Dakota County, Minnesota

2017 Wetland Health Evaluation Program

2017 Wetland Health Evaluation Program Report
Dakota County, MN

Coordinated By:

Dakota County

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Report
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FORTIN CONSULTING, INC.
serving the environment

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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
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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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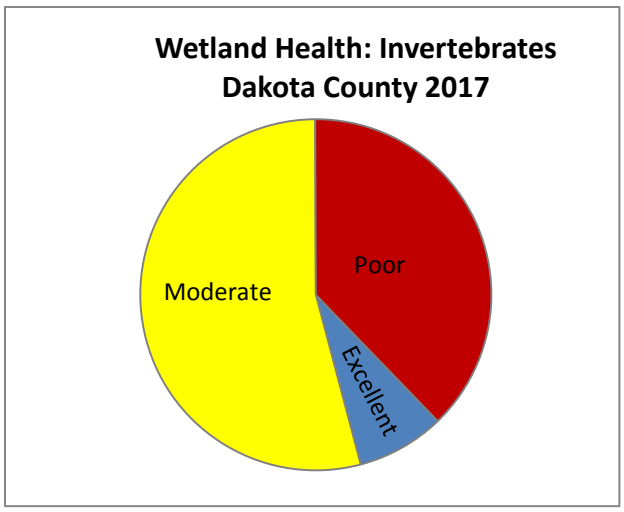
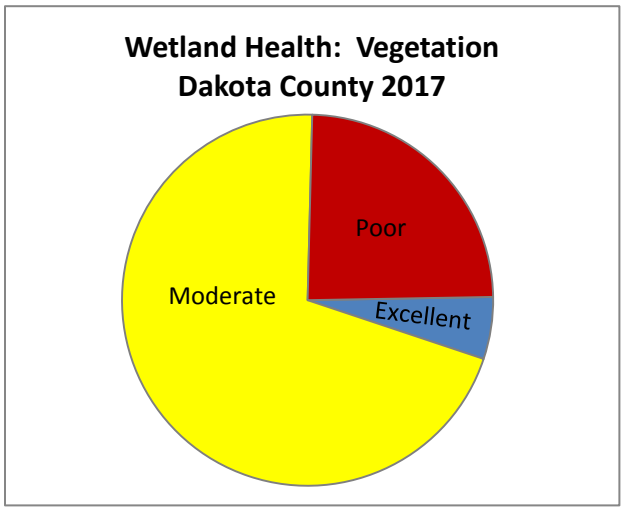
Executive Summary
Dakota County Wetland Health Evaluation Program 2017

Dakota County began sponsoring the Wetland Health Evaluation Program (WHEP) in 1997. Since then, 184 wetlands have been monitored by many volunteers across the County. In 2017, ten cities, one watershed management organization, and Dakota County Parks sponsored WHEP teams, monitoring 37 different wetlands. Four of these wetlands were monitored for the first time in 2017, including sites from Eagan and North Cannon River Watershed Management Organization. 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.





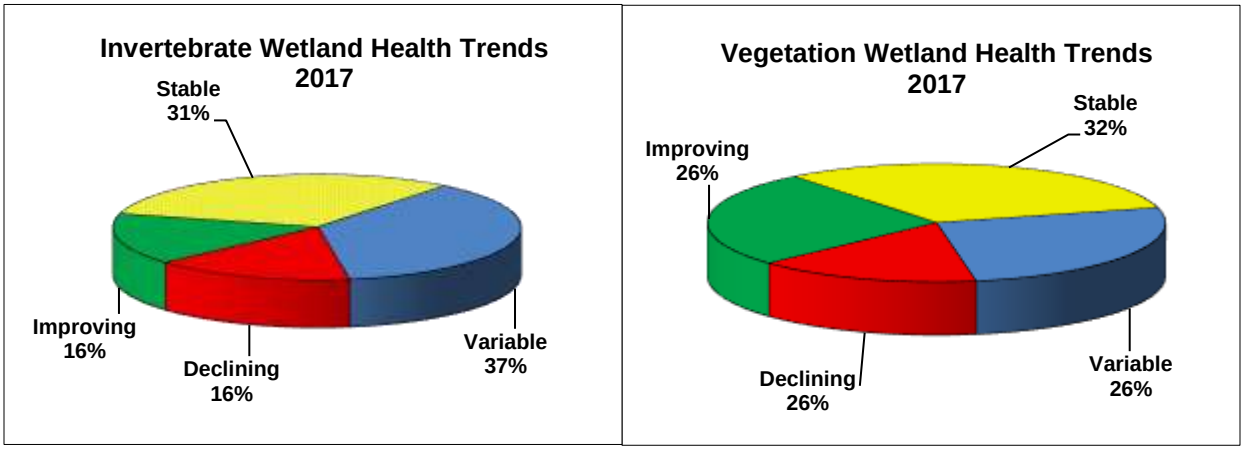
The results of the monitoring for 2017 showed a variety of wetland conditions. The Index of Biotic Integrity was used to determine wetland health ranging from poor to excellent. The majority of wetlands were in the moderate category for both macroinvertebrates (54%) and vegetation (74%). Three wetland sites rated excellent for macroinvertebrates: 180th Street Marsh (H-56), CR-38 Mitigation Site 1 (R-21), and CR-38 Mitigation Site 2 (R-23). Two wetland sites rated excellent for vegetation DNR #387 (L-7) and CR-38 Mitigation Site 2 (R-23). Site R-23 rated excellent in both invertebrates and vegetation. Forty-seven percent of the wetlands received poor invertebrate scores and twenty-six percent of the wetlands received poor vegetation scores.

The City of Rosemount's CR-38 Mitigation Site 2 (R-23) had the highest invertebrates score (30) and the City of Lakeville's DNR #387 (L-7) had the highest vegetation score (31) in 2017. The City of Apple Valley's Alimagnet Park (AV-10) and Dakota County Parks' Tamarack Swamp (DC-3) shared the lowest invertebrate scores (8). The City of Burnsville's Red Oak (B-8) had the lowest vegetation score (11) in 2017.

A trend analysis was conducted for all of the wetlands monitored in 2017 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, 16 percent of wetlands appear to be improving, 16 percent are declining, and 31 percent are stable. For vegetation, 26 percent of the wetlands appear to be improving, 26 percent are declining, and 32 percent are stable.

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.

2017 Dakota County Wetland Health Trends*



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

In 2017, 123 Dakota County WHEP volunteers donated more than 2,171 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**

1.1 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, and others in Hennepin County. Up to eleven 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 Counties 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.

1.2 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 ground water, 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.

1.3 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.

1.4 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 has coordinated Dakota County's WHEP since 2006. Paula states, "WHEP provides volunteers a rewarding science-based experience and delivers useable scientific data to water resource professionals to inform surface water management. Data and results can be used to plan restoration approaches, complement other monitoring programs, compare development impacts on water resources, or track the condition of wetlands over time. WHEP is a collaborative endeavor where volunteers learn from each other, team leaders, and professionals at county and state levels. Thank you to all WHEP volunteers and supporters."

Jeff Korpik is the new Field Coordinating Monitor for Dakota County WHEP. He I have been involved in WHEP since 2007 as a volunteer, team leader, and this year as the Field Coordinator. Jeff expressed "I have enjoyed all aspects of the program. It was interesting this year not being on a team. I got to see them all in action and explore parts of the County that I haven't been to. I did miss being on a team, but when a few teams were short-handed, I chipped in. I look forward to my 2nd year in this position. Every team seems to be doing a great job and we have some great team leaders."

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 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."

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

Mark Gernes

Michael Bourdaghs

Joel Chirhart

John Genet

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.

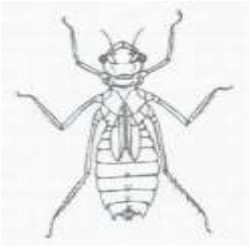
Vegetation Index of Biological Integrity (IBI)

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, Carolyn Dindorf, Lauren Schultzetenberg, Jessica Jacobson, Madeline Carlson, Katie Farber, and Roman Rowan,

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 2017, Fortin Consulting cross-checked the vegetation plots of four wetlands, one in Farmington (F-7), Mendota Heights (MH-2), North Cannon River Watershed (NCR-2), and West St. Paul (WSP-6). Fortin Consulting also reviewed the invertebrate samples from sites AV-20, B-1, DC-1, E-41, F-7, H-6, L-8, MH-2, NCR-2, R-21, SSP-3, and WSP x-check site (H-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 2017 Sampling Season Results

During the 2017 sampling season, twelve citizen teams (Apple Valley, Burnsville, Dakota County Parks, Eagan, Farmington, Hastings, Lakeville, Mendota Heights, North Cannon River Watershed Management Organization, Rosemount, South St. Paul, and West St. Paul) monitored 37 wetlands in ten cities in Dakota County. Twelve of these wetlands were sampled twice through citizen cross-checks. Four wetland vegetation samples and twelve invertebrate samples were checked for accuracy through the quality control check performed by Fortin Consulting.

Figure 3.1.1 Dakota County Wetland Ratings

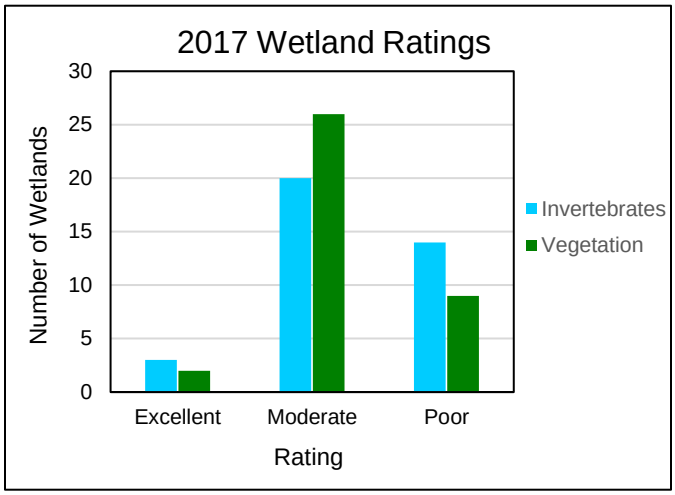


Figure 3.1.1 and Table 3.1.1 show the invertebrate and vegetation ratings for all of the wetlands assessed during the 2017 sampling season. Based on invertebrate scores, three of the wetlands rated excellent, twenty of the wetlands were rated moderate, and fourteen rated poor. Invertebrate scores ranged from 8 to 30 out of a maximum of 30 points.

The vegetation analysis resulted in two wetlands rating excellent, twenty-six rating moderate and nine poor. Vegetation scores ranged from 11 to 31 out of a maximum of 35 points.

Several of the sites showed different ratings for vegetation versus invertebrates. Twenty-one of the wetlands showed agreeing ratings for vegetation versus invertebrates, including Rosemount's CR-38 Mitigation Site 2 (R-23) that rated excellent for both categories. 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.

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)	2/1	1/2	0/0
Burnsville (B)	0/1	4/3	0/0
Dakota County (DC)	2/1	2/3	0/0
Eagan (E)	2/0	1/3	0/0
Farmington (F)	3/1	0/2	0/0
Hastings (H)	2/1	1/3	1/0
Lakeville (L)	0/0	2/1	0/1
Mendota Heights (MH)	0/0	2/2	0/0
North Cannon River (NCR)	0/1	2/1	0/0
Rosemount (R)	0/0	2/3	2/1
South Saint Paul (SSP)	1/2	1/0	0/0
West Saint Paul (WSP)	2/1	2/3	0/0
Totals	**14/ 9**	**20/ 26**	**3/ 2**

