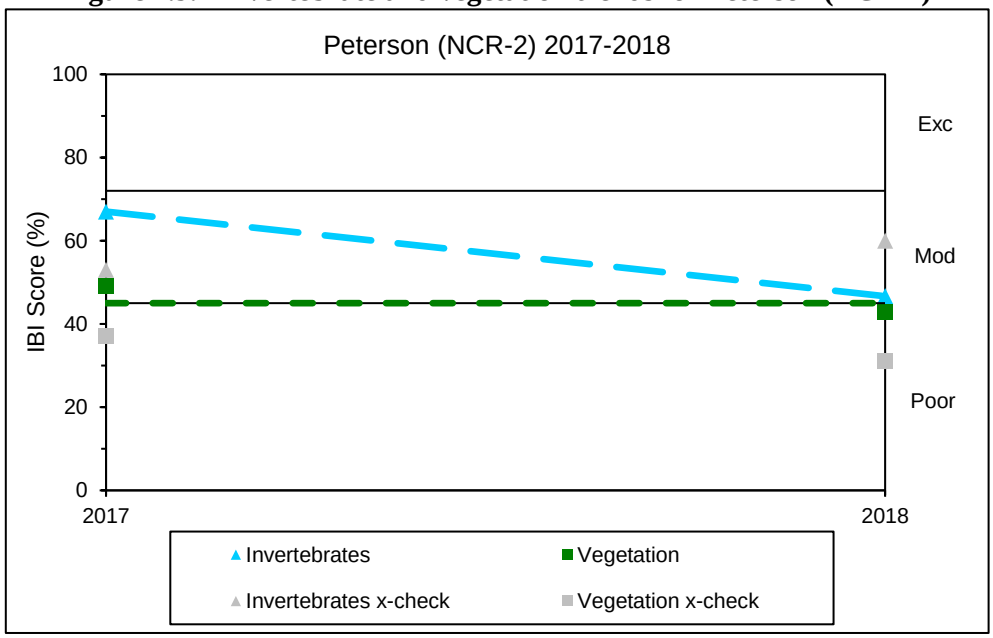
2018 Data (NCR-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Cross-check Rating (IBI score)	Moderate (18)	Poor (11)
Trend 2017-2018	Not enough data	Not enough data

Figure 4.9.2 Invertebrate and vegetation trends for Peterson (NCR-2)



Site summary: This is the second year that Peterson wetland has been monitored by WHEP volunteers. The invertebrate and vegetation scores were consistent, and both indicate poor wetland health. This wetland was cross-checked by another WHEP team in 2018. The scores between the two teams were inconsistent for both invertebrates and vegetation, differing by 13 percent and 12 percent, respectively. The cross-check team collected a larger diversity of snails, trueflies, and crustaceans which enhanced the invertebrate score. Though it did not affect the invertebrate score, the cross-check team collected hundreds of water boatman (*Corixidae*), but the City team had empty bottletraps without bugs and beetles. The City team commented that the strong current flowing into the wetland may have affected the invertebrate bottletrap collection. The City team identified a larger diversity of vegetation including grasses which enhanced the vegetation score. Additional years of monitoring will help to determine more reliable wetland health trends.

NORTH CANNON RIVER TEAM IN ACTION

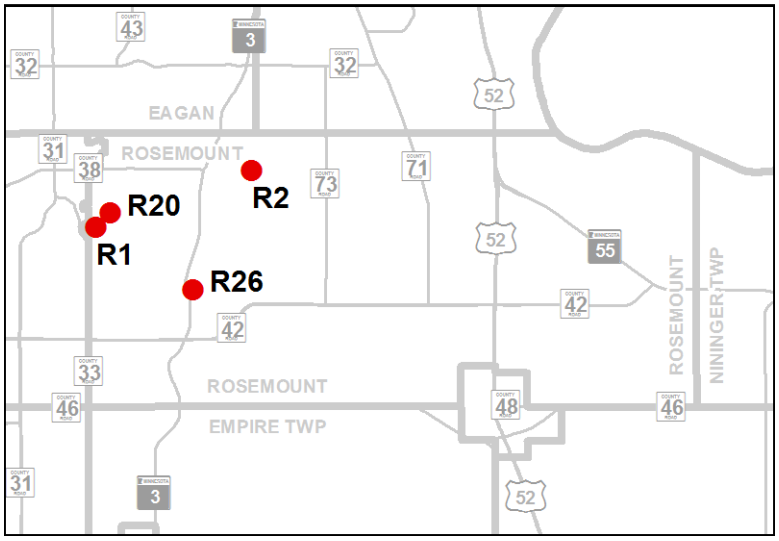
4.10 Rosemount Wetlands

Four wetlands were monitored in the City of Rosemount in 2018. The City has 21 years of WHEP data! Twenty-four wetlands have been monitored in Rosemount since the start of WHEP.

Team Leaders: Amy Jo Forslund

Team Members: Andy Bach, Maisy Bach, Gregory Dina, Jacob Geller, Kaelee Henrichs, Jim Hoopman, Agnes Jones, Tim Jones, Nicole Jones, Caleb Jones, Agnes Kramer, Eric Nelson, Jane Porterfield, Averie Simon, Peyton Simon, Andy Simon, Denise Wilkens, and Lisa Wolfe

Rosemount WHEP Sites Monitored in 2018



Amy Jo Forslund is the team leader for Rosemount. She explained, "This was my third year being the Rosemount team leader. I was a WHEP volunteer on the Eagan team for seven years, from 2007 to 2012, and asked to come back as a team leader for Rosemount. In my work life I am a substitute preschool teacher and an environmental educator. I have worked at many Metro area parks including Three Rivers Park District, Dakota County Parks, and Tamarack Nature Center. As an environmental educator I have taught

AMY JO FORSLUND

many elementary age children about natural history topics, and one of my favorite topics is wetlands. Being a part of WHEP has been a great opportunity to delve deeper into the wetland world. I want to thank the WHEP Rosemount team for their dedication, knowledge, and their masterful wetland and lab skills. It is honor to be a part of such a wonderful Citizen Science project."

GREG LUND

Greg Lund introduced himself, saying, "This is my first year as the city contact for the City of Rosemount, but I have been an active volunteer in the WHEP program since 2016. The City of Rosemount considers its wetlands to be a critical part of its natural resources. We have been participating in the WHEP program since it began, as it provides essential data that would otherwise be difficult to obtain with our limited staff time and resources.

"Over the years, volunteers have allowed us to track local trends and impacts on our wetlands, which lets us make critical decisions with surface water management.

"The City of Rosemount and I greatly appreciate the Rosemount WHEP Team. This program gives our community the opportunity to experience natural resources within their own city!"

ROSEMOUNT
MINNESOTA

Rosemount General Wetland Health

The City of Rosemount has a wetland management plan which includes four different categories of protection. Vegetated buffers are required around wetlands in new developments, with the buffer size determined by the wetland protection designation.

Wetland designation	**Required buffer**
Preserve Wetlands	75 feet
Manage I Wetlands	50 feet
Manage II Wetlands	30 feet
Utilize Wetlands	15 feet in non-agricultural areas only

Figure 4.10 Rosemount site scores (percent) for 2018

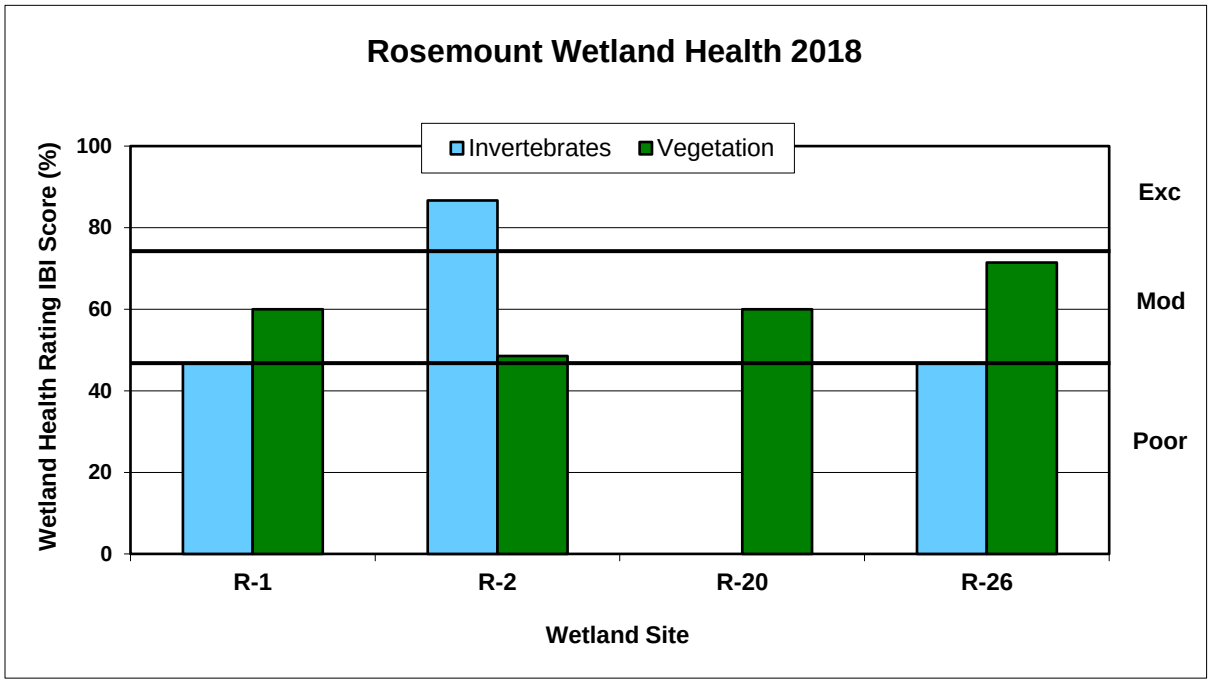


Figure 4.10 presents an overall view of wetland health for all the 2018 monitoring sites in Rosemount based on the scores for invertebrates and vegetation presented as a percent. Figure 4.10 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The four wetlands scored poor to excellent health. The invertebrate and vegetation scores for wetland sites R-1, R,2, and R-26 were inconsistent, differing by 13 percent, 38 percent, and 24 percent, respectively. Invertebrate data for R-20 was unusable.