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 2017 Invertebrate Scores

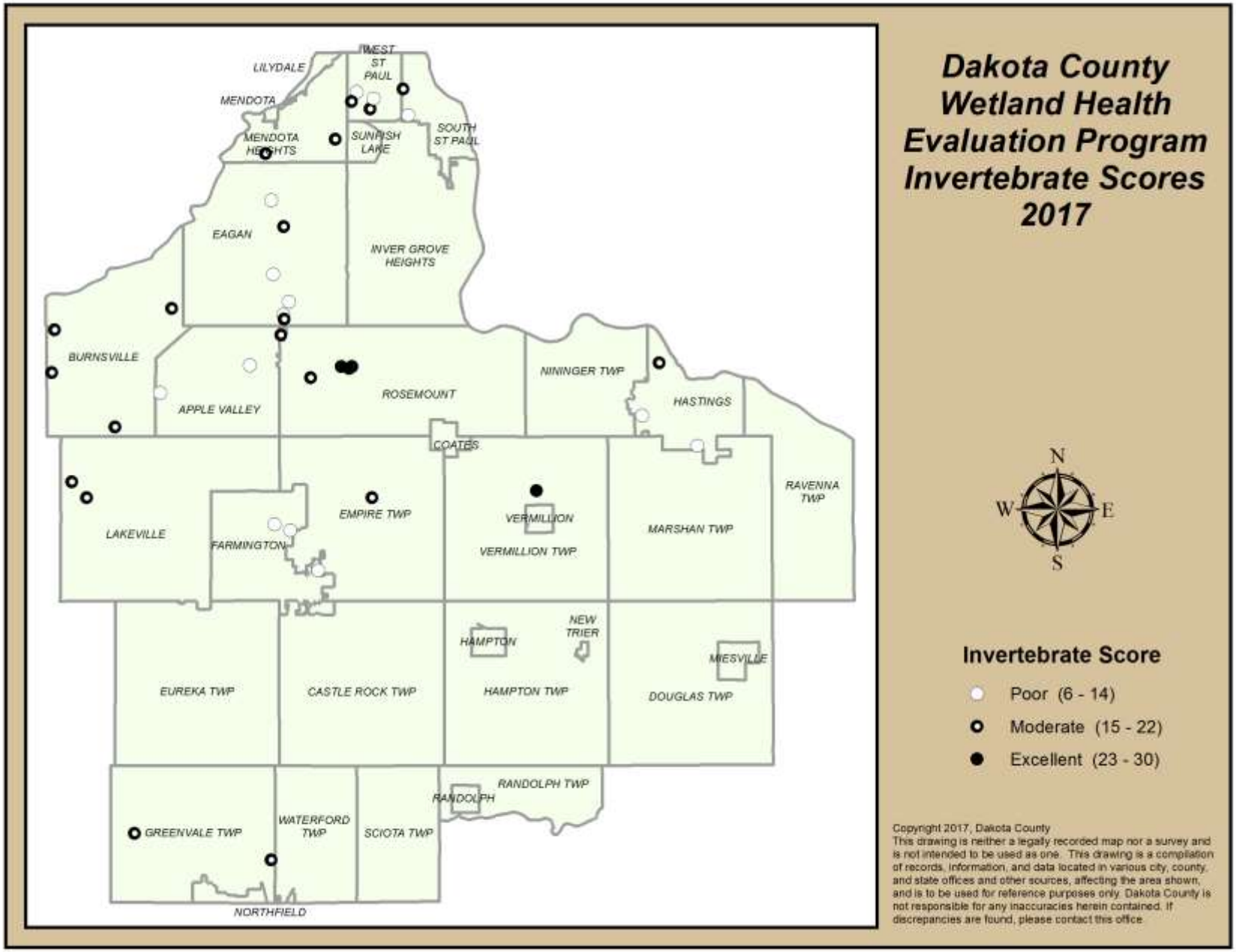
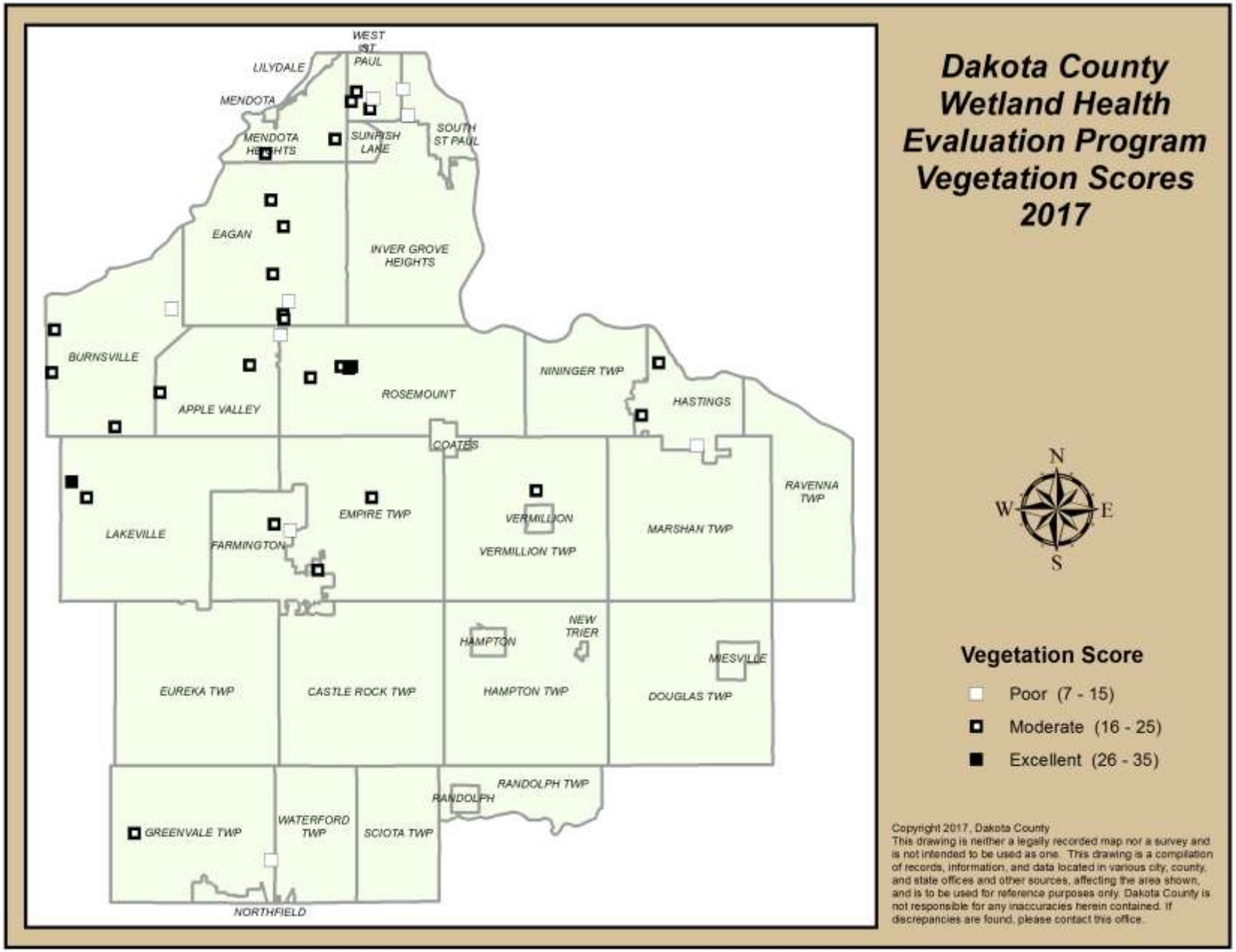


Figure 3.1.3 2017 Vegetation Scores



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 2017 were as expected. Many of the WHEP wetlands have been found to contain invasive species, but no early detection species were observed in 2017. Reed canary grass (*Phalaris arundinacea*) and purple loosestrife **(***Lythrum salicaria*) are two common wetland invaders. Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), Chinese mystery snails (*Cipangopaludina chinensis*), and banded mystery snails (*Viviparus georgianus*) were also observed in wetlands monitored in 2017. Reed canary grass was found in 86 percent of the wetlands, purple loosestrife was found in 19 percent of the wetlands, Eurasian watermilfoil and curly-leaf pondweed were each found in 5 percent of the wetlands, Chinese mystery snails were found in 16 percent of the wetlands, and banded mystery snails were found in 5 percent of the wetlands. In addition, buckthorn was reported in eight of the wetlands, and invasive honeysuckle was found in one 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 or 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, 8, 8. The highest invertebrate scores, respectively, are 30, 28, 28. The lowest vegetation scores for created, stormwater, and natural wetlands, respectively, are 11, 9, 11. The highest vegetation scores, respectively, are 27, 31, 27.

Wetland health scores vary from year to year. In 2017, 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 completed in previous reports 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 2017 within the vegetation plot sites. The lowest water level measured within the plots in 2017 was zero feet, the highest water level was 4.9 feet (1.5 m), and the average water level was 1.9 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 2017 Cross-checks

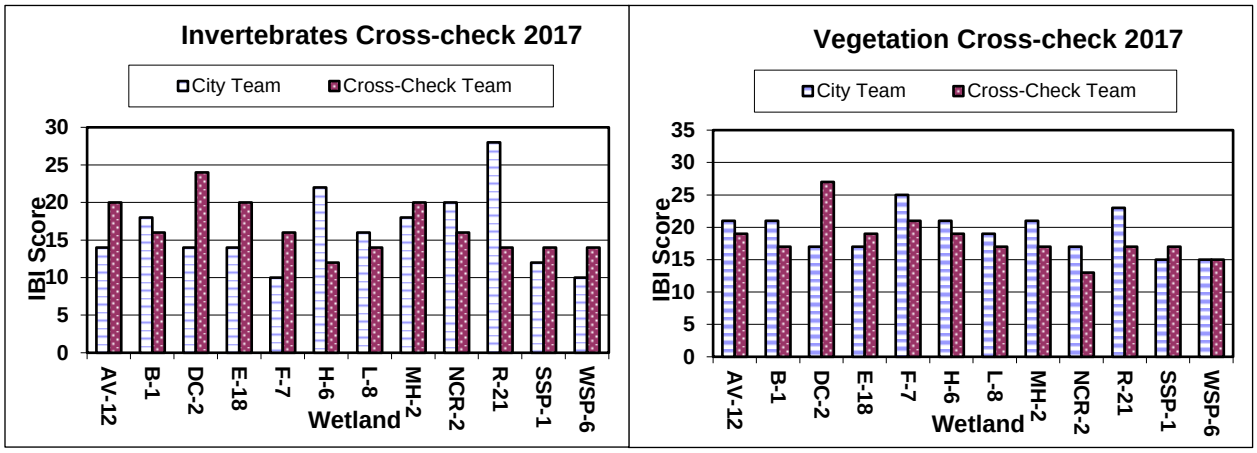
Each city team was responsible for evaluating one wetland in another city (Table 3.2.1). This citizen cross-check provides a second sample for the selected wetland. The purpose of this check is to determine if two different samples provide similar results for the vegetation and invertebrate IBI. Large 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 DC-2, H-6, and R-21 were inconsistent, differing by 10, 10, 14 points, respectively. Vegetation scores for site DC-2 were inconsistent, differing by 10 points. 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 WSP-6 were identical. Many scores were close in comparison.

- *DC-2:* The cross-check team identified a more diverse invertebrate community than the City team. This affected the Leech, ETSD, and Snail Metrics.
- *DC-2:* The cross-check team identified a more diverse vegetation community than the City team. This affected the Vascular, Grasslike, *Carex*, and *Utricularia* Metrics.
- *H-6:* The City team identified a more diverse invertebrate community than the cross-check team. This affected the Odonata, ETSD, and Snail Metrics.
- *R-21:* The City team identified a more diverse invertebrate community than the cross-check team. This affected the Leech, *Corixidae*, Odonata, ETSD, and Snail 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	Lakeville	AV-12	14	20	21	19
Burnsville	Dakota Co Parks	B-1	18	16	21	17
Dakota County Parks	Burnsville	DC-2	**14**	**24**	**17**	**27**
Eagan	Rosemount	E-18	14	20	17	19
Farmington	North Cannon River WMO	F-7	10	16	25	21
Hastings	West St. Paul	H-6	**22**	**12**	21	19
Lakeville	Apple Valley	L-8	16	14	19	17
Mendota Heights	South St. Paul	MH-2	18	20	21	17
Rosemount	Eagan	R-21	**28**	**14**	23	17
North Cannon River WMO	Farmington	NCR-2	20	16	17	13
South St. Paul	Mendota Heights	SSP-1	12	14	15	17
West St. Paul	Hastings	WSP-6	10	14	15	15

Figure 3.2.1 Cross-check Comparisons of IBI Scores



3.2.2 2017 Quality Control Checks

Quality control checks were conducted at four sites for vegetation and twelve sites for invertebrates in 2017 (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-20, B-1, DC-1, E-41, F-7, H-6, L-8, MH-2, NCR-2, R-21, SSP-3, WSP-6, and WSP cross-check.

Autumn Glen in Farmington

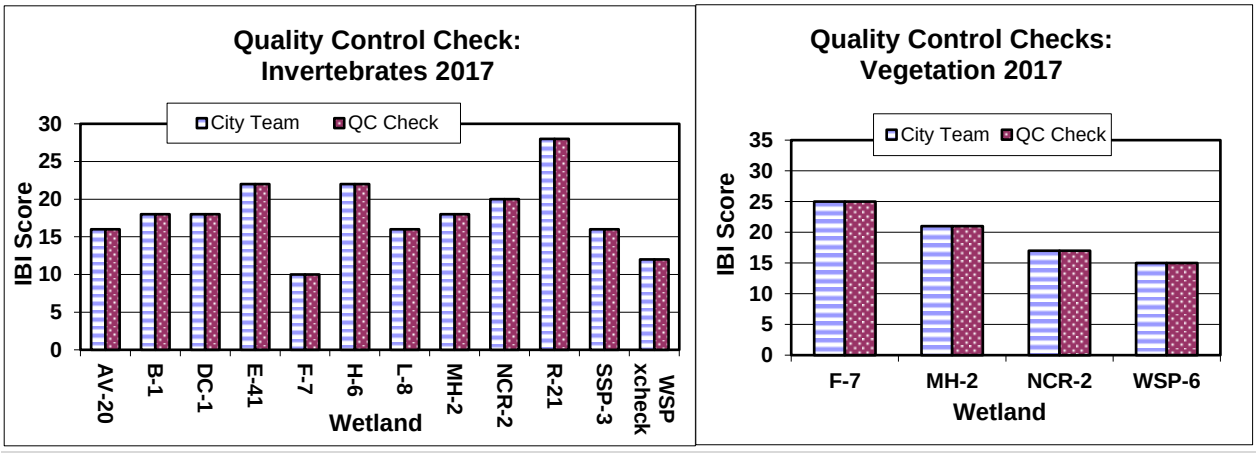
Copperfield in Mendota Heights

Peterson in NCRWMO

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 24 transfer errors. 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. Four errors were caused by miscalculating metric scores. Corrections affected the scores by zero to six 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-10	8	8	0	19	17	1
	AV-12	14	14	0	23	21	1
	AV-20	16	16	0	17	15	1
	L-8 cc*	14	14	0	19	17	1
Burnsville	B-1	18	18	0	21	21	0
	B-3	22	22	0	17	17	0
	B-8	22	22	0	11	11	0
	B-13	18	18	0	17	17	0
	DC-2 cc*	24	24	0	27	27	0
Dakota Co	DC-1	18	18	0	21	21	0
	DC-2	14	14	0	17	17	0
	DC-3	8	8	0	15	15	0
	DC-4	18	18	0	19	19	0
	B-1 cc*	16	16	0	17	17	0
Eagan	E-18	15	14	2	15	17	1
	E-41	16	22	5	19	23	5
	E-42	14	12	2	19	19	5
	R-21 cc*	14	14	0	17	17	0
Farmington	F-3	14	14	0	20	21	1
	F-7	10	10	0	25	25	0
	F-8	12	12	0	15	15	0
	NCR-2 cc*	16	16	0	13	13	0
Hastings	H-4	10	10	0	17	17	0
	H-6	22	22	0	21	21	0
	H-56	28	28	0	19	19	0
	H-57	12	14	1	15	15	0
	WSP-6 cc*	14	14	0	15	15	0
Lakeville	L-7	18	18	0	31	31	0
	L-8	16	16	0	19	19	0
	AV-12 cc*	20	20	0	19	19	0
Mendota Heights	MH-2	18	18	0	21	21	0
	MH-4	16	16	0	17	17	0
	SSP-1 cc*	14	14	0	17	17	0
NCRWMO	NCR-1	20	20	0	15	15	0
	NCR-2	20	20	0	17	17	0
	F-7 cc*	16	16	0	21	21	0

		Invertebrate IBI Scores			Vegetation IBI Scores		
Team Name	**Site**	**Team**	**Review**	**Errors**	**Team**	**Review**	**Errors**
Rosemount	R-4	16	18	1	17	17	0
	R-14	22	22	0	21	21	0
	R-21	28	28	0	23	23	0
	R-23	30	30	0	27	27	0
	E-18 cc*	20	20	0	19	19	0
South St. Paul	SSP-1	12	12	0	15	15	0
	SSP-3	16	16	0	15	15	0
	MH-2 cc*	20	20	0	17	17	0
West St. Paul	WSP-3	20	20	0	17	17	0
	WSP-4	12	12	0	17	17	0
	WSP-6	10	10	0	15	15	0
	WSP-8	16	16	0	17	17	0
	H-6 cc*	12	12	0	17	19	1