4.10.1 Kelly Marsh (R-1)

Kelly Marsh (R-1), also known as WMP #362, is a 1.3-acre, type 5 wetland within the Birger Pond watershed. The watershed is 897 acres with 80 percent impervious surface. There is one inlet on the north side and one outlet on the south side of the wetland. Kelly Marsh is part of the City's stormwater management plan and is designated to preserve with a management goal to maintain wetland without loss of function and value, and to maximize potential for education purposes by taking advantage of surrounding residential area and park.

The wetland is located in a basin surrounded by a housing development and City park. The wetland basin is affected by storm water runoff from the nearby development which is encroaching upon the existing 75-foot buffer.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is somewhat mucky with a firm base. The wetland is within the City's Innisfree Park. Submergent and floating leaved plants dominated the wetland, including: coontail (*Ceratophyllum* sp.), waterweed (*Elodea* sp.), pondweed (*Potamogeton* sp.), white water lily (*Nymphaea* sp.), duckweed (*Lemna* sp. and *Spirodela* sp.), and water-meal (*Wolfia* sp.). Leeches, dragonflies, damselflies, snails, true flies, and crustaceans were collected.

Table 4.10.1 Kelly Marsh (R-1) Wetland Health based on Index of Biotic Integrity

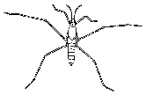
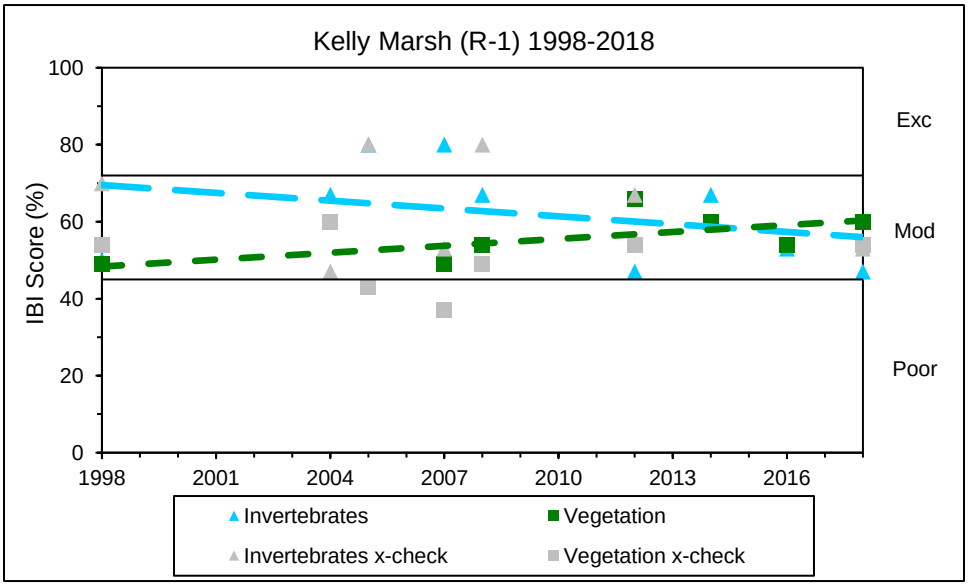
2018 Data (R-1)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (21)
Cross-check Rating (IBI score)	Moderate (16)	Moderate (19)
Trend 1998-2018	Variable	Stable

Figure 4.9.1 Invertebrate and vegetation trends for Kelly Marsh (R-1)



Site summary: This is the ninth time Kelly Marsh has been monitored since 1998. The invertebrate and vegetation health scores were inconsistent in 2018, differing by 13 percent. The invertebrate score indicates poor wetland health while the vegetation score indicates moderate wetland health. The invertebrate data has been variable through the years of sampling. The vegetation data has been fairly stable. This wetland was cross-checked by another WHEP team in 2018. The scores between teams were consistent with each other. There were a few differences in the two invertebrate collections, but did not greatly affect the metric scores. The vegetation surveys were nearly identical; the City team identified slender Riccia (*Riccia fluitans*) which bumped the metric score.

4.10.2 White Lake (R-2)

White Lake (R-2), also known as WMP #152, is a 22-acre, type 5 openwater wetland within the White Lake watershed. The watershed is 998 acres with 30 percent impervious surface. There is one outlet on the south side of the wetland, but no inlets. White Lake is part of the City's stormwater management plan and is designated to preserve with a management goal to maintain wetland and its existing functions, values, and wildlife habitat.

A large buffer surrounds the wetland providing water quality treatment. The surrounding area includes an active agricultural field to the north, and road sides. Excess nutrient loading may occur from the crop fields and runoff from the roads.

Wetland Health

Site Observations: The wetland slope is steep. The wetland substrate is mucky. Coontail (*Ceratophyllum* sp.) was dense and dominated the wetland vegetation. The shoreline included a ring of cattail. Reed canary grass (*Phalaris arundinacea*) was present in the wetland, but not found in the vegetation plot. The vegetation diversity was low. Leeches, dragonflies, damselflies, mayflies, caddisflies, snails, true flies, and crustaceans were present. Chinese mystery snails were also observed.

Table 4.10.2 White Lake (R-2) Wetland Health based on Index of Biotic Integrity

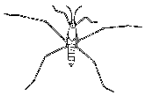
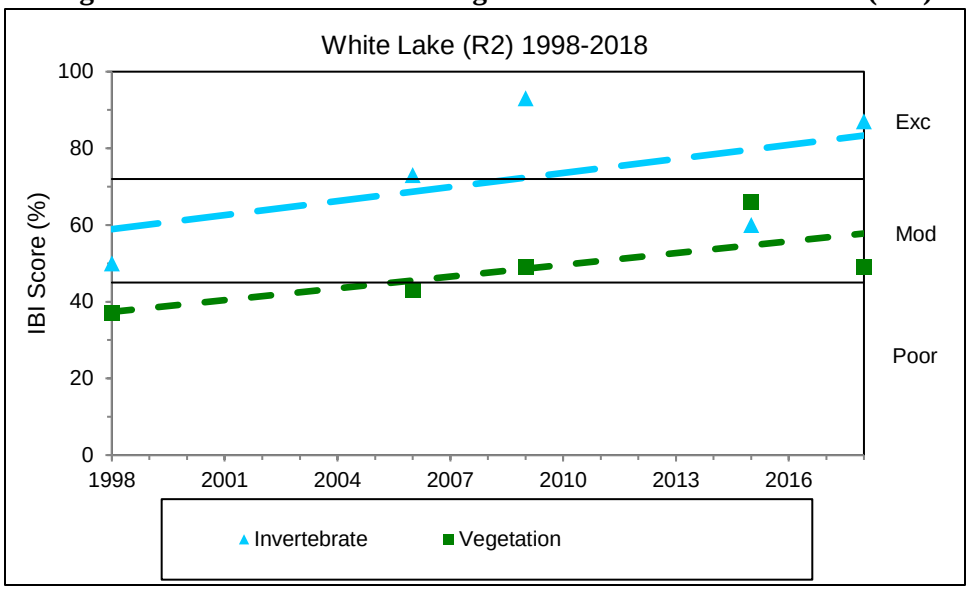
2018 Data (R-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (26)	Moderate (17)
Trend 1998-2018	Improving	Improving

Figure 4.10.2 Invertebrate and vegetation trends for White Lake (R-2)

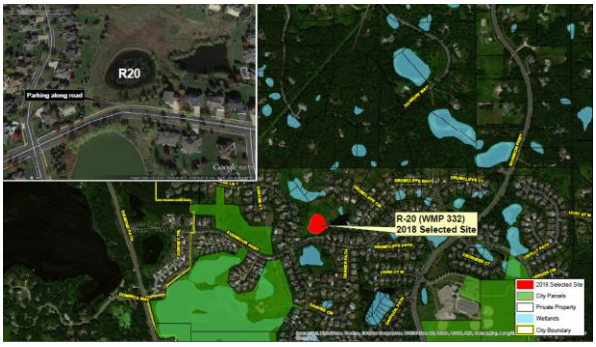


Site summary: This is the fifth year that R-2 has been monitored since 1998. The invertebrate and vegetation scores were inconsistent, differing by 39 percent. The invertebrate score indicated excellent wetland health while the vegetation score indicated moderate wetland health. The vegetation diversity was very low, dominated by a dense growth of coontail, and including only small populations of a few other plants like pondweed (*Potamogeton* sp.), white water lily (*Nymphaea* sp.), and duckweed (*Spirodela* sp.). The wetland provided healthy habitat for a large diversity of invertebrates. Both health trends appear to be improving; however, more years of data will help determine more reliable health trends.

AMY JO FORSLUND, JANE PORTERFIELD, GREG DINA, CALEB JONES, AVERIE SIMON, ANDY SIMON

4.10.3 WMP 332 (R-20)

WMP #332 (R-20) is a one acre, type 5 open water wetland in the Birger Pond watershed. The watershed is 897 acres of which 80 percent is impervious surface. There are no inlets or outlets. This wetland is included in the City's stormwater management plan and is designated to preserve with a management goal to maintain wetland and its existing functions, values, and wildlife habitat.



R-20 is surrounded by residential areas with several roads adjacent to the wetland. There is a 75 foot buffer around the wetland. Stormwater runoff from the roads, and nutrient loading from turfgrass maintenance of residential lawns may impact the wetland health.

Wetland Health

Site Observations: The wetland slope is gradual. The water is murky, and the substrate is muddy and uneven. Scattered willows (*Salix* sp.) grow along the south side of the wetland. Coontail (*Ceratophyllum* sp.) and pondweed (*Potamogeton* sp.) dominated the submergent vegeation. Duckweed (*Lemna* sp. and *Spirodela* sp.), white water lily (*Nymphaea* sp.), and water-meal (*Wolfia* sp.). Smartweed (*Polygonum* sp.) was also prevelent.

Table 4.10.3 WMP 332 (R-20) Wetland Health based on Index of Biotic Integrity

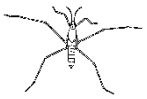
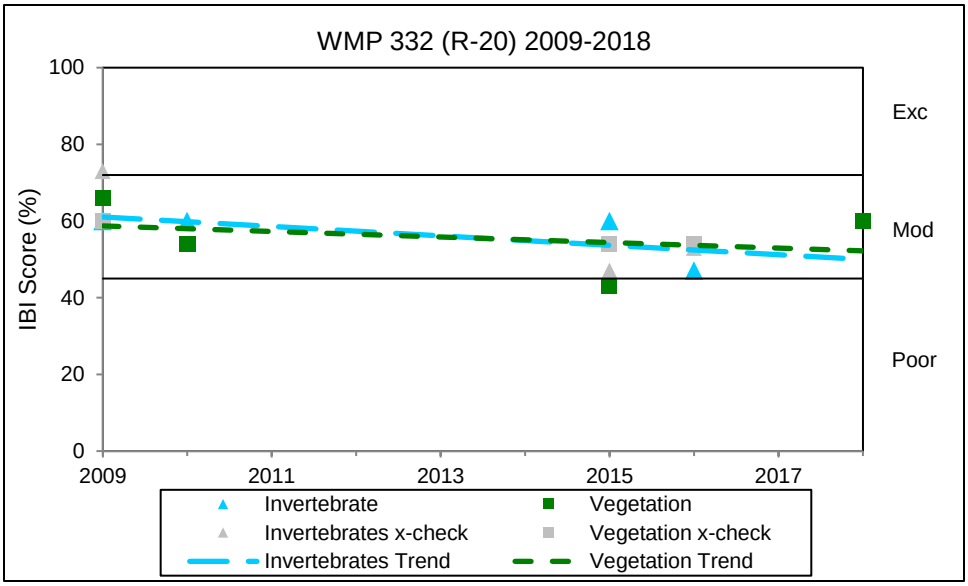
2018 Data (R-20)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	NA	Moderate (21)
Trend 2009-2018	Not enough data	Stable

Figure 4.10.3 Invertebrate and vegetation trends for WMP 332 (R-20)



Site summary: This is the fifth time that R-20 has been monitored by the WHEP volunteers since 2009. The vegetation score indicates moderate wetland health, and the health trend appears stable; however, more years of data will help determine a more reliable health trend. The invertebrate sample spoiled in 2018 and was unusable.

4.10.4 Erickson Pond (R-26)

Erickson Pond (R-26), also known as WMP #620, is a 1.9-acre, type 3 wetland in the Erickson Pond Watershed. The watershed is 1,832 acres of which 25 percent is impervious surface. There is one inlet on the south side and no outlets. The wetland is included in the City's stormwater management plan and is designated to preserve with a management goal to reduce the presence of invasive wetland plant species and enhance the vegetative diversity of the wetland basin.

Erickson Pond lies in a depression surrounded by hiking trails, parks, oak forest, woodlands, and restored native prairie. The basin area was included in the City's Erickson Pond Water Quality and Habitat Enhancement Project. This project, constructed in 2008, provides improved stormwater treatment to treat runoff from the downtown area that drains to Erickson Pond. Prior to the project, large amounts of stormwater discharged directly into the wetland basin. The stormwater now enters treatment cells prior to discharge to the wetland. The wetland is also currently undergoing vegetation management to minimize invasive species and a five-acre native prairie has been planted in the adjacent upland. There is also a 75-foot buffer that helps pre-treat stormwater draining into the wetland.

CALEB JONES, GREG DINA, AMY JO FORSLUND, AVERIE SIMON, ANDY SIMON

Wetland Health

Site Observations: The wetland slope is a steep drop-off. The wetland substrate is mucky with a sandy bottom. A large diversity of vegetation including woody plants, grasslike plants, emergent forbs, submergent forbs, and floating plants were present. The shoreline was dominated by reed canary grass (*Phalaris arundinacea*) and smartweed (*Polygonum* sp.). Coontail (*Ceratophyllum* sp.), pondweed (*Potamogeton* sp.), and duckweed (*Lemna* sp.) dominated the water colum. Leeches, dragonlies, snails, true flies, and crustaceans were present. Corixidae were collected in the bottle traps in high abundance.

Table 4.10.4 Erickson Pond (R-26) Wetland Health based on Index of Biotic Integrity

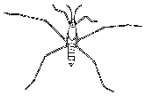
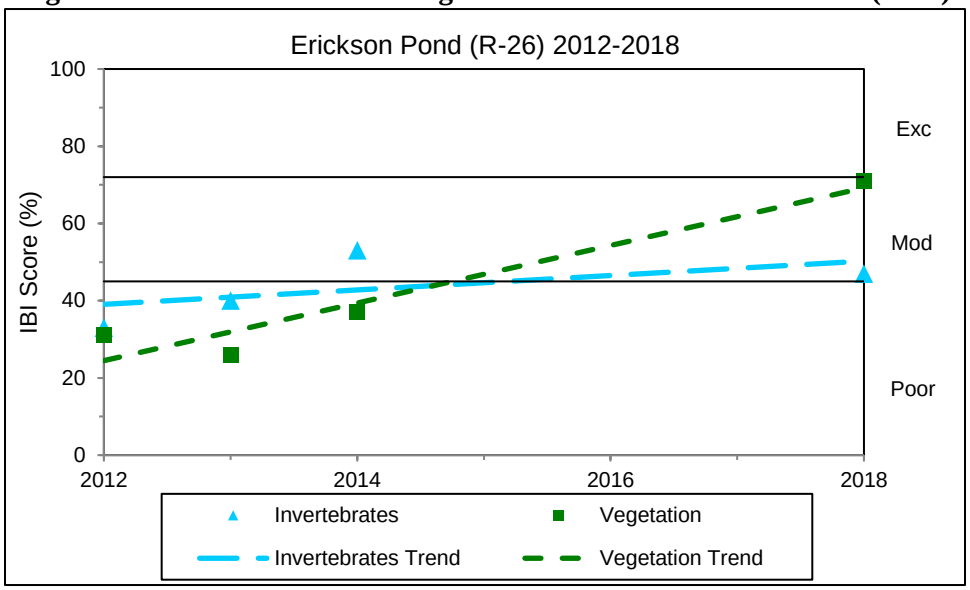
2018 Data (R-26)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (25)
Trend 2012-2018	Not enough data	Not enough data

Figure 4.10.4 Invertebrate and vegetation trends for Erickson Pond (R-26)



Site summary: This is the fourth time Erickson Pond has been monitored since 2012. The invertebrate and vegetation scores were inconsistent in 2018, differing by 24 percent. The vegetation score indicates a nearly excellent wetland health while the invertebrate score indicates poor wetland health. The vegetation diversity recorded in 2018 was diverse. The vegetation score improved from poor in prior years to nearly excellent in 2018. The invertebrate score remains similar to past data collections. More years of surveys will help determine more reliable health trends.

4.11 South St. Paul Wetlands

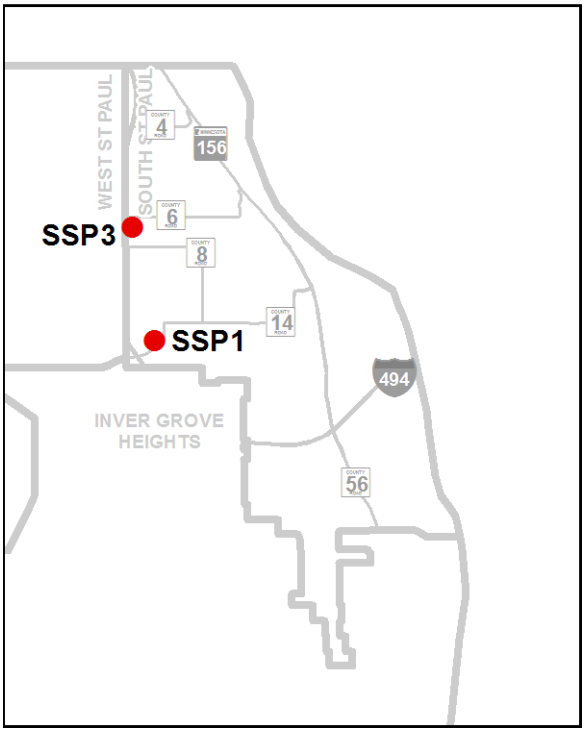
Two wetlands were monitored in South St. Paul in 2017 by the South St. Paul team. The City has 17 years of WHEP data! Four wetlands have been monitored in South St. Paul since the start of the WHEP program.

Team Leaders: Kristine Maurer and Sondra Larson

Team Members: Sabrina Greene, Charlie Jude, Morgan Kemper, Tim Kuehn, Anna Larson, Roger Larson, John Swanson, and Noah Torvik

Kristine Maurer and Sondra Larson are co-team leaders of the South St. Paul team.

South St. Paul WHEP Sites Monitored in 2018



Kristine has participated in both the Hennepin County and Dakota County WHEP programs, and has been a team leader for Dakota County WHEP since 2016. She admitted, "I am an environmental scientist and water quality specialist. I studied wetland ecology in graduate school and love being a team leader because it is a fun way to teach others about wetland ecology. I also learn new things every year, whether it is from the class instructors or fellow volunteers."

KRISTINE MAURER

SONDRA LARSON

Sondra explained, "This was my second year being involved with the program. I currently do research for the University of Minnesota in the Water Resources Center so the WHEP program is a fun way for me to share my interest in water as one of Minnesota's most valuable resources with my friends, family and other South Saint Paul team members. My favorite parts of the summer were putting on waders and getting in to the water and being able to spend the time observing each wetland closely to really recognize its differences and similarities.

CHRIS HARTZELL

Chris Hartzell is the City of South St. Paul's City Engineer. He commented, "The City of South St. Paul places a high value on the function and importance of wetlands within the community. We have relatively few wetlands compared to some communities, but the ones we do have help reduce the impacts from pollutants in our lakes and waterbodies. I look forward to staying involved in the WHEP program".