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

3.3 WHEP Historical Data

Since WHEP began in 1997, 184 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 2017 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

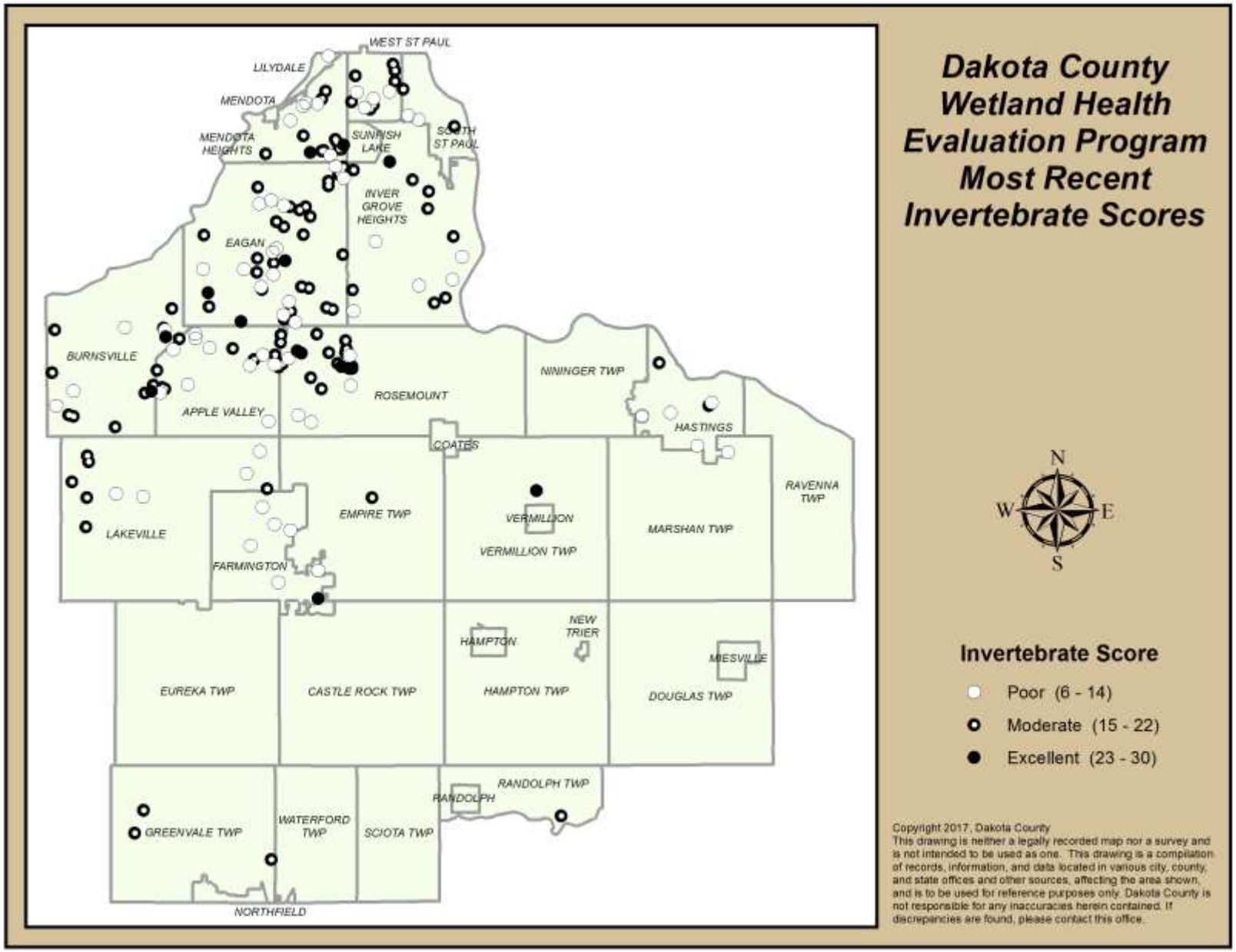
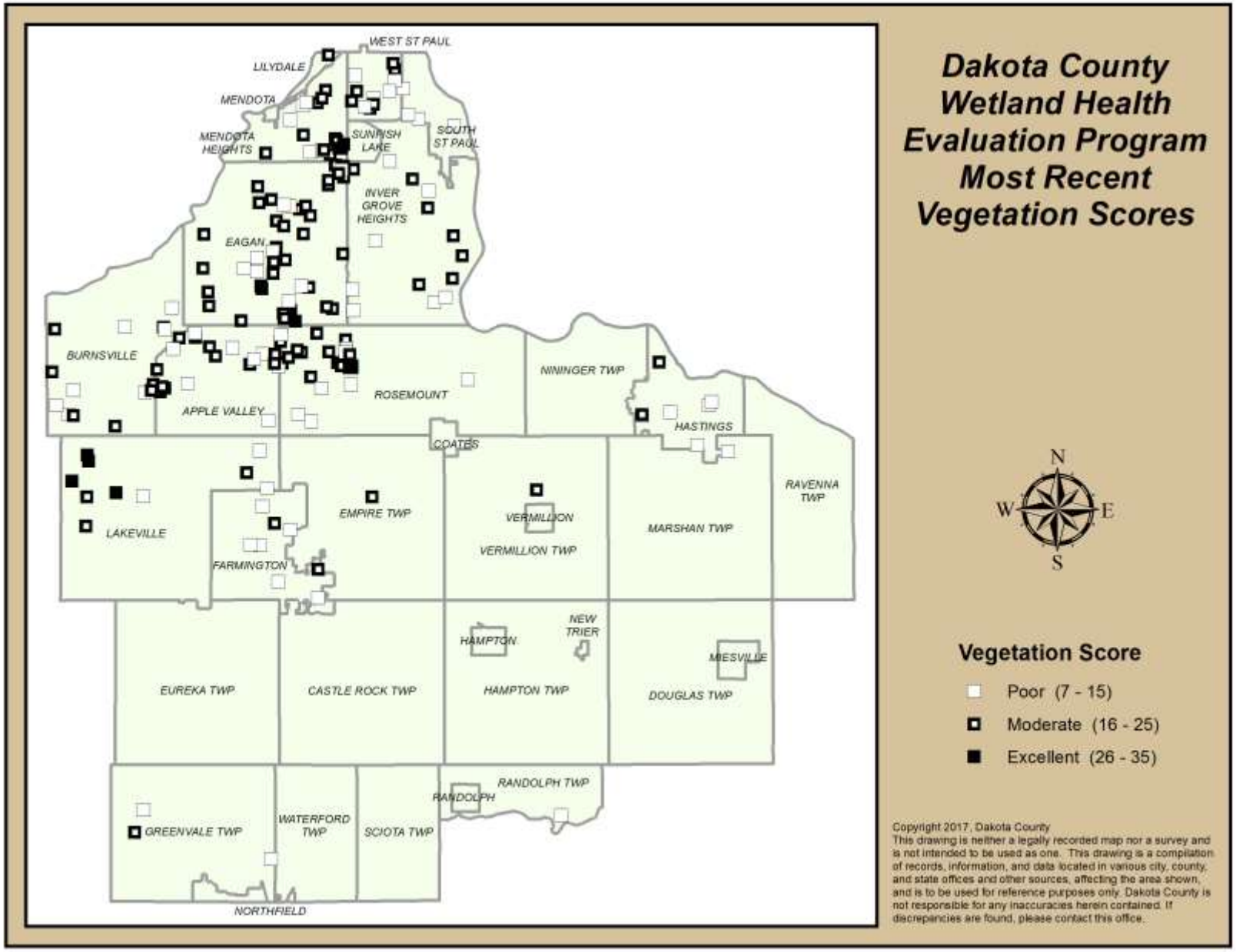


Figure 3.3.2 Most Recent Vegetation Scores



4.0 Wetland Evaluations

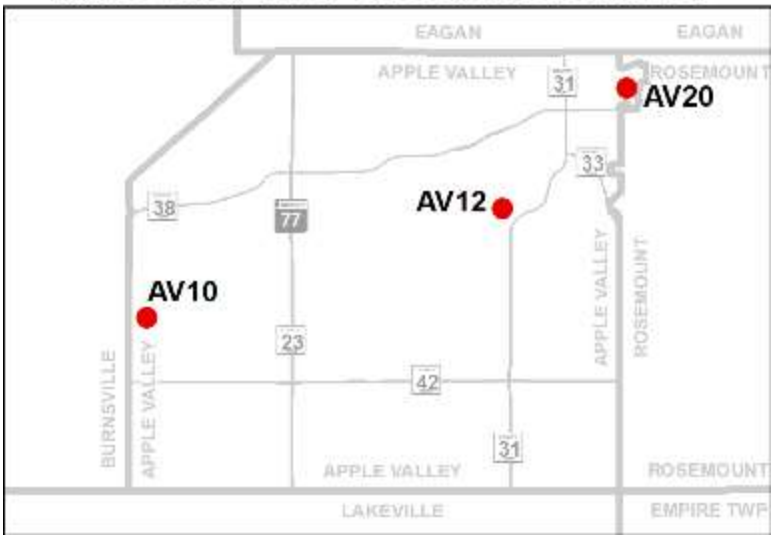
4.1 Apple Valley Wetlands

Three wetlands were monitored within the City of Apple Valley in 2017. This is the 20th year the City has participated in WHEP! Twenty wetlands have been monitored in Apple Valley since the initiation of WHEP in 1997.

Team Leaders: Katie Koch-Laveen and Cindy Taintor

Team Members: Brad Blackett, Emma Edwards, Kathy Joroensen, Mikayla Lindquist, Kris Reiners, Larry Reiners, Katie Traub, and Tessa Venables

Apple Valley WHEP Sites Monitored in 2017



Katie Koch-Laveen

Katie Koch-Laveen is co-leader of the Apple Valley WHEP team. She has been involved in WHEP since 2000, being a long-time team leader of the Farmington team. After a year off, she returned to the program in 2017, to join Apple Valley. She stated, "The Apple Valley Team had many volunteers of different ages - high school to retired. Volunteers showed up regularly and shared all responsibilities. To count bugs and complete reports we went the biology labs of Apple Valley High School and worked with at the same time the Farmington Team was similarly engaged. The joint effort worked out well. We were pleased to see the Apple Valley City folks also come and observe the lab work."

Cindy Taintor

Cindy Tainter is co-leader of the Apple Valley WHEP team. This is her first year as team leader; however, she has been volunteering for WHEP since 2009. She commented, "I was grateful that Katie Koch-Laveen came out of retirement to be my co-leader. Her knowledge, experience and helpful presence made it successful and enjoyable. I need to also give credit to Jeff Korpik, who was the previous team leader in Apple Valley. My team consisted of very dedicated volunteers this year, and we couldn't do it without a hardworking team.

"I have been a team member on the Apple Valley WHEP team for several years. Biology classes were always my favorite studies in college, although that was not my major. A few years after moving to Apple Valley, I saw a notice in the paper about the opportunity to join a wetland team. Training was included and experience not required, so I was immediately interested. Getting out into the wetlands is fascinating. Knowing that the data we gather is reliable and useful is very satisfying. Nobody fell in, and the mosquitoes were barely noticeable. It was a great first year as team leader."

Jessica Schaum

Jessica Schaum started with Apple Valley as their Natural Resources Coordinator three 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. Sometimes unexpected projects come up – like the future North Creek Greenway trail near our reference wetland. It will be interesting to see potential benefits of the overall project somewhere we already have compiled data. 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."

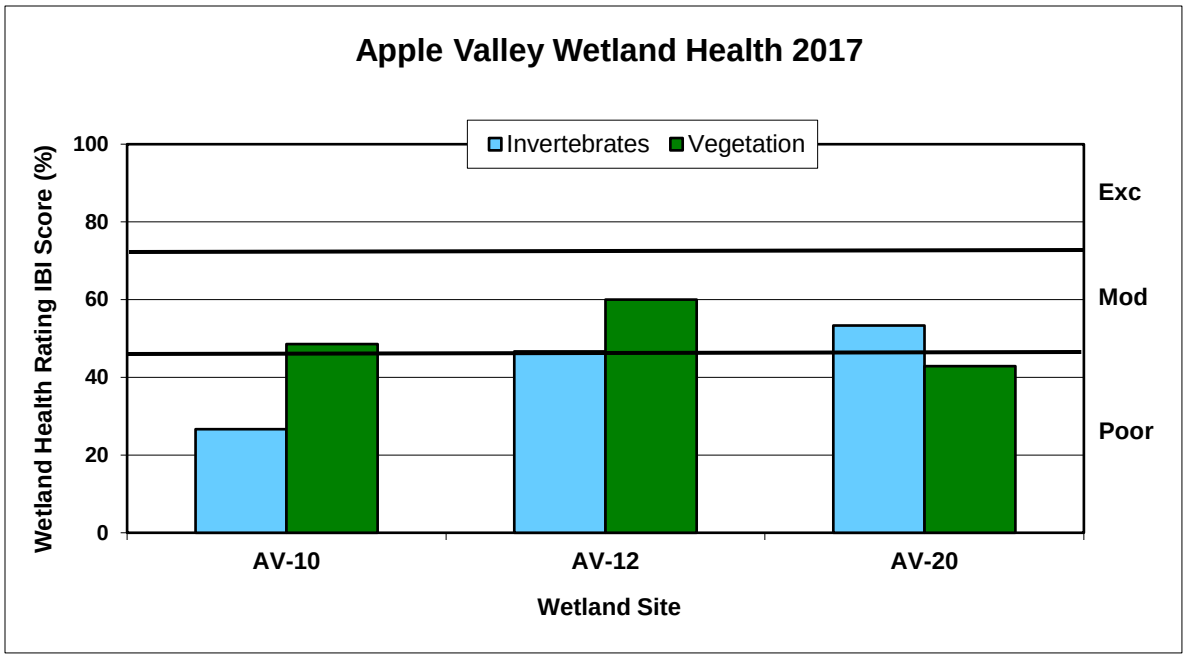
Jane Byron

Apple Valley General Wetland Health

Figure 4.1 presents an overall view of wetland health for all of the 2017 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; however, the invertebrate and vegetation ratings opposed each other in all three wetlands. Invertebrate and vegetation scores for AV-20 measured a ten percent scoring difference. The invertebrates and vegetation scores for AV-10 and AV-12 were inconsistent and differed by 22 and 13 percent, respectively.