South St. Paul General Wetland Health

Figure 4.11 presents an overall view of wetland health for all of the 2018 monitoring sites in South St. Paul based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.11 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a

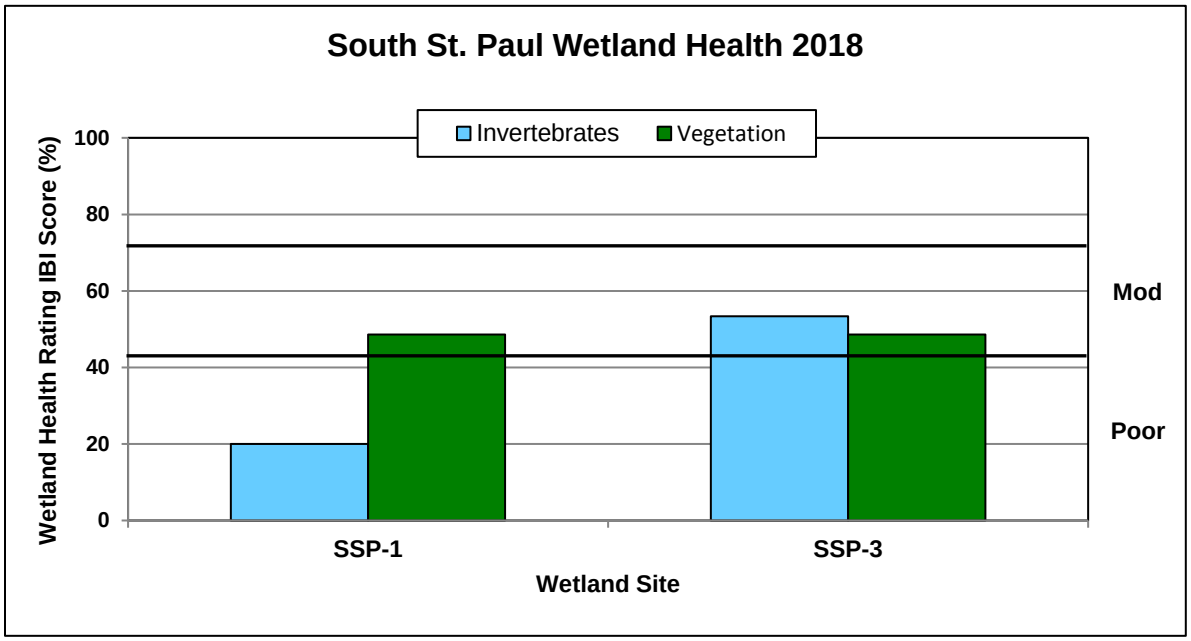
ANNA LARSON

ROGER LARSON, CHARLIE JUDE, KRISTINE MAURER

MORGAN KEMPER

wetland health rating is assigned as excellent, moderate or poor. In 2018, the invertebrates and vegetation health rated poor moderate. The invertebrates and vegetation scores for SSP-1 were inconsistent, differing by 29 percent.

Figure 4.11 South St. Paul site scores (percent) for the 2018 sampling season



4.11.1 Anderson Pond (SSP-1)

Anderson Pond (SSP-1) is a 2.4-acre, type 4 wetland within the Lower Mississippi River watershed. The drainage area is 168 acres, and is approximately 15 percent impervious. It is publicly owned. It has three inlets: one inlet on the north side of the wetland, one inlet on the west side, and one inlet on the south side. There is also an outlet on the south side of the wetland. It is part of the City's Stormwater Management Plan. The City does not have a wetland management plan.

Virtually all of the area that contributes to this wetland is fully developed. In 2008, the City performed an extensive dredging of Anderson Pond. The cattails are already returning on the east and west sides of the pond. A separate maintenance cell was created near the northwest inlet in order to facilitate future dredging and other maintenance activities. Additional dredging was done in late 2011 and 2012. In 2009, Southview Pond was constructed as a pre-treatment measure for the runoff from Highway 52 and West St. Paul, prior to conveyance into Anderson Pond. Highway 52 is a major contributor to Anderson Pond as is the City of West St. Paul (over 90% of the pond's watershed is in West St. Paul). The pond is in an older established residential area surrounded by roads, apartment blocks, and houses.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is mucky. A thick band of cattails (*Typha* sp.) surrounds about 75 percent of the wetland shoreline. The area without the cattails has large overhanging trees. Coontail (*Ceratophyllum* sp.) is abundant and represented the only submergent plant in the vegetation plot. Duckweed (*Lemna* sp. and *Spirodela* sp.) and water-meal (*Wolfia* sp.) covered much of the wetland surface. Very few grasses and emergent forbs were documented, with the exception of cattail. A poor diversity of invertebrates was collected, including: one family of leech, one family of dragonfly, scuds, and crayfish.

Table 4.11.1 Anderson Pond (SSP-1) Wetland Health based on Index of Biotic Integrity

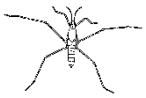
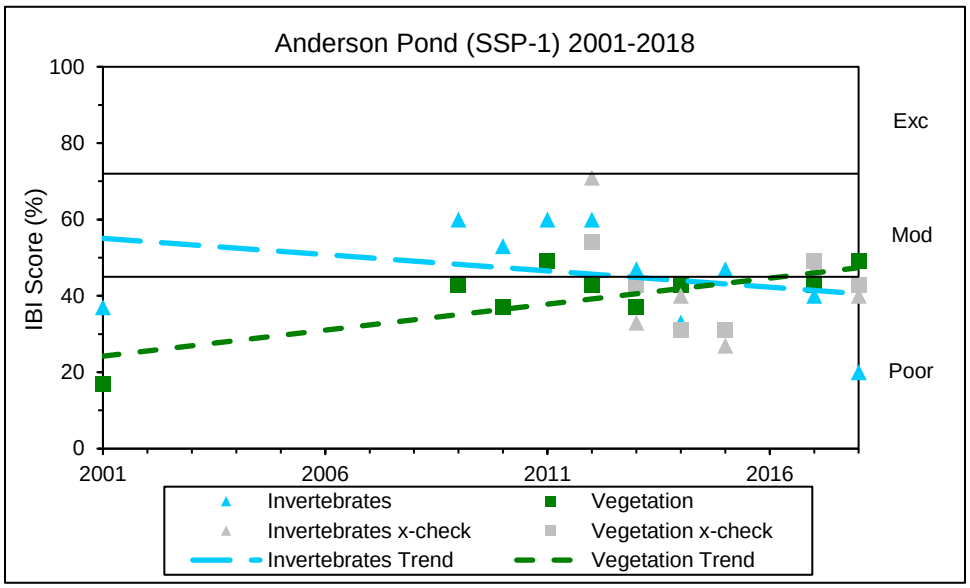
2018 Data (SSP-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (6)	Moderate (17)
Cross-check Rating (IBI score)	Poor (12)	Poor (15)
Trend 2001-2018	Stable	Stable

Figure 4.11.1 Invertebrate and vegetation trends for Anderson Pond (SSP-1)



Site Summary: This is the tenth time that SSP-1 has been monitored since 2001. The invertebrate and vegetation scores are inconsistent, in 2018, differing by 29 percent. The City team noted that fish and tadpoles were collected in the invertebrate bottle traps which may have impacted the invertebrate score. The invertebrate score declined in 2018 compared to past years of data. The vegetation scores appear to be

stable, with an exception for the first year of surveys. This wetland is described as a poor site, and the scores are reflecting its physical image. Highway 52 contributes stormwater input to the wetland. This wetland was cross-checked by another WHEP team in 2018. The invertebrate scores between teams were inconsistent, differing by 20 percent. Though neither team found many bugs and beetles, the difference in the Corixidae Proportion affected the metric score improving the overall invertebrate score calculated by the cross-check team. The cross-check team also found a mayfly which enhanced the score, as well. The vegetation species identified by each team were similar in representation.

4.11.2 LeVander Pond (SSP-3)

LeVander Pond, also known as SSP-3, is a 3.4-acre, type 4 wetland within the Lower Mississippi River Watershed. Its watershed is 37.9 acres which is approximately 20 percent impervious. It is part of a City of South St. Paul easement. There is one inlet on the west side, one on the north side, and one on the east side. There is one outlet on the north side of the wetland. It is part of the City's stormwater management plan.

Virtually all of the area that contributes to this wetland is fully developed. In 2008, LeVander Estates, a new development was completed on the east side of LeVander Pond. A trail was constructed down to the pond. Mn/DOT recently completed an upgrade of Wentworth/Thompson interchanges and in doing so enhanced some of the drainage in LeVander Pond by installing a pretreatment basin south of the pond. TH52 is a major contributor to LeVander Pond as is the City of West St. Paul.

Wetland Health

Site Observations: The wetland slope is gentle. The substrate is very mucky. A dense population of coontail (*Ceratophyllum* sp.) is the only plant to represent submergent vegetation in the wetland. The wetland surface is covered in duckweed (*Lemna* sp. and *Spriodela* sp.) and water-meal (*Wolfia* sp.). Cattails (*Typha* sp.) surround the wetland. Leeches, dragonflies, caddisflies, snails, midges, scuds, and crayfish were observed.

Table 4.11.2 LeVander Pond (SSP-3) Wetland Health based on Index of Biotic Integrity

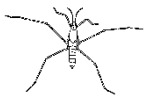
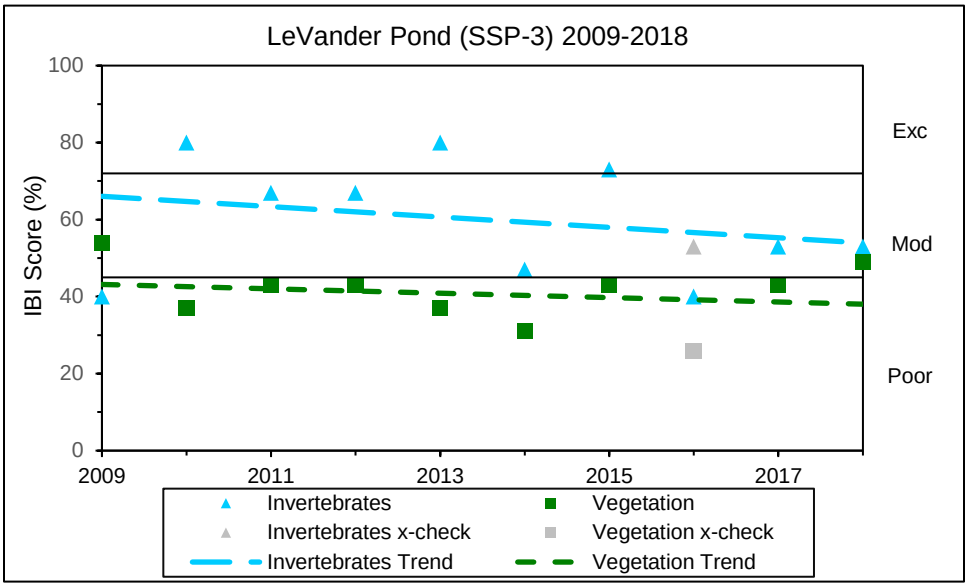
2018 Data (SSP-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (17)
Trend 2009-2018	Variable	Stable

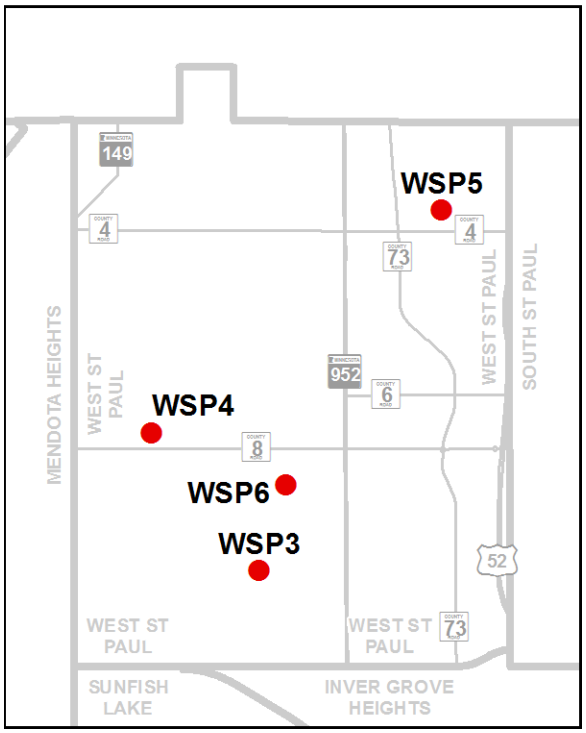
Figure 4.11.2 Invertebrate and vegetation trends for LeVander Pond (SSP-3)



Site summary: This is the tenth consecutive year of monitoring LeVander Pond. The vegetation and invertebrates scores were consistent with each other in 2018, and both indicate moderate wetland health. The invertebrate scores have fluctuated between poor and excellent over the years. The vegetation trend appears stable. The only emergent vegetation represented included reed canary grass and cattail, which dominate the shoreline.

4.12 West St. Paul Wetlands

West St. Paul WHEP Sites Monitored in 2018



Four wetlands were monitored in West St. Paul in 2018 by the West St. Paul team. The City of West St. Paul has 19 years of WHEP data! Eleven wetlands have been monitored in West St. Paul since the City became involved with WHEP in 1999.

Team Leaders: Anneliese Tatham

Team Members: Eric Boyce, Maya Boyce, Maggie Karschnia, and Kelsey White

Anneliese Tatham is the WHEP Team Leader for the City of West St. Paul. She admitted, "This was my first year as a WHEP team leader. I have been tagging along with my mom, Darcy, and the Mendota Heights team for the past several years where I began learning about macroinvertebrates and plants and the roles they play in our wetland ecosystems. I am in my second year studying Environmental Science and Environmental

ANNELIESE TATHAM

Studies at the University of Minnesota - Morris where I specifically enjoy learning about native prairie and working in the sustainable agriculture community. It has been a wonderful opportunity to spend time outside this summer while learning about the environmental health of wetlands in our own communities. Thanks for a great WHEP season!"

Ross Beckwith is the City of West St. Paul's City Engineer/Public Works and Parks Director. He expressed, "I am truly impressed by the work that the WHEP team does. They are a fully efficient group that clearly takes pride in their work. The fact that we get such thorough results for such a minimal expense makes this a fun partnership. A big THANK YOU from West St. Paul to all of you that make this program a success!"

ROSS BECKWITH

Dave Schletty is the Assistant Parks & Recreation Director at the City of West St Paul. He has been assisting with coordination of the program for more than 6 years. Dave helps select which wetlands to monitor each year and then reviews the data. With so few wetlands within the 95 percent-developed 5-square-mile City, Dave understands the importance of keeping them healthy. He also supervises the City's Environmental Committee and shares the WHEP data with the group, so together they help educate residents about improving water quality and how to implement best practices.

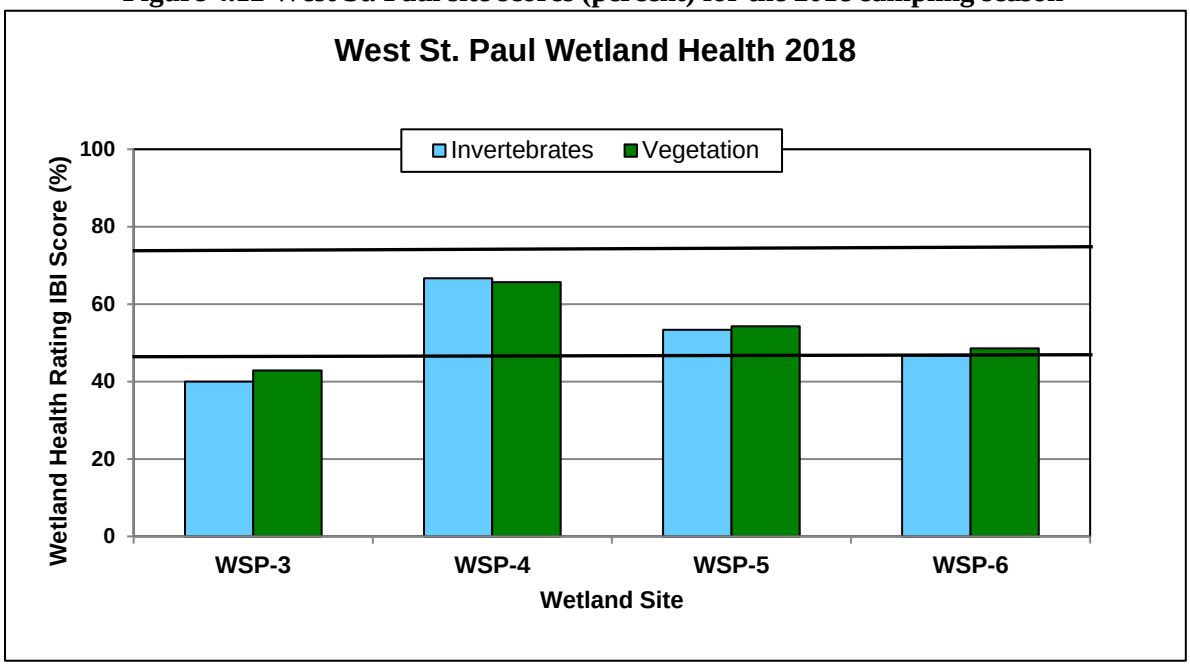
DAVE SCHLETTY

West St. Paul General Wetland Health

WEST ST. PAUL AND SOUTH ST. PAUL TEAMS AT INVERTEBRATE IDENTIFICATION TRAINING

Figure 4.12 presents an overall view of wetland health for all of the 2018 monitoring sites in West St. Paul based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.12 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. The West St. Paul wetland ratings ranged from poor to moderate wetland health in 2018. The invertebrate and vegetation scores for all of the wetlands were consistent.

Figure 4.12 West St. Paul site scores (percent) for the 2018 sampling season



4.12.1 Duck Pond (WSP-3)

Duck Pond (WSP-3) is a 2.5-acre, type 5 wetland within the Highway 110-494 watershed. The watershed is 65 acres. It is publicly owned, and is part of the City's stormwater management plan. It is designated as A4P Duck Pond. There is an inlet on the north side of the wetland, and an outlet on the east side. Although Duck Pond is located within a densely populated area, it is largely surrounded by trees and not widely visible from the road. The shoreline contains woody debris from fallen branches or trees.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is mucky. Little to no submergent vegetation is present, but duckweed (*Lemna* sp.) and water-meal (*Wolfia* sp.) floated on the surface of the pond. Few other species of vegetation were represented in the plot. Reed canary grass is present along the shoreline. Leeches, dragonflies, damselflies, mayflies, true flies, and scuds were collected.

Table 4.12.1 Duck Pond (WSP-3) Wetland Health based on Index of Biotic Integrity

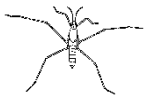
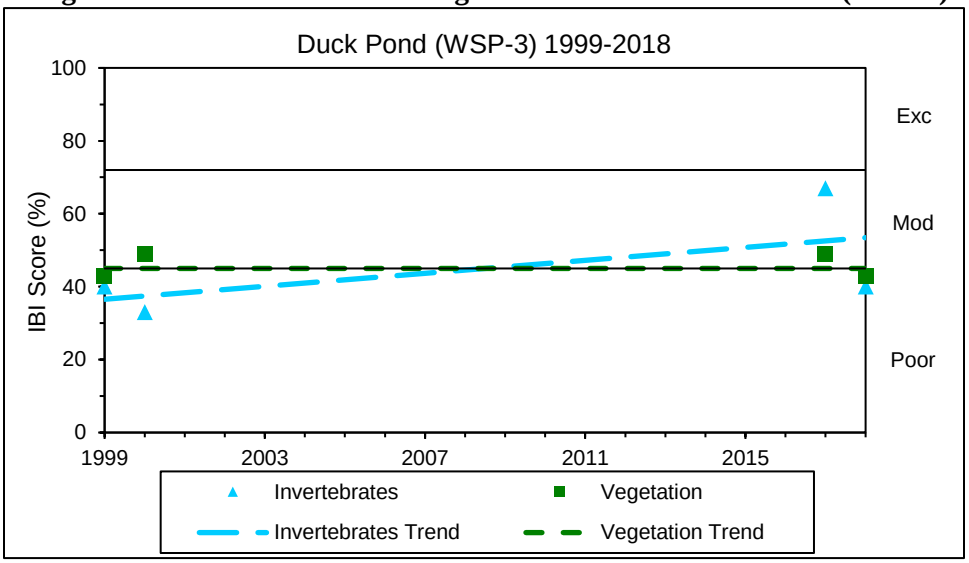
2018 Data (WSP-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (12)	Poor (15)
Trend 1999-2018	Not enough data	Not enough data

Figure 4.12.1 Invertebrate and vegetation trends for Duck Pond (WSP-3)



Site Summary: This is the second consecutive year, and the overall fourth time that Duck Pond has been surveyed by WHEP volunteers, since 1999. Prior to 2017, it had not been surveyed since 2000. The invertebrate and vegetation scores were consistent with each other, and both scores indicate poor wetland health. The invertebrate score is more similar to initial survey scores. The vegetation score is similar all four years. More years of data will help determine a more reliable health trend.