Apple Valley team at invertebrate training

Figure 4.1 Apple Valley site scores (percent) for the 2017 sampling season



4.1.1 Alimagnet Park (AV-10)

Alimagnet Park (AV-10) is a 0.5-acre, type 5 wetland located within Alimagnet Lake subwatershed of the Vermillion River Watershed, and lies just southeast of Alimagnet Lake. The wetland watershed has approximately 25 acres with five acres of direct drainage, and is 20 percent impervious. There is one inlet at the southeastern corner of the wetland and one outlet along the western border which pipes beneath a trail. It is not part of the City's stormwater management plan; however, it 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. This wetland is within the Alimagnet TMDL drainage, but no key measures are called out for it within the TMDL. BMPs include one upstream stormwater pond, one upstream wetland, and one upstream raingarden.

The wetland is located within an active park that features a frisbee golf course. The surrounding area includes wooded parkland and residential neighborhoods. Some minor disturbances to the understory have occurred within the parkland from installation of the frisbee golf course; however, disturbances within this watershed are limited. A raingarden was installed upstream of the wetland, by the parking lot, in 2008. It will treat some of the stormwater that flows to this wetland. Great River Greening completed a buckthorn removal project in some areas adjacent to the wetland two to three years ago.

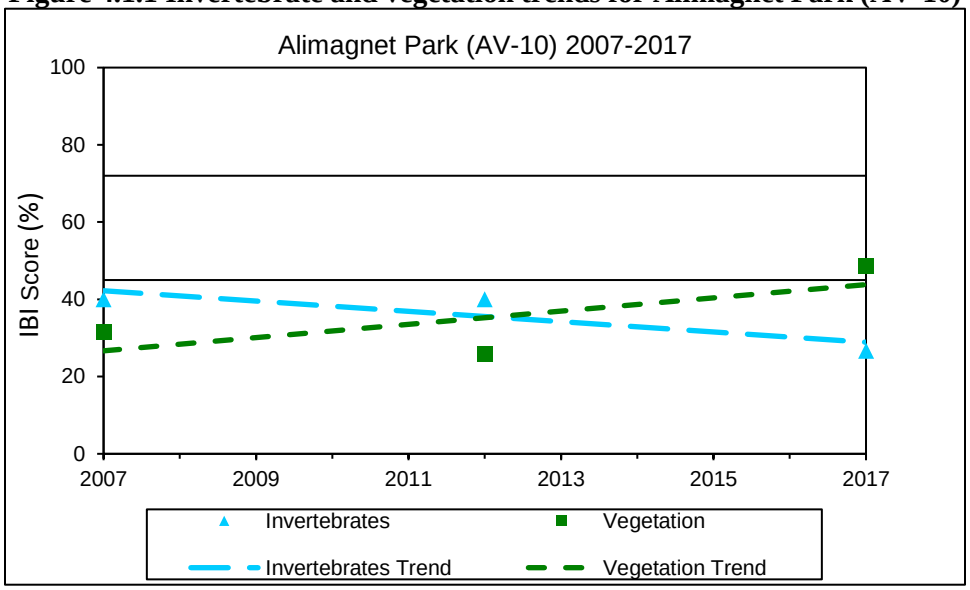
Wetland Health

Site Observations: The wetland has a gentle slope and very mucky substrate. Duckweed covers the wetland surface. Fallen trees lay in the water. Trees line the east and south edges, and patches of grasses sprout along the west and north edges of the wetland. A painted turtle and a family of mallards were observed.

Table 4.1.1 Alimagnet Park (AV-10) Wetland Health based on Index of Biotic Integrity (IBI)

2017 Data (AV-10)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (8)	Moderate (17)
Trend 2007-2017	Not enough data	Not enough data

Figure 4.1.1 Invertebrate and vegetation trends for Alimagnet Park (AV-10)



Site Summary: Alimagnet Park has been surveyed three times since 2007; but has not been surveyed since 2012. Invertebrate health scores have remained poor all three surveys. The vegetation health scores were poor in past surveys, but in 2017 improved to moderate. The health scores have declined since the initial surveys in the early 2000's, and the health trends agree. In 2017, very few invertebrates were collected including one family of leech, one family of snail, one family of clams, and three individual true bugs. The vegetation plot contained no submergent vegetation. Floating vegetation covered nearly 100 percent of the wetland surface. Dense floating vegetation can shade out submergent vegetation. Sparse submergent vegetation will limit invertebrate habitat.

4.1.2 Everest Pond (AV-12)

Everest Pond (AV-12), also known as EVR-P12 and Public Water 19-225W, is a 5.7-acre, type 5 wetland within the EVR-P12 subwatershed within the Vermillion River Watershed. The subwatershed has approximately 527 acres of total drainage in which all 61 acres drain directly. There is one inlet in the northwest corner of the wetland, and one inlet along the southwestern shoreline. There is one outlet in the northwest corner of the wetland, and one outlet along the northeastern shoreline. Everest Pond is part of the City's stormwater management plan and is designated as a Manage 1 wetland. Wetlands in this classification have medium floral diversity/integrity, but also have direct stormwater input. The wetland must have high or exceptional restoration potential and be located in public or open space in order to meet the restoration classification.

This wetland is a key drainage area to Long Lake and Farquar lake, both of which are impaired for phosphorus. Approximately 68 percent of the external phosphorus load entering Long Lake comes from this pond. Several projects have been completed in the pond and the overall drainage as part of addressing the TMDL. The area surrounding this wetland is primarily residential. More than half of the wetland is surround by a wooded buffer, and the rest by manicured lawn. There are algal blooms in the summer, and the presence of goldfish has been noted.

Apple Valley team in lab

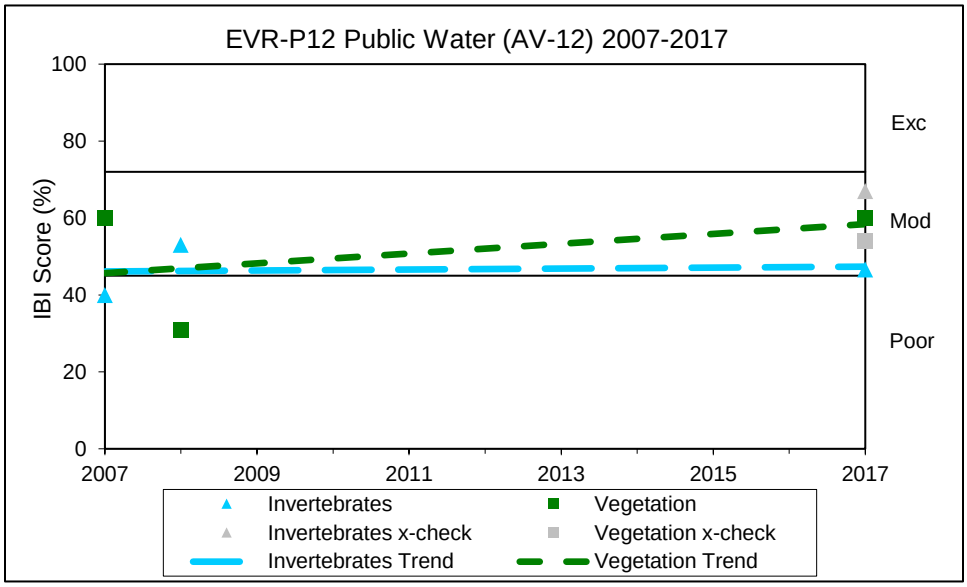
Wetland Health

Site Observations: The nearshore area is woody and includes willow, aspen, and cottonwood trees. Some duckweed and cattails are present. Reed canary grass is present. There is a gentle slope, and the substrate is clay/sand mix. Rocks and other submerged hazards exist. Minnows, sunfish, and bluegills were observed in the nearshore water. Mystery snails were observed/collected from this wetland.

Table 4.1.2 Everest Pond (AV-12) Wetland Health based on IBI

2017 Data (AV-12)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (21)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (19)
Trend 2007-2017	Not enough data	Not enough data

Figure 4.1.2 Invertebrate and vegetation trends for Everest Pond (AV-12)



Site summary: This is the third time that AV-12 has been monitored since the initial survey in 2007, but has not been surveyed since 2008. The invertebrate scores have remained stable while the vegetation scores are variable. More data is needed to analyze a reliable health trend. This wetland was cross-checked in 2017. The vegetation scores between the City team and cross-check are similar; however the invertebrate scores are inconsistent. The cross-check team identified a larger diversity of invertebrates. Both teams sampled along the eastern shoreline. The City team noted fish in the area at the time of collection. Whether this impacted the invertebrate population is unknown.

4.1.3 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 golf course. Management of the wetland is consistent with the golf course's practices. The golf course is also interested in pursuing Audubon Certification; as such, they are interested in programs like WHEP that can add to their education components.

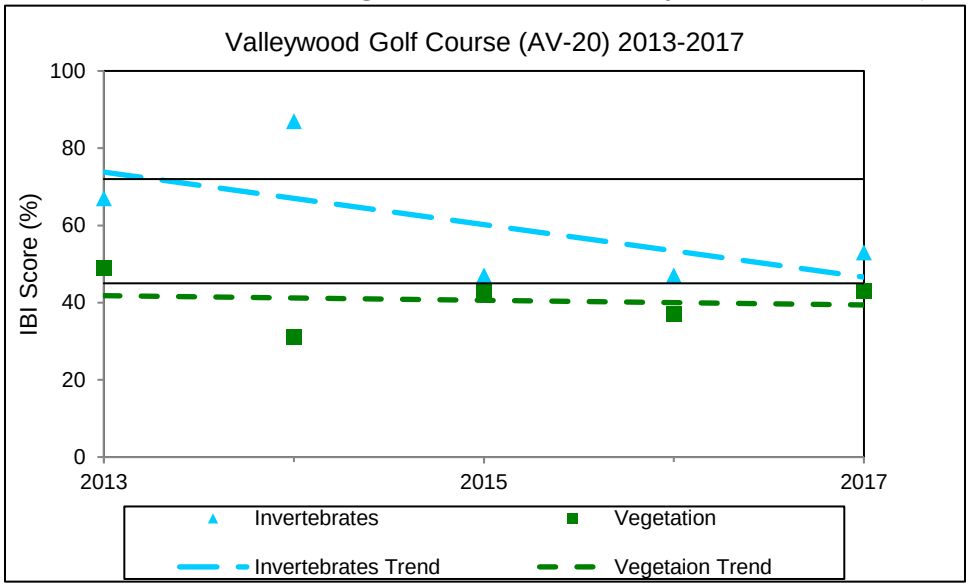
Wetland Health

Site Observations: The wetland slope is gentle, and the substrate is very mucky. Oak trees surround the wetland, and there is a lot of vegetation in the water including coontail, duckweed, and water-meal. Crayfish and tadpoles were observed.

Table 4.1.3 Valleywood Golf Course (AV-20) Wetland Health based on Index of Biotic Integrity

2017 Data (AV-20)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Poor (15)
Trend 2013-2017	Declining	Stable

Figure 4.1.3 Invertebrate and vegetation trends for Valleywood Golf Course (AV-20)



Site summary: This is the fifth consecutive year that AV-20 has been monitored through WHEP. Invertebrate and vegetation health scores have been steady the past three years, and both invertebrate and vegetation scores are slightly improved from last year. The team made note that this wetland seems to be improving in diversity. Overall, the invertebrate trend is declining since first monitored in 2013 while the vegetation trend remains stable. Invertebrate and vegetation scores were consistent in 2017, even though the vegetation rated poor while the invertebrate rated moderate.

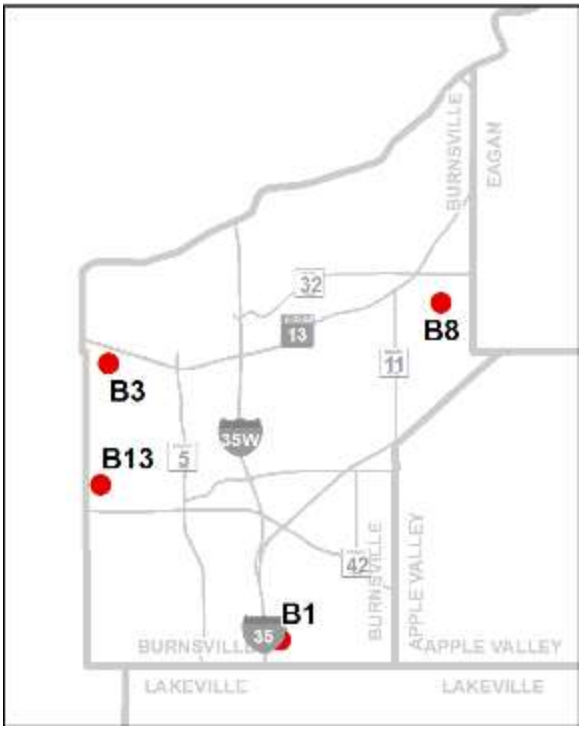
4.2 Burnsville Wetlands

Four wetlands were monitored within the City of Burnsville in 2017. This is the 21st year the City has participated in WHEP! Sixteen wetlands have been monitored in Burnsville since the initiation of WHEP in 1997.

Team Leader: Dianne Rowse

Team Members: Holly Check, Pete Curtis, Bernie DeMaster, Katie Dennis, Tracy Few, Patrick Heim, Kevin Nelson, Travis Nelson, Jeff Richards, Nick Rowse, Melody Schake, Daniel Shaughnessy, and Matthew Tyrrell

Burnsville WHEP Sites Monitored in 2017



Dianne Rowse

Dianne Rowse is the Burnsville team leader. She started participating in WHEP in 1998 as the Farmington team leader for three years. Then she led the Burnsville team for seven years. She took a break from WHEP to lead the statewide dragonfly survey for two years and continues survey work as a volunteer for the Minnesota Dragonfly Society. She returned to WHEP in 2016, and is excited to lead the Burnsville team again.

Dianne is a retired Professional Naturalist and enjoys wading into wetlands, identifying plants and bugs, and sharing this with others. She says "I am delighted to have a dedicated team of extraordinary citizen scientists. I hope they'll return in 2018!"

Liz Forbes with husband Andy

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.