4.12.2 Weschcke Pond (WSP-4)

Weschcke Pond (WSP-4) is a 1.3-acre, type 3 wetland within the Ivy Falls Creek Watershed. The watershed is 42.4 acres. It is publicly owned, and part of the City's stormwater management plan. It is designated as IF1BP Weschcke Pond. It has no inlets, but one outlet on the north side.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is soft, but not overly mucky. It is located within Weschcke Park. The surface of the water is completely covered in duckweed (*Lemna* sp. and *Spirodela* sp.) and water-meal (*Wolfia* sp.). The only submergent vegetation found was a small population of coontail (*Ceratophyllum* sp.). Small populations of shrubs, grasses, and emergent forbs were documented. Trash was littered along the shoreline and there was woody debris on the bottom of the wetland. Leeches, snails, true flies, and scuds were collected.

Table 4.12.2 Weschcke Pond (WSP-4) Wetland Health based on Index of Biotic Integrity

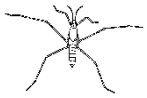
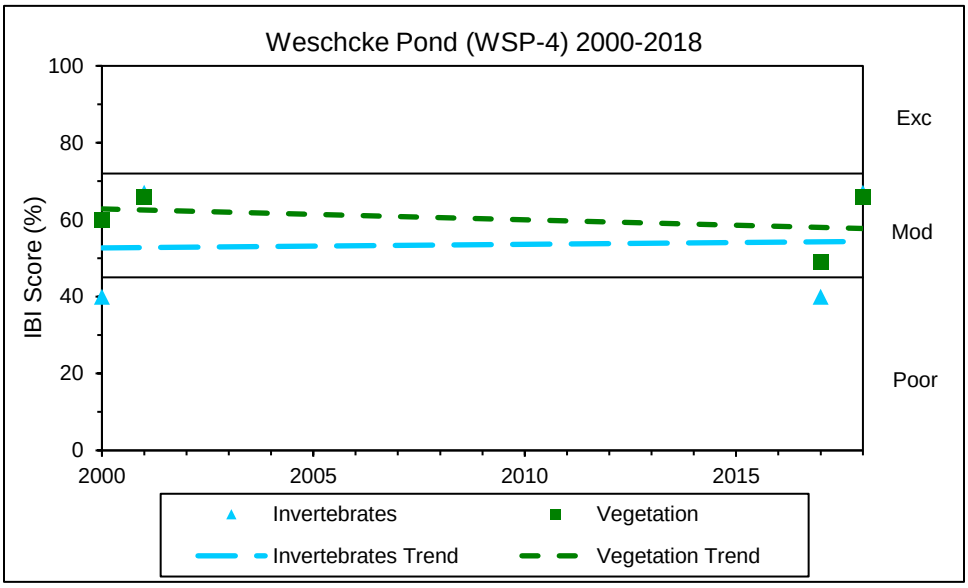
2018 Data (WSP-4)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (20)	Moderate (23)
Trend 2000-2018	Not enough data	Not enough data

Figure 4.12.2 Invertebrate and vegetation trends for Weschcke Pond (WSP-4)



Site Summary: This is the second consecutive year, and the overall fourth time that WSP-4 has been surveyed for WHEP since 2000. Prior to 2017, it had not been surveyed since 2001. The invertebrates and vegetation data was consistent with each other, both indicating moderate wetland health. Both scores were higher than in 2018. More years of monitoring will help determine a more reliable health trend.

4.12.3 Lilly Lake (WSP-5)

Lilly Lake (WSP-5), also known as RW24P, is a 6.4-acre, type 3 wetland within the Riverview Tunnel Drainage District. Its watershed is 22 acres. It is publically owned. There is one inlet from Carrie Street east of the Carrie Stanley intersection. There is an outlet on the north end to Bernard Street. It is part of the City's stormwater management plan.

Wetland Health

Site Observations: The wetland slope is fairly steep, and the substrate is very mucky. The surrounding area is densely residential. Patches of trees and shrubs provide buffer between the homes and the lake. Very little emergent vegetation is present, including cattail (*Typha* sp.) and reed canary grass (*Phalaris arundinacea*). A dense population of coontail (*Ceratophyllum* sp.) was the only plant to represent the submergent vegetation. Duckweed (*Lemna* sp. and *Spirodela* sp.) covered the wetland surface. White water lily (*Nymphaea* sp.) was also present. Leeches, dragonflies, snails, true flies, and scuds were observed.

Table 4.12.3 Lilly Lake (WSP-5) Wetland Health based on Index of Biotic Integrity

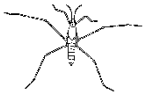
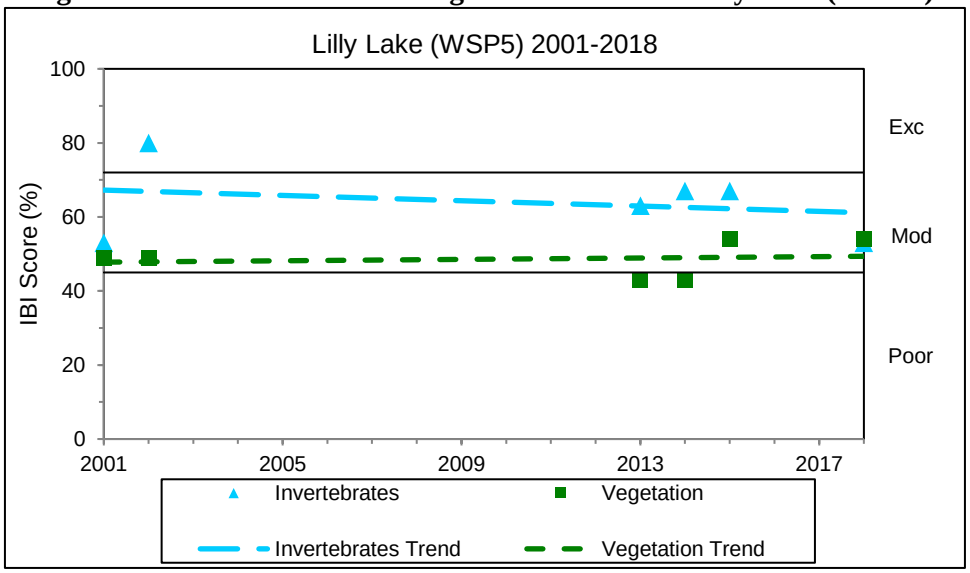
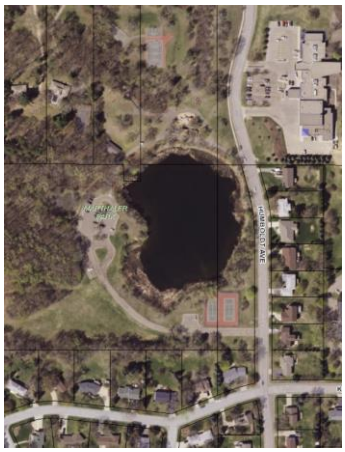
2018 Data (WSP-5)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (19)
Trend 2001-2018	Variable	Stable

Figure 4.12.3 Invertebrate and vegetation trends for Lilly Lake (WSP-5)



Site Summary: This is the sixth time that Lilly Lake has been surveyed since 2001. The invertebrates and vegetation scores were consistent with each other, both indicating moderate wetland health. The vegetation scores appear stable. The invertebrate score declined in 2018, and the overall invertebrate trend is variable. More years of monitoring will help determine a more reliable health trend.

4.12.4 Marthaler Park (WSP-6)



Marthaler Park (WSP-6) is a 4.5-acre, type 5 wetland within the Simons Ravine District drainage area. Its watershed is 23 acres. It is publicly owned, and it is part of the City's stormwater management plan. It is designated as SR4P Marthaler Pond. There is one inlet on the east side, but no outlets.

The wetland is located within Marthaler Park. Most of the surrounding area is undisturbed with trees and other vegetation. Humboldt Avenue runs along the eastern side of the wetland. Residential neighborhoods exist to the south and east of the wetland. The West St. Paul Sports Center is northeast of the wetland.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is firm with sand, but mucky on top. Large trees on the shore were cut prior to surveys. Other than willows, the emergent and submergent vegetation diversity is low. Dense populations of coontail (*Ceratophyllum* sp.) and waterweed (*Elodea* sp.) were present. Water-meal (*Wolfia* sp.) covered the wetland surface. Some pondweed (*Potamogeton* sp.), and duckweed (*Lemna* sp. and *Spirodela* sp.) were also present. Leeches, mayflies, caddisflies, snails, and true flies were collected.