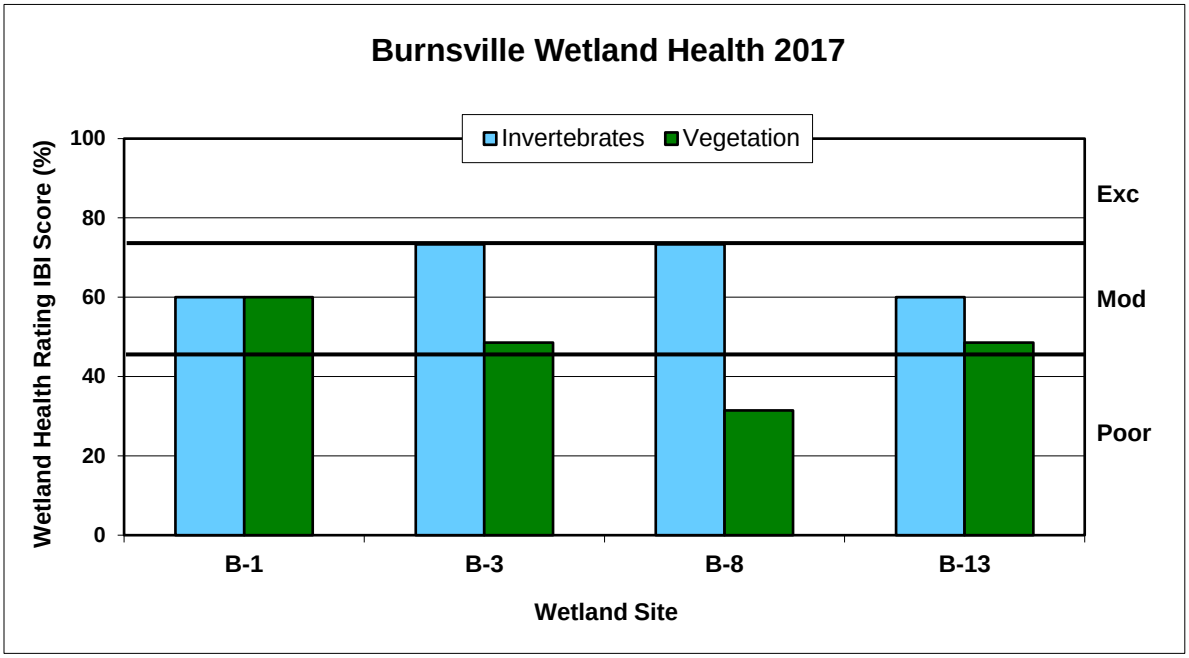
"The 20 years' worth of wetland data collected by WHEP volunteers provides a valuable reference tool for the City. In addition to guiding surface water management decisions, the data comes in handy when responding to inquiries about water bodies or applying for habitat restoration grants.

"The City truly appreciates the efforts made by the Burnsville WHEP team. This year, team leader, Dianne Rowse gave a presentation about WHEP at a City Parks & Natural Resources Commission meeting. Also attending were volunteers Nick Rowse and Bernie DeMaster (former team leader). The talk was well-received and led to some discussion about ways to protect wetland water quality."

Burnsville General Wetland Health

Figure 4.2 presents an overall view of wetland health for all of the 2017 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 moderate wetland health based on invertebrate and vegetation data. Only wetland B-8 rated poor for vegetation. B-1, B-3, and B-13 scored moderate for both invertebrate and vegetation. Invertebrate and vegetation scores were inconsistent for B-3, B-8, and B-13 and differed by 24 ,42, and 11 percent, respectively. Invertebrate and vegetation scores for B-1 were perfectly consistent.

Figure 4.2 Burnsville site scores (percent) for the 2017 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.

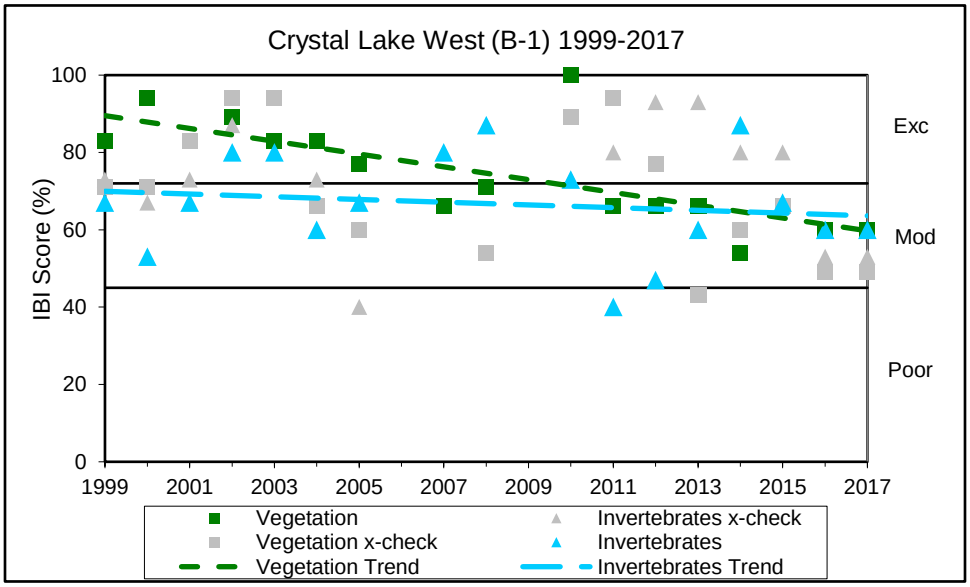
Wetland Health

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 white water lilies. Submergent vegetation including coontail and pondweed are prolific. Chara was present during the June invertebrate sampling. A large diversity of invertebrate taxa were collected; however, there were very few individuals per taxa represented.

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

2017 Data (B-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (21)
Cross-check Rating (IBI score)	Moderate (16)	Moderate (17)
Trend 1999-2017	Variable but stable	Variable but declining

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



Site summary: This is the seventeenth time that B-1 has been surveyed since 1999, and eighth consecutive survey since 2010 (it was not surveyed in 2006 and 2009). The invertebrate and vegetation scores both indicate that the wetland has moderate health. Throughout the years of monitoring, the scores have varied and ranged from poor to excellent. This site was cross-checked by another WHEP team in 2017. All scores from both monitoring teams were identical to 2016 scores. Scores between the City team and the cross-check team were consistent. The invertebrate trend line indicates variable but overall stable wetland health.

The vegetation trend indicates variable but overall declining health. The Burnsville team expressed concern for the annual human impact of monitoring this wetland, how it may affect the wetland biological health.

4.2.2 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 management goal is 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.

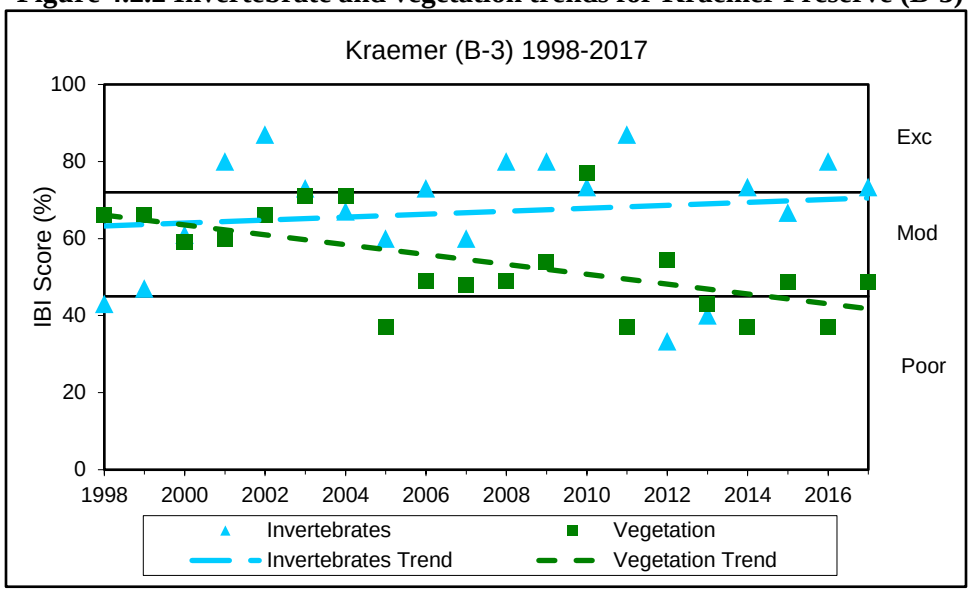
Wetland Health

Site Observations: This is a large wetland surrounded by a walking trail. Dense cattail surround the wetland, encroaching 10 or more 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 wetland substrate is mucky. Coontail, pondweed, northern water milfoil, water crowfoot, and duckweed flourished in the wetland. Only submergent and floating leaved aquatic forbs and cattail were documented in the vegetation plot. Several taxa of dragonflies, damselflies, mayflies, caddisflies, snails, and true flies were recorded. Fish, filamentous algae, Chinese mystery snail and banded mystery snails were also observed.

Table 4.2.2 Kraemer Preserve (B-3) Wetland Health based on Index of Biotic Integrity

2017 Data (B-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (17)
Trend 1998-2017	Variable but stable	Overall decline, but stable since 2005

Figure 4.2.2 Invertebrate and vegetation trends for Kraemer Preserve (B-3)



Site summary: This is the twentieth 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.

4.2.3 Red Oak (B-8)

Red Oak (B-8) is a 0.5-acre, type 3 wetland located within the E4 Drainage of the East Subwatershed (2,170 acres) within the Black Dog Watershed (3,700 acres). The E4 Drainage is 121 acres with approximately 25 percent impervious surface. There are no inlets, but one outlet at the northern end of the wetland. The wetland is part of the City's stormwater management plan. It is designated as an Protection Class wetland and is managed to maintain or improve existing habitat.

The wetland is located on the northwest side of a 36-acre Red Oak Park. Mixed grassland and woodland buffer the wetland. Large athletic fields (baseball and soccer) are to the north and east of the wetland. A paved park trail lies 100 feet away on the east and south sides of the wetland. A footpath for the disc golf course is west and south of the wetland. North and west of the wetland are residential neighborhoods. This wetland receives runoff from the adjacent residential areas and athletic fields.

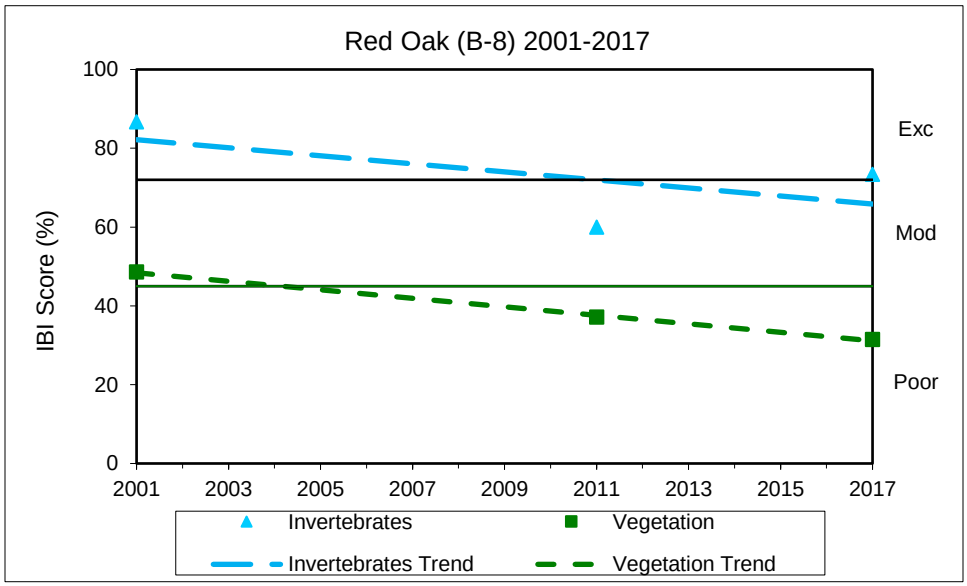
Wetland Health

Site Observations: The wetland substrate is firm but mucky, and the slope is gentle. There is minimal open water. The wetland is choked with cattails. No submergent vegetation was documented. Ricciocarpus was observed during the invertebrate collection, but not within the vegetation plot. Tadpoles were found in the bottle traps.

Table 4.2.3 Red Oak (B-8) Wetland Health based on Index of Biotic Integrity

2017 Data (B-8)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (22)	Poor (11)
Trend 2001-2017	Not enough data	Not enough data

Figure 4.2.3 Invertebrate and vegetation trends for Red Oak (B-8)



Site summary: This is the third time that Red Oak (B-8) has been surveyed since initially surveyed in 2001. Invertebrate and vegetation scores were inconsistent with invertebrates rating moderate while vegetation rated poor. The invertebrate diversity is healthy; however, few individuals per taxa were collected. The wetland is choked with cattail limiting vegetation diversity, and possibly affecting the invertebrate density.

Burnsville team at WHEP Invertebrate Training

4.2.4 Sunset Pond (B-13)

Sunset Pond (B-13) is a 48-acre, type 3 wetland located within the SP1 drainage area of Sunset Pond Subwatershed (2,488 acres) of the Black Dog Watershed (3,700 acres). The SP1 drainage area is 402 acres and approximately 40 percent impervious. The wetland has eight inlets on all sides. There is one outlet on the north end. The wetland is part of the City's stormwater management plan and wetland management plan. It is designated as an Improvement Class wetland and is being managed to maintain the wetland without degrading its existing functions, values, and wildlife habitat. Its functions include flood and stormwater attenuation and water quality protection. Its values include flood protection, sediment control, nutrient removal, open space, and aesthetics.

The entire shoreline is owned by the City and maintained as a natural park. A heavily-used trail circles the wetland. Invasive species (narrow-leaf cattail and reed canary grass), stormwater inflow, sediment pollution, and encroachment of natural areas by neighboring properties into the conservation easement are all disturbance concerns. Herbicide treatment and controlled burns are used as measures of weed control and management in the surrounding upland buffer. A conservation easement exists on the neighboring private properties that restrict structures and requires natural vegetation buffers.