Table 4.12.4 Marthaler Park (WSP-6) Wetland Health based on Index of Biotic Integrity

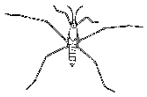
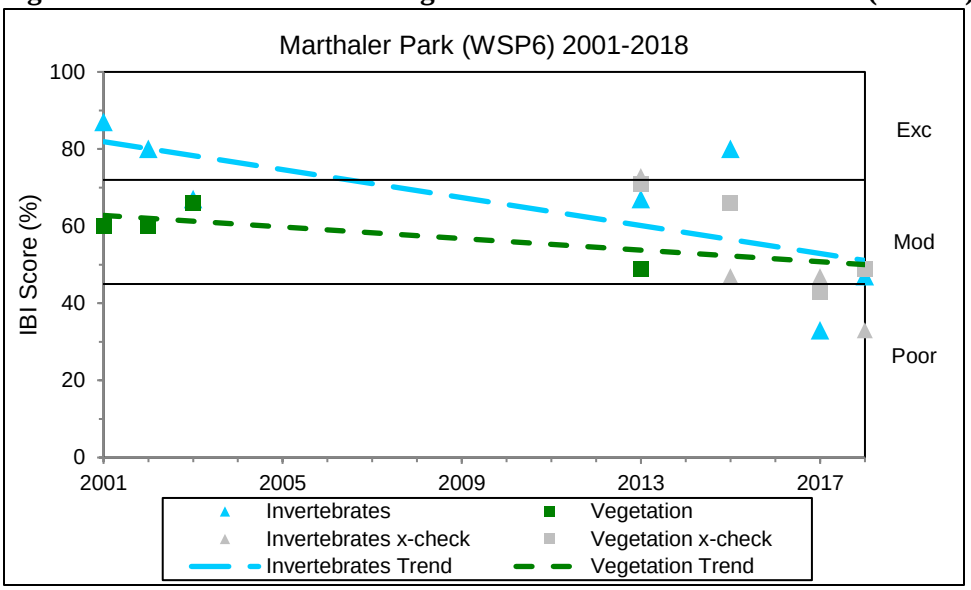
2018 Data (WSP-6)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (17)
Cross-check Rating (IBI score)	Poor (10)	Moderate (17)
Trend 2001-2018	Declining	Declining

Figure 4.12.4 Invertebrate and vegetation trends for Marthaler Park (WSP-6)



Site summary: This is the seventh time that Marthaler Park has been monitored since 2001. The invertebrates and vegetation scores were consistent, in 2018, even though the invertebrate score indicates poor wetland health and the vegetation data indicates moderate wetland health. Overall, the trends for both invertebrates and vegetation are variable. This wetland was cross-checked by another WHEP team in 2018. The invertebrates scores of the teams were inconsistent, differing by 14 percent. The vegetation scores were identical. The City team identified a larger diversity of invertebrates including mayflies and caddisflies, enhancing the invertebrate score above the cross-check team's score. The two teams identified very similar diversity and abundance of vegetation.

Appendix A-1. Invertebrate Metric Scores

Site Number	Leech Metric	Corixid Metric	Odonata Metric	ETSD Metric	Snail Metric	Total Taxa Metric	Total IBI Score
AV-1	1	5	1	3	1	3	14
AV-7	3	3	1	1	3	3	14
AV-18	3	3	1	3	5	5	20
AV-20	3	5	1	1	3	3	16
B-1	3	5	5	5	5	5	28
B-2	3	5	5	3	3	5	24
B-3	1	3	5	5	5	5	24
B-17	3	5	3	5	1	5	22
DC-2	3	5	1	1	1	3	14
DC-3	3	1	1	1	1	3	10
DC-5	3	1	1	3	5	5	18
DC-6	1	1	1	3	1	3	10
DC-7	3	5	1	3	1	3	16
DC-8	3	3	1	1	3	3	14
DC-9	1	5	1	3	1	3	14
DC-10	1	3	1	3	1	3	12
E-9	3	5	1	1	1	3	14
E-31	3	5	1	5	3	5	22
E-43	3	5	3	5	3	5	24
F-3	1	1	1	3	1	3	10
F-7	5	3	1	3	1	3	16
F-9	1	1	1	1	3	1	8
H-4	1	3	1	1	1	3	10
H-6	1	5	1	3	5	3	18
H-56	5	5	5	5	5	5	30
H-57	3	3	1	3	1	3	14

L-7	3	5	1	3	5	5	22
L-8	1	5	3	3	2	3	16
MH-2	1	5	1	5	1	3	16
MH-19	3	1	3	1	1	5	14
NCR-1	1	3	1	3	1	3	12
NCR-2	3	1	1	3	5	3	16
R-1	3	5	1	1	1	3	14
R-2	5	3	5	5	5	5	28
R-20	NA	NA	NA	NA	NA	NA	NA
R-26	1	1	1	3	3	5	14
SSP-1	1	1	1	1	1	1	6
SSP-3	3	5	1	3	1	3	16
WSP-3	3	1	1	3	1	3	12
WSP-4	3	5	1	1	5	5	20
WSP-5	3	5	1	1	3	3	16
WSP-6	3	3	1	3	1	3	14

Appendix A-2. Vegetation Metric Scores

Site #	Vascular Genera	Nonvascular Taxa	Grasslike Genera	Carex Cover	Utricularia Presence	Aquatic Guild	Persistent Litter	Total IBI Score
AV-1	3	1	1	1	1	3	5	15
AV-7	3	1	1	1	1	3	5	15
AV-18	3	1	3	1	1	3	5	17
AV-20	3	1	1	1	1	5	5	17
B-1	3	1	3	3	1	3	5	19
B-2	5	1	5	5	1	1	5	23
B-3	1	3	1	1	1	3	5	15
B-17	3	1	3	1	1	3	5	17
DC-2	3	1	3	1	1	1	5	15
DC-3	3	1	3	1	5	3	5	21
DC-5	3	1	1	1	5	3	5	19
DC-6	3	1	3	3	5	3	3	21
DC-7	3	1	5	5	1	1	5	21
DC-8	3	1	1	1	5	3	5	19
DC-9	3	1	3	1	5	5	1	19
DC-10	1	1	3	1	1	1	5	13
E-9	5	3	5	1	1	1	1	17
E-31	3	3	1	1	1	3	5	17
E-43	3	3	1	1	1	5	5	19
F-3	3	1	3	1	5	5	5	23
F-7	1	1	3	5	1	3	5	19
F-9	3	3	3	1	1	5	3	19
H-4	5	3	3	1	1	1	1	15
H-6	5	3	3	5	1	5	5	27
H-56	3	1	1	1	1	3	3	13
H-57	3	3	3	1	1	1	1	13
L-7	5	3	5	3	5	3	3	27

L-8	3	1	3	1	5	5	3	21
MH-2	5	1	5	1	5	5	5	27
MH-19	3	1	1	1	1	3	5	15
NCR-1	3	1	3	1	1	3	3	15
NCR-2	3	1	3	1	1	3	3	15
R-1	3	3	3	1	1	5	5	21
R-2	3	3	1	1	1	3	5	17
R-20	3	3	3	1	1	5	5	21
R-26	5	5	5	1	1	3	5	25
SSP-1	3	3	1	1	1	5	3	17
SSP-3	3	1	1	1	1	5	5	17
WSP-3	3	1	3	1	1	1	5	15
WSP-4	5	3	5	1	1	3	5	23
WSP-5	3	1	3	1	1	5	5	19
WSP-6	3	1	1	1	1	5	5	17

Appendix B. Invasive Species Presence 2012-2018

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
AV-1		1					1	
AV-6		1						
AV-7		1						
AV-10		1				1	1	
AV-11		1					1	
AV-12		1				1	1	
AV-13		1					1	
AV-18		1					1	
AV-19		1						
AV-20		1				1		
B-1	1	1					1	
B-2		1				1	1	
B-3							1	1
B-4		1						
B-6		1					1	
B-7		1						
B-8	1	1						
B-9	1	1						
B-10		1						
B-12		1						
B-13	1	1		1			1	1
B-17	1	1						
DC-1		1					1	
DC-2		1						
DC-3		1						
DC-4		1						

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
DC-5		1						
DC-6		1						
DC-7		1						
DC-8		1						
DC-9		1						
DC-10		1						
E-7		1					1	
E-9	1	1						
E-10		1						
E-11		1					1	
E-18		1				1		
E-20		1						
E-31		1						
E-32		1					1	
E-33		1					1	
E-34	1	1					1	
E-35		1						
E-36		1						
E-37		1						
E-38		1						
E-40		1					1	
E-41		1				1		
E-42		1						
E-43						1		
F-3	1	1		1			1	
F-6		1					1	
F-7		1					1	

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
F-9		1						
H-4		1	1				1	
H-6	1	1	1			1	1	
H-56	1	1					1	
H-57	1	1					1	
L-7	1	1					1	
L-8		1					1	
L-9		1					1	
L-10		1					1	
LD-1	1	1					1	
MH-2	1	1				1	1	
MH-4		1						
MH-16		1					1	
MH-17		1						
MH-19						1		
NCR-1		1						
NCR-2		1						
R-1		1					1	
R-2		1						
R-4		1	1					
R-6		1						
R-14		1						
R-20		1						
R-21	1	1					1	
R-23	1	1					1	
R-26		1					1	

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
SSP-1	1	1				1	1	
SSP-3		1				1	1	
SSP-4	1							
WSP-1	1	1					1	
WSP-2		1					1	
WSP-3		1				1		
WSP-4	1	1				1		
WSP-5		1					1	
WSP-6	1	1			1	1	1	
WSP-7		1						
WSP-8		1						
WSP-9		1						
WSP-10		1					1	
WSP-12	1							
WSP-18	1							
Totals:	23	88	3	2	1	15	43	2

Appendix C. Site Score Averages of Created, Stormwater, and Natural Wetland 2008-2018

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater Wetlands	Natural Wetlands	Created Wetlands	Stormwater Wetlands	Natural Wetlands
AV-1		14			15	
AV-5			15			18
AV-6		15			18	
AV-7		14			15	
AV-8		15			21	
AV-10			11			12
AV-11			17			13
AV-12		14			18	
AV-13		21			12	
AV-14		12			9	
AV-15		11			13	
AV-16					17	
AV-17			18			19
AV-18		20			17	
AV-19			20			16
AV-20			16			17
B-1			28			19
B-1 Alt.			15			23
B-2			18			23
B-3		24			13	
B-4			18			15
B-6		19			18	
B-7		17			18	
B-8			22			14
B-9		13			12	
B-10		20			14	

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater Wetlands	Natural Wetlands	Created Wetlands	Stormwater Wetlands	Natural Wetlands
B-11		18			21	
B-12			14			15
B-13		18			19	
B-17			22			17
DC-1			21			24
DC-2			14			15
DC-3			10			21
DC-4			16			20
DC-5			18			19
DC-6			10			21
DC-7			16			21
DC-8			14			19
DC-9			14			19
DC-10			10			13
E-1		20			19	
E-7		22			20	
E-9			14			17
E-10		11			17	
E-11		17			19	
E-18		15			20	
E-20		19			23	
E-21		20			17	
E-22		16			16	
E-25		16			19	
E-26		14			15	
E-27		18			21	
E-28		16			21	