Tracy Few and Katie Dennis

Bernie DeMaster, Kevin Nelson, Tracy Few, Katie Dennis, Matt Tyrrell, and Melody Schake

Jeff Richards

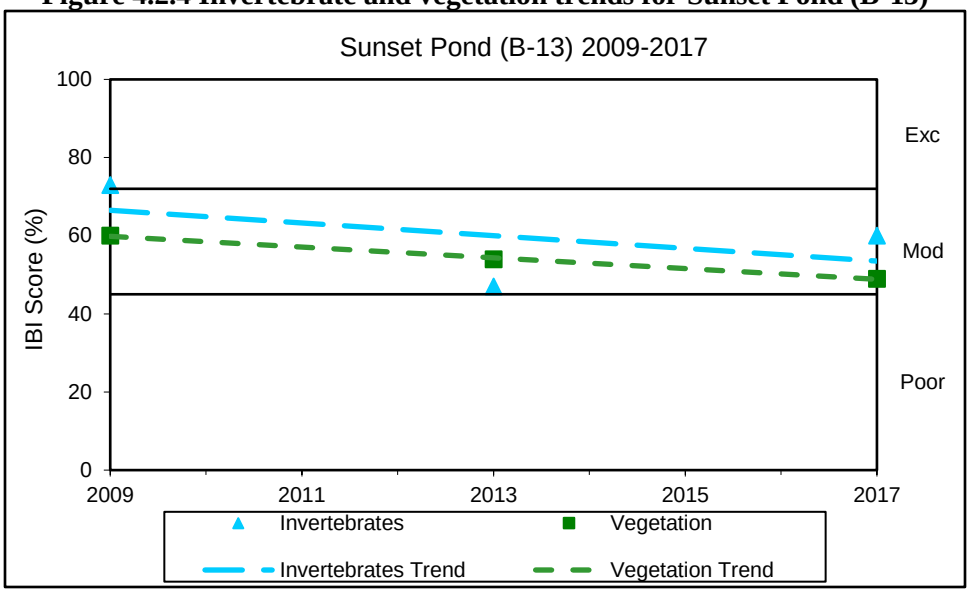
Wetland Health

Site Observations: The wetland has a gentle slope and a mucky substrate. A 10 to 30 meter wide ring of cattails surrounds the perimeter of the wetland. Coontail and duckweed dominated the vegetation; however, other submergent and emergent plants were present. Eurasian water milfoil is present, as well as purple loosestrife, reed canary grass, and Chinese and banded mystery snails. There is a restored prairie to the east of the wetland. Tadpoles were present in the bottle traps.

Table 4.2.4 Sunset Pond (B-13) Wetland Health based on Index of Biotic Integrity

2017 Data (B-13)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (17)
Trend 2009-2017	Not enough data	Not enough data

Figure 4.2.4 Invertebrate and vegetation trends for Sunset Pond (B-13)

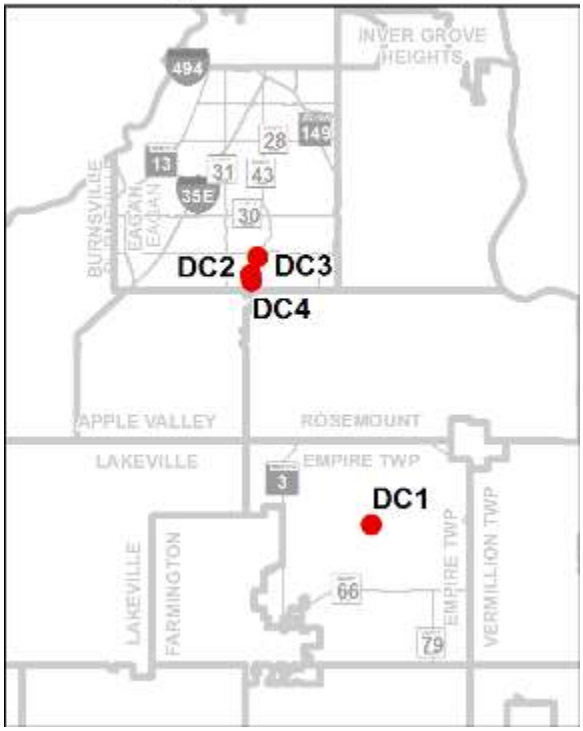


Site summary: This is the third time that Sunset Pond has been surveyed since 2009. The invertebrate and vegetation scores were inconsistent with each other; however, both scored moderate. More data is necessary to determine a reliable health trend.

4.3 Dakota County Parks Wetlands

Four wetlands were monitored for Dakota County in 2017. This is the third year that Dakota County has monitored wetlands with WHEP, and the second year that an organized WHEP team has been dedicated to monitoring these wetlands.

Dakota County WHEP Sites Monitored in 2017



Team Leaders: Bradley Ohmann

Team Members: Jim Barnett, Amy Fischer, Georg Fischer, Thomas Fischer, Taylor Karhatsu, Betsy Lehman, Mike Lynn, Lauren Meckle, Elizabeth Pribyl, Sarah Pronschinske, Noah Ricard, Rachel Ricard, John Valo, and Kaila Vogt

This is Brad's first year as a WHEP team leader for Dakota County Parks Department. He is currently enrolled as a senior at Northland College with a major in Biology. Although relatively new to WHEP, 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 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."

Meghan Manhattan with Quinn Jones

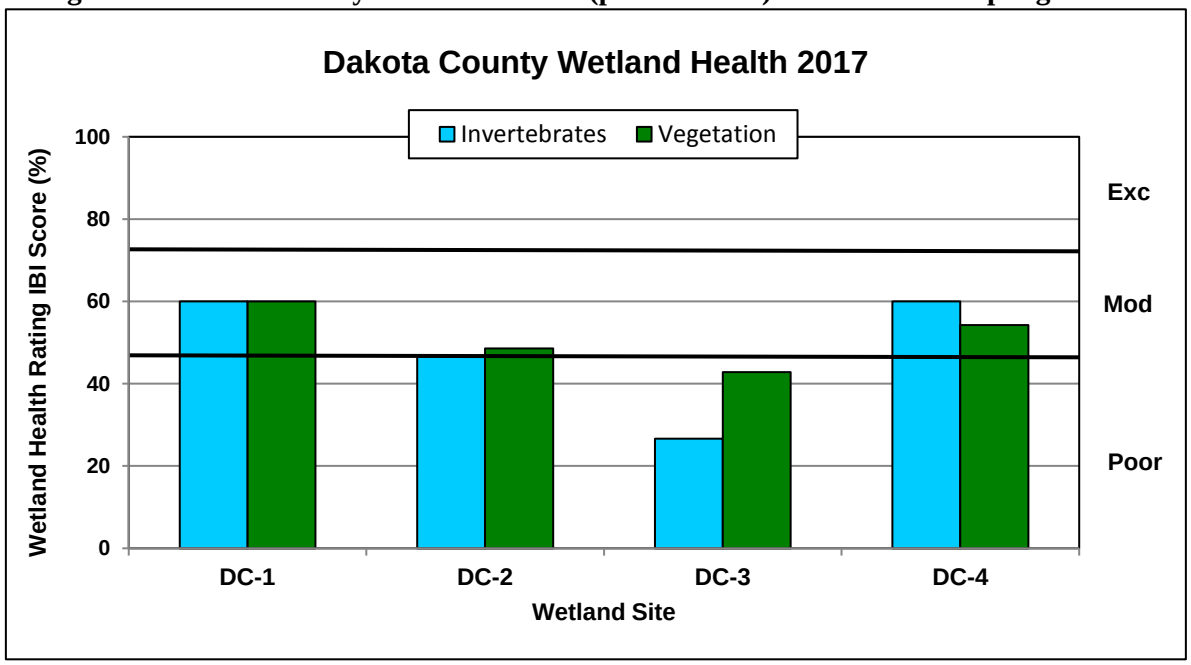
Meghan Manhattan is Dakota County Parks' WHEP contact. She said, "Dakota County Parks' mission is to enrich lives by providing high quality recreation and education opportunities in harmony with natural resource preservation and stewardship. We're currently managing over $2 million in natural resource 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 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."

Dakota County Parks General Wetland Health

Figure 4.3 presents an overall view of wetland health for all of the 2017 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 were inconsistent, differing by 16 percent.

Figure 4.3 Dakota County Parks site scores (percent form) for the 2017 sampling season



4.3.1 Empire Lake (DC-1)

Empire Lake (DC-1) is a 25.1-acre, type 5 wetland located in the Vermillion River Watershed. The subwatershed is 6 square miles and 5 percent impervious. Empire Lake is the man-made result of impounding an unnamed tributary stream to the Vermillion River. This dike was built in 1965. Some improvements have been made to the dike since the original construction. Water enters the lake on the west side via a stream channel and exits at the dike on the east.

Empire Lake is located within Whitetail Woods Regional Park. The surrounding area includes agricultural fields, natural areas, and gravel mining. The adjacent woodland is highly disturbed by invasive buckthorn. Dakota County began implementing major ecological restoration of the adjacent uplands, including buckthorn removal, in the fall of 2015 and is ongoing. 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 Whitetail Woods Regional Park addresses water quality and lake quality. A water quality survey was completed on this lake in 2009 measuring healthy phosphorus levels. Secchi disk measurements also indicate higher water clarity.

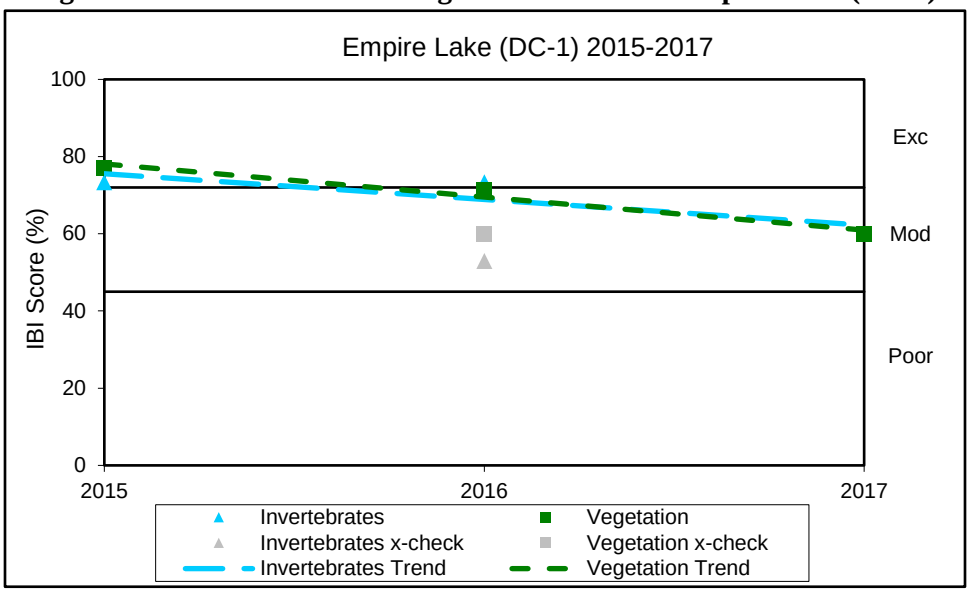
Wetland Health

Site Observations: The wetland has a gentle slope. The substrate is very mucky and difficult to walk. A lot of driftwood is present. Near the releve were many floating mats of vegetation, most of which are sedges. The wetland is within a recreational park including trails, picnic pavilions, and campsites. Farmland stretches just outside of the regional park.

Table 4.3.1 Empire Lake (DC-1) Health based on Index of Biotic Integrity

2017 Data (DC-1)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (21)
Trend 2015-2017	Not enough data	Not enough data

Figure 4.3.1 Invertebrate and vegetation trends for Empire Lake (DC-1)



Site summary: This is the third consecutive year that Empire Lake has been monitored by WHEP. The invertebrate and vegetation scores have remained consistent with each other, both scoring 60 percent. Both scores are lower than in previous years, which shows declining health trends in the short term; however, more years of monitoring is needed to determine a more reliable wetland health trends.

4.3.2 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 will continue 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.

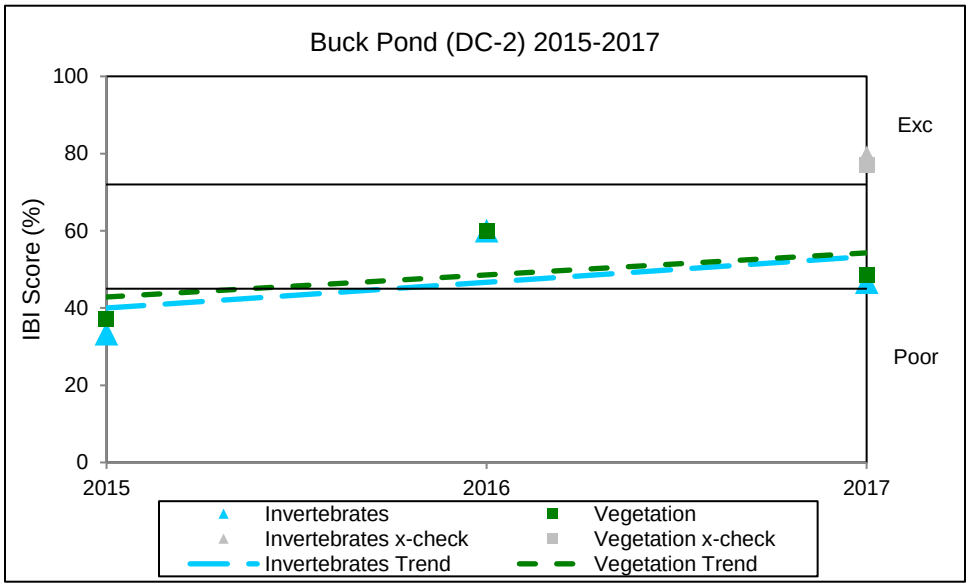
Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is solid with very little muck. Families of dragonflies, damselflies, mayflies, caddisflies, true flies, leeches, snails, and crustaceans were present. Grasses, duckweed, water-meal, and narrowleaf arrowhead dominates. Tadpoles, adult frogs, and salamanders were found in the bottle traps. One buck, three does, and one fawn were observed during a vegetation survey.

Table 4.3.2 Buck Pond (DC-2) Health based on Index of Biotic Integrity

2017 Data (DC-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (17)
Cross-check Rating (IBI score)	Excellent (24)	Excellent (27)
Trend 2015-2017	Not enough data	Not enough data

Figure 4.3.2 Invertebrate and vegetation trends for Buck Pond (DC-2)



Site summary: This is the third consecutive year that Buck Pond has been monitored by WHEP. This wetland was cross-checked by another WHEP team in 2017. Each team calculated invertebrate and vegetation scores that were consistent with each other; however, the compared invertebrate and vegetation scores between the two teams were inconsistent with each other, differing by 33 and 28 percent, respectively. The invertebrate and vegetation scores rated moderate for the City team, and excellent for the cross-check team. The short-term health trends for both invertebrates and vegetation (not including the cross-check team scores) is improving; however, more years of monitoring is needed to determine more reliable wetland health trends. The invertebrate diversity was similar for each team. The cross-check team did identify mayflies and caddisflies, though, which enhanced their invertebrates score. The vegetation species identified by the two teams were quite different. The cross-check team identified a larger diversity of species, including bladderwort.