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater Wetlands	Natural Wetlands	Created Wetlands	Stormwater Wetlands	Natural Wetlands
E-29			12			27
E-31		22			17	
E-32		16			17	
E-33		16			21	
E-34		24			23	
E-35			12			27
E-36		16			17	
E-37		18			17	
E-38		24			19	
E-39		16			11	
E-40		18			15	
E-41		22			23	
E-42		12			19	
E-43		22			19	
F-1		14			16	
F-3		10			23	
F-4	11			15		
F-5		17			16	
F-6		16			10	
F-7		16			19	
F-8	17			16		
F-9		8			19	
H-4	10			15		
H-6		16			27	
H-30	14			14		
H-56		30			13	
H-57	14			13		

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater Wetlands	Natural Wetlands	Created Wetlands	Stormwater Wetlands	Natural Wetlands
L-4	16			20		
L-7		22			27	
L-8			16			23
L-9	17			17		
L-10			13			11
LD-1			14			17
MH-2		16			27	
MH-4		19			17	
MH-8		10			9	
MH-9		22			24	
MH-13		16			21	
MH-14		22			25	
MH-15		16			21	
MH-16		24			29	
MH-17	12			15		
MH-18		22			27	
MH-19		14			15	
NCR-1			12			15
NCR-2			14			15
R-1		14			21	
R-2		26			17	
R-4		17			14	
R-6			18			18
R-14			22			24
R-18			26			19
R-20		17			21	
R-21	24			22		

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater Wetlands	Natural Wetlands	Created Wetlands	Stormwater Wetlands	Natural Wetlands
R-22		22			22	
R-23	20			23		
R-25		12			23	
R-26			14			25
SSP-1		6			17	
SSP-3		16			17	
SSP-4		18			11	
WSP-1			18			18
WSP-2		17			16	
WSP-3		12			15	
WSP-4		20			23	
WSP-5			16			19
WSP-6			14			17
WSP-7		19			18	
WSP-8			20			16
WSP-9			12			11
WSP-10		22			17	
WSP-12		10			15	
AVERAGES	15	17	16	16	18	18

Appendix D. Wetland and Watershed Data for 2008-2018

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
AV-1	Hidden Valley	2	21	35	14	15
AV-5	Cedar Knolls Pond	0.5	8	20	14	19
AV-6	Belmont Park	1.3	202	20	8	13
AV-7	Podojil Pond	1.3	8	25	14	15
AV-8	Chaparal Pond	1.5	110	30	16	15
AV-10	Alimagnet Park	0.5	25	20	8	17
AV-11	Farquar Lift Station	2.2	373	25	10	17
AV-12	EVR-P12 Public Water	5.7	571	25	14	21
AV-13	EVR-P14	3.6	26	35	18	9
AV-14	EVR-P43, Apple Valley East Park	0.8	2738	35	12	9
AV-15	Carrollwood	1.2	398	30	10	13
AV-16	Nordic Park	1	17	25	NA	17
AV-17	AL-P9.1 Alimagnet Lift Station Chain of Ponds	0.25	7	20	18	19
AV-18	Sunset Park Pond	1	252	30	20	17
AV-19	AL-P9.3 Alimagnet Lift Station Chain of Ponds	0.25	28.5	25	18	17
AV-20	Valleywood Golf Course	1.5	12	0	16	17
B-1	Crystal Lake West	0.9	444.5	5	28	19
B-1 Alt	Crystal Lake West Alternate	6	550	0	15	23
B-2	Cam Ram	0.41		0	18	23
B-3	Kraemer	30	93	30	24	13
B-4	Alimagnet	0.9	701	20	16	15
B-6	Alimagnet East/Dog Park	2.5	34	15	16	17
B-7	Terrace Oaks North	2.2	15.7	5	20	19
B-8	Red Oak	3	115	25	22	11
B-9	Crosstown West	7.2	388	50	14	15

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
B-10	AP-3 Cedar Pond	3.1	212	22	10	15
B-11	Valley View	1	80	10	16	13
B-12	Terrace Oaks	1.7	68	5	14	15
B-13	Sunset Lake	30	436	50	18	17
B-17	Terrace Oaks Buckthorn Pond	2.7	24	5	22	17
DC-1	Empire Lake	21	1152	NA	18	21
DC-2	Buck Pond	1.6	25	0	14	15
DC-3	Tamarack Swamp	7.7	40	0	10	21
DC-4	Jenson Lake	50	330	7	18	19
DC-5	Wood Pond	0.8	22	0	18	19
DC-6	BB's Wetland	NA	NA	NA	10	21
DC-7	Lilypad Pond	NA	NA	NA	16	21
DC-8	Star East	NA	NA	NA	14	19
DC-9	Star West	NA	NA	NA	14	19
DC-10	Duck Pond	NA	NA	NA	12	13
E-1	Thomas Lake Park Pond	0.4	4	37	18	21
E-7	Discovery Pond	4.1	16.5	0	20	21
E-9	Wilderness Run/LP-50	1.5	25	20	14	17
E-10	AP-3 Cedar Pond	3.1	212	25	14	17
E-11	Central Park Pond	1.8	130	20	14	21
E-18	Moonshine Park Pond	2.5	34	25	14	17
E-20	Shanahan Lake	10.9	56.4	1	10	17
E-21	FP-11.5	0.26	1.6	0	20	19
E-22	FP-11.6	0.58	2.7	0	20	17
E-25	FP 4.5	1	35	55	16	19
E-26	DP-6.2, Northwoods Business Park	3.2	25	44	14	15
E-27	LP-26.54, Thomas Woods Site	0.2	5.3	29	18	21

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
E-28	HDP-1, Kennerick Addition Site	0.8	39	18	16	21
E-29	LP-15, Lily Pond in Lebanon Hills Pk	6.5	21.8	5.5	12	27
E-31	Walnut Hill Pond	0.65	20	10	22	17
E-32	City Hall Pond	6.6	81.3	14	14	15
E-33	Coventry Pond	5.5	60	35	16	21
E-34	McCarthy Lake	11.3	220	15	24	23
E-35	Prairie Pond	0.8	5.1	0	NA	27
E-36	Mooney Pond	7	41	25	16	17
E-37	Kettle Pond	0.8	23	30	18	17
E-38	Gerhardt Lake	13.5	32	5	24	19
E-39	Black Hawk Middle School	0.3	24	31	16	11
E-40	Heine Pond	7.4	17	15	18	15
E-41	O'Leary Lake	16	84	40	22	23
E-42	LP-44	2.4	49	30	12	19
E-43	LP-41	4	37	30	22	19
F-1	Pine Knoll	35	107.5	10.4	NA	13
F-3	Kral Pond	10	41.8	6.6	16	19
F-4	Lake Julia	10	233	21.2	8	11
F-5	Autumn Glen	2.9	10	NA	20	21
F-6	Vermillion River	6.3	16	30	12	9
F-7	Autumn Glen	2.9	10	4	16	19
F-8	Mystic Meadows	6.19	8.23	NA	12	15
F-9	Cambodia	NA	NA	NA	8	19
H-4	Stonegate Treated	1	9.5	35	10	15
H-6	Lake Rebecca	19	56	1	16	27
H-30	Sand Coulee	1	107	25	8	13
H-56	180th Street Marsh	20	340	1	30	13

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
H-57	Cari Park Pond	0.78	29	14	14	13
L-4	Water Treatment Wetland Bank	22.85	99.8	20	14	15
L-7	DNR 387	10	2087	29	22	27
L-8	DNR 393	9.6	4987	17	16	23
L-9	NC 54	13.8	183	12	20	11
L-10	DNR#349W	40	213	NA	12	11
LD-1	Pickerel Lake				14	17
MH-2	Copperfield/Friendly Hills	9.4	865.3	20	16	27
MH-4	Industrial Park				16	17
MH-8	Victoria Pond	0.4	209.2	40	10	9
MH-9	Hagstrom-King	3	20	25	22	27
MH-13	MH Par 3	0.5	36	3	20	21
MH-14	Wagon Wheel	0.9	18.1	10	22	25
MH-15	Upper Bridgeview	4.1	66.4	NA	16	21
MH-16	Field Stone	6.9	577.9	20	24	29
MH-17	Marie Pond	0.6	64.2	20	12	15
MH-19	Lexington Marie Pond	1.1	46.5	30.1	14	15
NCR-1	Loretto Wetland	0.5	160	4	12	15
NCR-2	Peterson	2	55	0	14	15
R-1	Kelly Marsh - Derryglen Ct in 2004	1	12.5	80	14	21
R-2	White Lake	333	998	30	26	17
R-4	Schwarz Pond	10.9	144.5	20	18	17
R-6	Keegan Lake/WMP 310	35	1530	30	22	19
R-14	WMP #379	4.8	81	30	22	21
R-18	WMP #279	4.5	33.7	30	26	19
R-20	Unnamed/WMP 332	1	897	80	NA	21
R-21	CR-38 Mitigation Site 1	1.7	1530	30	28	23

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
R-22	Mare Pond, South	8	81	10	24	19
R-23	CR-38 Mitigation Site 2	0.3	81	30	30	27
R-25	WMP #306	1.7	81	30	12	23
R-26	Erickson Pond	1.9	1832	25	14	25
SSP-1	Anderson Pond	2.4	168	15	6	17
SSP-3	LeVander	3.4	37.9	20	16	17
SSP-4	Villaume Pond	1.66	25	30	18	11
WSP-1	Mud Lake	3.1	34.2	NA	20	13
WSP-2	Thompson Lake 48W	9	73920	50	16	17
WSP-3	Duck Pond	2.5	65	NA	12	15
WSP-4	Weschcke Pond	1.3	42.4	0	20	23
WSP-5	Lilly Lake	6.4	22	NA	16	19
WSP-6	Marthaler Park	4.5	23	0	14	17
WSP-7	Humboldt Pond/Vivian Pond	1.2	23	NA	18	19
WSP-8	DNC Prairie Pond	2.9	113	0	16	17
WSP-9	Marie Avenue	4	15	NA	12	11
WSP-10	Emerson Pond South	2.3	23	NA	22	15
WSP-12	Wentworth Pond	6	71.2	NA	8	15

*Scores reflect most recent data