4.3.3 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

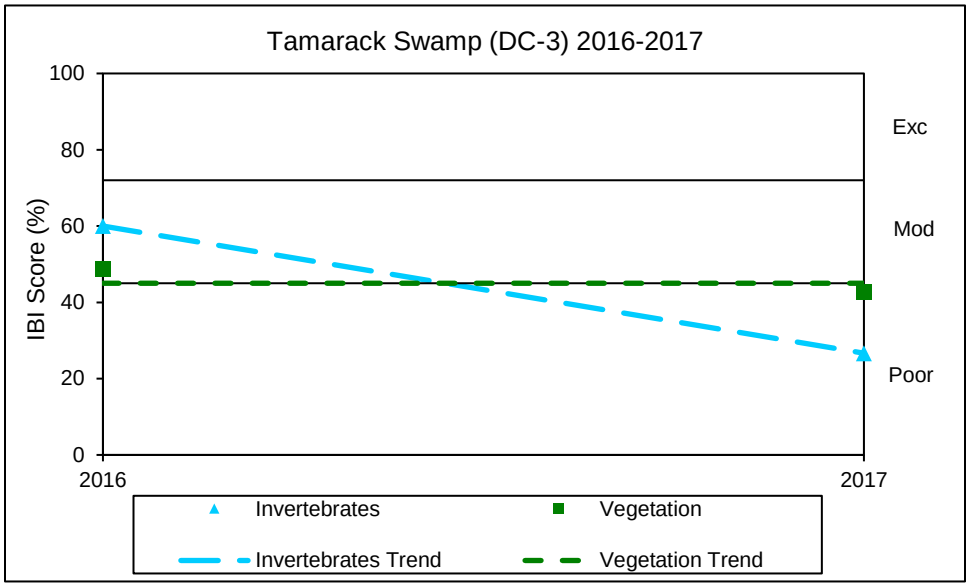
Site Observations: The wetland slope is gentle, and the wetland substrate is mucky. The wetland surface is covered in 95 percent duckweed. Horsetail, willow, three-way sedge, spike rush, arrowhead, and smartweed were also present. A large track of vegetation has recently been removed east of the wetland. A stand of trees exists west of the wetland.

Dakota County Parks team at WHEP Invertebrate Training

Table 4.3.3 Tamarack Swamp (DC-3) Health based on Index of Biotic Integrity

2017 Data (DC-3)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (8)	Poor (15)
Trend 2016-2017	Not enough data	Not enough data

Figure 4.3.3 Invertebrate and vegetation trends for Tamarack Swamp (DC-3)



Site summary: This is the second year that Tamarack Swamp has been monitored by WHEP. The invertebrate and vegetation scores were not consistent with each other, differing by 16 percent; however, they both rated poor. The vegetation score is similar to surveys taken in 2016, but the invertebrate score has declined. Only three taxa of leeches, one taxa of snails, one taxa of true flies, water boatman and other true bugs and beetles were collected from this wetland in 2017. In 2016, dragonflies and damselflies were also present, as well as more taxa of snails and true flies. Only nine species of vegetation were observed in the vegetation plot. More years of monitoring is needed to determine reliable wetland health trends.

4.3.4 Jensen Lake (DC-4)

Jensen Lake (DC-4) is a 50-acre, type 5 wetland located in the Lower Minnesota River watershed. The pond's watershed is approximately 330 acres with seven percent impervious surface. The watershed in this area of the south metro has been greatly changed/altered with the building of roads, commercial industry, and residential areas. The general water flow is still in the same direction; however, altered with the addition of Pilot Knob Road culverts and overall landscape altering. There is a culvert running under Pilot Knob Road that connects two small ponds on either side of the road. The pond adjacent to Jensen Lake was created to collect sediment, salt, and fertilizers from entering into Jensen Lake. When this pond reaches a certain depth, the excess water flows into Jensen without these contaminants. Jensen Lake drains into Sedge Pond in the northeast corner.

Historically, the land north of Jensen Lake was agriculture and pastured land. The woodland surrounding Jensen Lake was most likely grazed with cattle. The Natural Resource Department is in the process of restoring 175 acres in the surrounding adjacent acres in Lebanon Hills. The north woodland slope of Jensen Lake was identified by the MN DNR as a high quality natural community. The north and east woodlands are more degraded with invasive species like buckthorn and honeysuckle which will be removed and treated with the completion of the restoration of this area. Baseline data is wanted to monitor the change over time in this natural area as the land is restored and maintained to the proper native plant community. Dakota County would like to use the WHEP data to monitor this restoration area. Turtle surveys are also conducted

in the area. A Natural Resources System Management Plan is being completed for Dakota County, along with an individual Management Plan for Lebanon Hills Regional Park which will address water quality, lake quality, and other data.

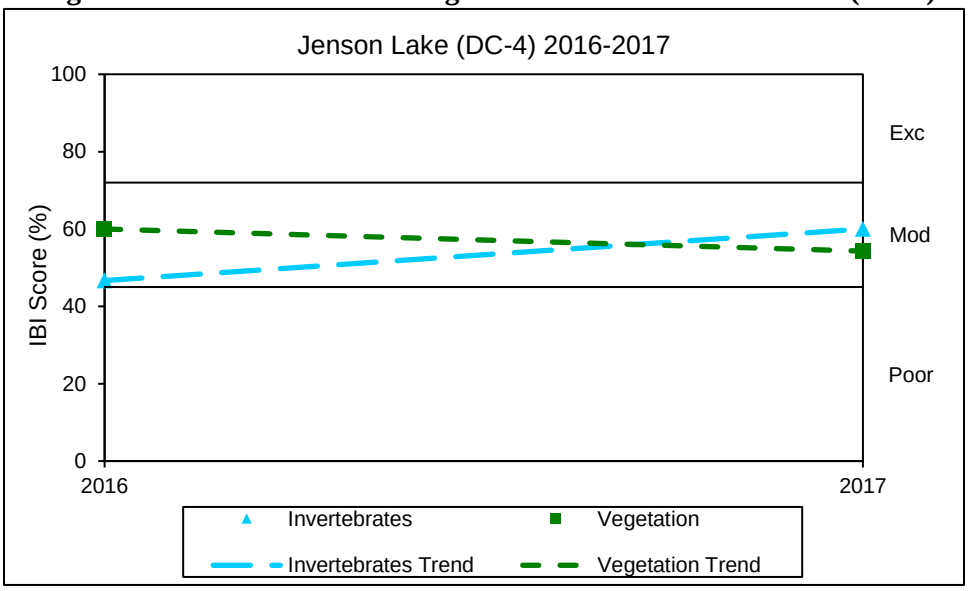
Wetland Health

Site Observations: The wetland slope is gentle, and the wetland substrate is very mucky. A boat path through the water lilies, allowing access to survey sites. Fish were present in the bottle traps. Coontail was very dense. Coontail, waterweed, white water-lily, and pondweed dominated the vegetation. Some duckweed and yellow pond-lily were present.

Table 4.3.4 Jensen Lake (DC-4) Health based on Index of Biotic Integrity

2017 Data (DC-4)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (19)
Trend 2016-2017	Not enough data	Not enough data

Figure 4.3.4 Invertebrate and vegetation trends for Jenson Lake (DC-4)



Site summary: This is the second year that Jensen Lake has been monitored by WHEP. The invertebrate and vegetation scores were inconsistent with each other, rating moderate. The invertebrate diversity is increased from 2016, improving the score. The vegetation score is similar to the 2016 score. More years of monitoring is needed to determine reliable wetland health trends.

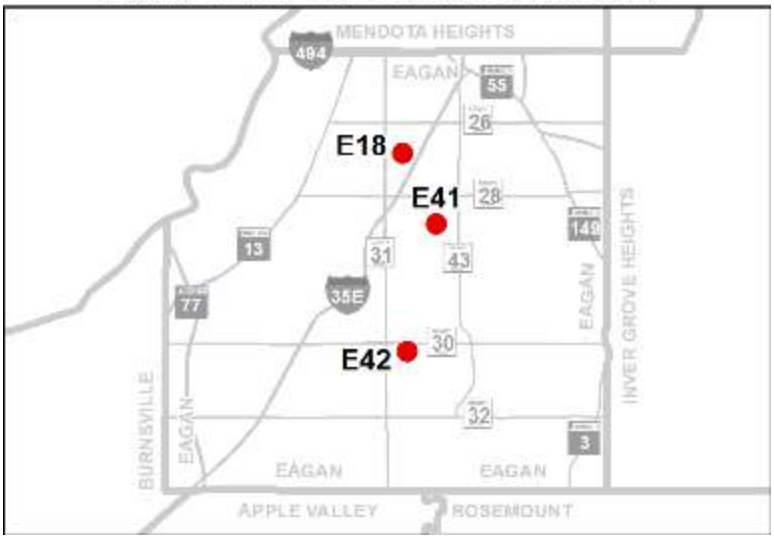
4.4 Eagan Wetlands

Three wetlands were monitored within the City of Eagan in 2017. The City has 20 years of data! Forty-one wetlands have been monitored in Eagan since the initiation of WHEP in 1997.

Team Leaders: Marianne McKeon

Team Members: Robert Giefer, Pat Graham, Craig Harnagel, Doris Ikier, Ivette Izea-Martinez, Felix Martinez-Paz, Ava McKeon, Mark Niznik, Gari Plehal, Joe Schulte, Greg Searle, and Trent Young

Eagan WHEP Sites Monitored in 2017



Marianne McKeon

Marianne McKeon has been involved in WHEP since 2007, and has been Eagan's team leader for the past seven years. She commented, "As always, I am so grateful for our citizen-scientists! They have such dedication to our work and are great company too! Of the sites we monitored in 2017, the most notable was Moonshine Pond as it had large amounts of trash. It would seem it is serving its purpose of protecting Lemay Lake."

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."

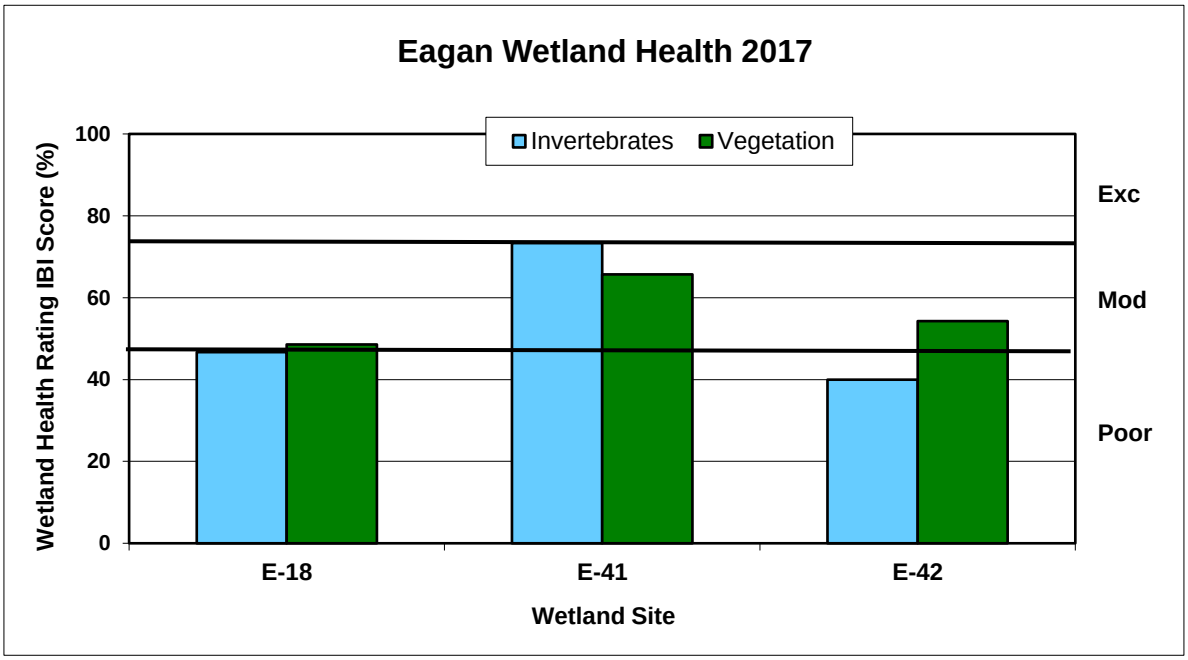
Since 1999, Eric Macbeth has managed Eagan's water resources programs that focus on protecting and improving lakes, conserving wetlands, and preventing stormwater pollution. "The City of Eagan has supported WHEP from the beginning, when we helped develop the program with Dakota County in 1997," he says. "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 2017 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 2017. The invertebrates and vegetation scores for E-42 were inconsistent, differing by 14 percent. E-18 and E-42 each rated poor for invertebrates but moderate for vegetation. Wetland site E-41 rated moderate in both categories.

Figure 4.4 Eagan site scores (percent form) for the 2017 sampling season



4.4.1 Moonshine Park Pond (E-18)

Moonshine Park Pond (E-18), also known as DP-14, is a 2.5-acre, type 3 wetland within the Eagan-Inver Grove Heights Watershed, and flows to LeMay Lake. Its watershed is 34 acres including approximately 25 percent impervious surface. There are two inlets; one in the southwest and one on the western shore. There is one outlet on the east side of the wetland. The wetland is part of the City's stormwater management plan. The City has a general wetland management plan, but no specific plans for this particular wetland. The management goal is to protect water quality in LeMay Lake. The City would like to continue to educate the public about the importance of clean stormwater.

Most of the shoreline is wooded and is located within Moonshine Park. The very north shoreline is private property. A new parking lot and play area was constructed southeast of the wetland. The wetland receives stormwater runoff from the surrounding residential areas, as well as from the new parking lot/play area. A raingarden filters water from the new parking lot/play area; however, overflow is directed into the wetland. Water lettuce (*Pistia stratiotes*), an Early Detection Target, has been found in the wetland. Water lettuce is a plant sold through aquarium and pond supply dealers. It is believed to be susceptible to hard freezes, so it may not survive Minnesota winters. It has not been observed recently. Buckthorn has been removed from the area in the recent past.

Wetland Health

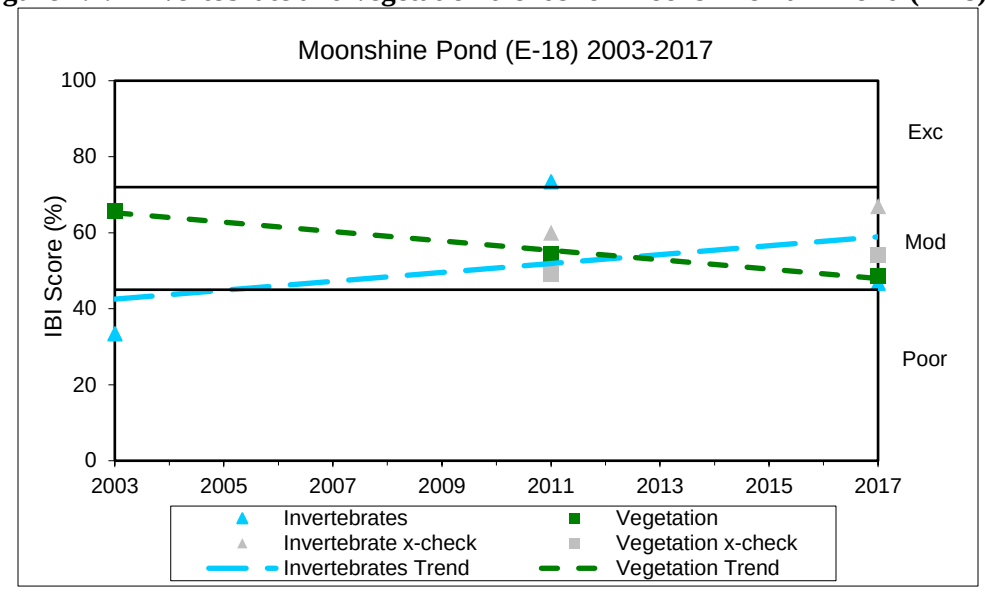
Site Observations: The wetland slope is gentle. The wetland substrate is very mucky, and the wetland is foul smelling. Mixed deciduous trees, shrubs, and vines line the shore. The wetland surface is covered with duckweed and water-meal. Reed canary grass is present.

Eagan team at
WHEP Invertebrate Training

Table 4.4.1 Moonshine Park Pond (E-18) Wetland Health based on Index of Biotic Integrity

2017 Data (E-18)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (17)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (19)
Trend 2003-2017	Not enough data	Not enough data

Figure 4.4.1 Invertebrate and vegetation trends for Moonshine Park Pond (E-18)



Site summary: This is the third time that Moonshine Park Pond has been surveyed since 2003, and the first time since 2011. This site was cross-checked by another WHEP team in 2017. The invertebrate and vegetation scores for the City team were consistent, even though the invertebrates rated poor while the vegetation rated moderate. The invertebrate and vegetation scores for the cross-check team were inconsistent, differing by 13 percent. The invertebrate scores between the two teams were not consistent, differing by 20 percent; however, the vegetation scores between the two teams were consistent. The City team noted that tadpoles and crayfish were caught in their bottle traps, and their bottle trap collection was sparse including only dragonflies. The cross-check team, however, collected leeches, beetles, true bugs, dragonflies, caddisflies, snails, and true flies in their bottle traps. Likely, the tadpoles and crayfish consumed any other invertebrates that may have been caught in the City team's bottle traps. The vegetation species identified by each team were very similar; however, the cross-check team observed a dense population of coontail while the City team did not note its existence within the plot. More years of data will determine reliable health trends.

4.4.2 O'Leary Lake (E-41)

O'Leary Lake (E-41) is a 16-acre, type 5 wetland within the Eagan-Inver Grove Heights Watershed which eventually flows to LeMay Lake. The watershed is 84 acres with approximately 40 percent impervious surface. The wetland is irregularly shaped and consists of three basins connected by narrow channels. There are six inlets around the perimeter of the wetland, and one outlet on the far eastern shoreline. The wetland is included in the City's stormwater management plan and includes a management goal to maintain a naturalized shoreline and protect the surrounding watershed from stormwater impacts. Stormwater ponds and an iron-sand filter are upstream of O'Leary Lake for water that is coming from the nearby business area.

The wetland shoreline is both publicly and privately owned. O'Leary Park includes the northern portions of the shoreline. Businesses and parking lots, as well as a new development, lies to the north of the City park. The most immediate shoreline is vegetated. The pond is very shallow (maximum depth is 4 feet). Cattails and floating leaf vegetation cover the wetland surface most of the summer.

Wetland Health

Site Observations: The survey site is on the eastern shoreline of the western basin. The wetland slope is gentle. The wetland substrate is in between solid and mucky. Several species of leeches, dragonflies, damselflies, mayflies, caddisflies, snails, and true flies were present. Coontail and white water-lily dominated the vegetation plots. Reed canary grass is present.

Table 4.4.2 O'Leary Lake (E-41) Wetland Health based on Index of Biotic Integrity

2017 Data (E-41)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (23)
Trend 2017	Not enough data	Not enough data

Site summary: This is the first time that O'Leary Lake has been surveyed. Invertebrate and vegetation scores were consistent, and both rated moderate. More years of data will help determine reliable health trends.

4.4.3 Pond LP-44 (E-42)

Pond LP-44 (E-42) is a 2.4-acre, type 4 wetland is within the Eagan-Inver Grove Heights Watershed. The wetland watershed is 46 acres and approximately 30 percent impervious. There are three inlets; one on the north shore, one on the west shore, and one on the south-southwest shore. There is one outlet at the farthest southern point which flows to Carlson Lake. The wetland is part of the City's stormwater management plan. The City has a general wetland management plan that includes protecting water quality in Carlson Lake. The City has increased street sweepings in the area to protect Carlson Lake.

The wetland is completely surrounded by private residential properties. Access to the wetland is limited by private fences. Shoreline maintenance varies between completely manicured lawns to vegetative shoreline buffers. Some residents have installed native shoreline vegetation along their shorelines. There is approximately 30 percent tree cover around the wetland shoreline. Reed canary grass, curlyleaf pondweed, and, possibly goldfish are present in the wetland. The wetland has received alum treatments in the past.

Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is in between solid and mucky. Cattail has been cut back around the wetland.

Table 4.4.3 LP-44 (E-42) Wetland Health based on Index of Biotic Integrity

2017 Data (E-42)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (12)	Moderate (19)
Trend 2017	Not enough data	Not enough data

Site summary: This is the first year that LP-44 has been surveyed. The invertebrate and vegetation scores were inconsistent with each other, differing by 14 percent. Fish were present in the bottle traps and may have affected the invertebrate diversity. The wetland was dominated by coontail; however, many other species of emergent vegetation are represented in small quantity. More years of data will determine reliable health trends.

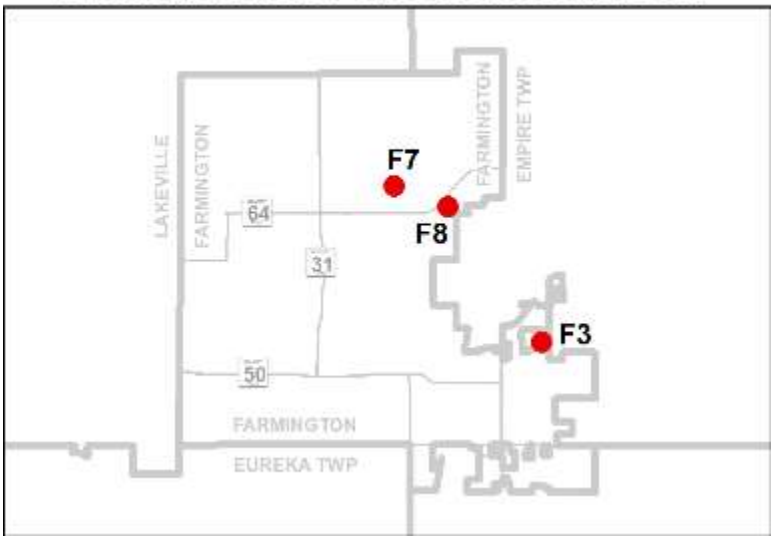
4.5 Farmington Wetlands

Three wetlands were monitored within the City of Farmington in 2017. The City has 20 years of data! Eight wetlands have been monitored in Farmington since the initiation of WHEP in 1997.

Team Leader:
Rick Schuldt

Team Members: Rollie Greeno, Josiah Hakala, Ben Letourneau, Bridget Middleton, and Marcia Richter

Farmington WHEP Sites Monitored in 2017



Rick Schuldt

Rick Schuldt has been involved with the Farmington WHEP team since 2010. This was his second year as Team Leader. He assumed leadership of the Farmington Team last year following Katie Koch-Laveen's retirement. He admitted, "the Farmington team is small, but regular participation by a core of the members allowed for timely gathering and processing of the data. Team members include several retired high school teachers and others with a strong background in scientific sampling procedures. Each member brings unique skills to the team and volunteering of their time is greatly appreciated. This year we

coordinated processing of invertebrate samples with the Apple Valley Team at the Apple High School labs. This worked well for sharing of information, expertise, and equipment."

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 the switch to small wetlands to learn about a different suite of organisms and plants and to follow their changes from year to year.

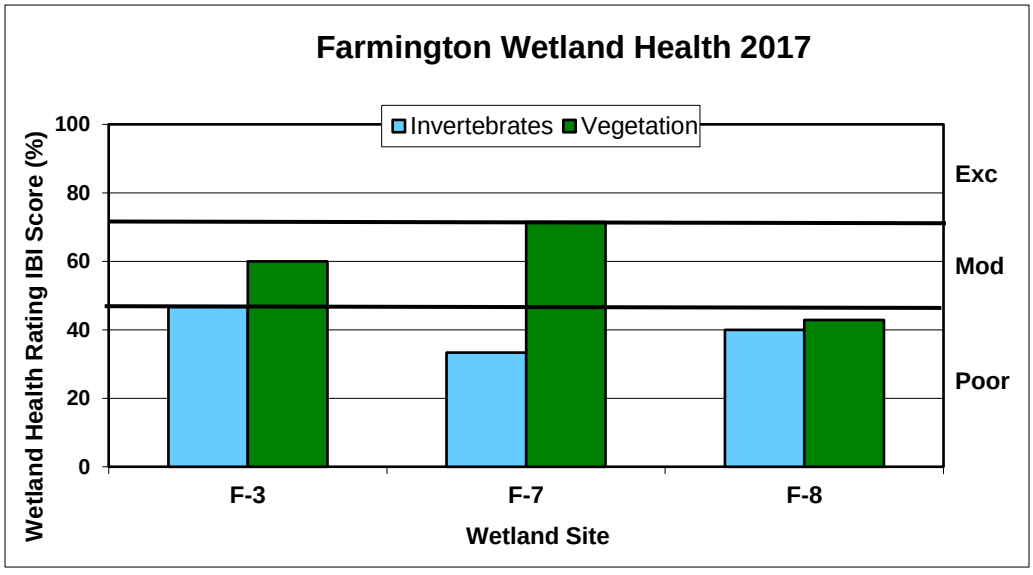
Jen Dullum

Jennifer Dullum has administered the WHEP program for the City of Farmington since 2003. The role of the City is to determine the wetlands to be monitored, provide administrative support to the volunteers, review of the data collected and publicize the program through local media sources. She says, "The WHEP program is important to the City in comparing past data to see changes occurring within the wetland system as development increases in Farmington. WHEP volunteers are extremely dedicated and all their hard work is appreciated and a value to the City. Because of the volunteers, wetland health is monitored at a much higher level than it would be without their assistance." Jen decided to change career paths in April departing the City, but left a well-run program for her predecessor. Katy Gehler, Public Works Director, has served the administrative role in the interim.

Farmington General Wetland Health

Figure 4.5 presents an overall view of wetland health for all of the 2017 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-7, differing by 13 and 38 percent, respectively. Invertebrates rated poor in all three wetlands. Vegetation rated poor for wetland F-8, and rated moderate for wetland F-3 and F-7.

Figure 4.5 Farmington site scores (percent) for the 2017 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 housing and agriculture impact the man-made wetlands.

Wetland Health

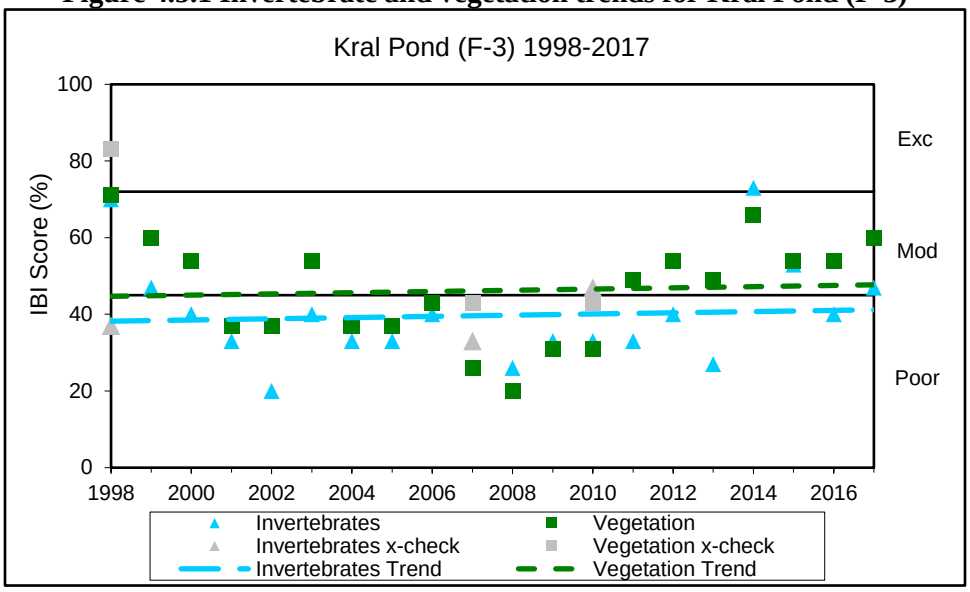
Rick Schuldt, Josiah Hakala, and Bridgit Middleton work with the West St Paul team at the WHEP invertebrate training

Site Observations: The wetland slope is gentle. The wetland substrate is firm. This is a large wetland with extensive stands of cattail. There is an abundance of filamentous green algae along the cattails. 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**.** Eurasian water-milfoil and reed canary grass are present. Green frogs were heard.

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

2017 Data (F-3)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Moderate (21)
Trend 1998-2017	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 20 consecutive years. The invertebrate and vegetation scores were inconsistent again in 2017, differing by 13 percent. Invertebrates received a poor health score while vegetation received a moderate health score. In 2017, very few macroinvertebrates were found in the bottle traps, but fish were collected. Dragonflies, mayflies, snails, and crustaceans were collected by dipnets. A dense and diverse population of submergent vegetation was present, including bladderwort. The data throughout the years has been variable; gradually decreasing from 1998 to 2008 and then improving from 2008 to 2017. 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. 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.

Wetland Health

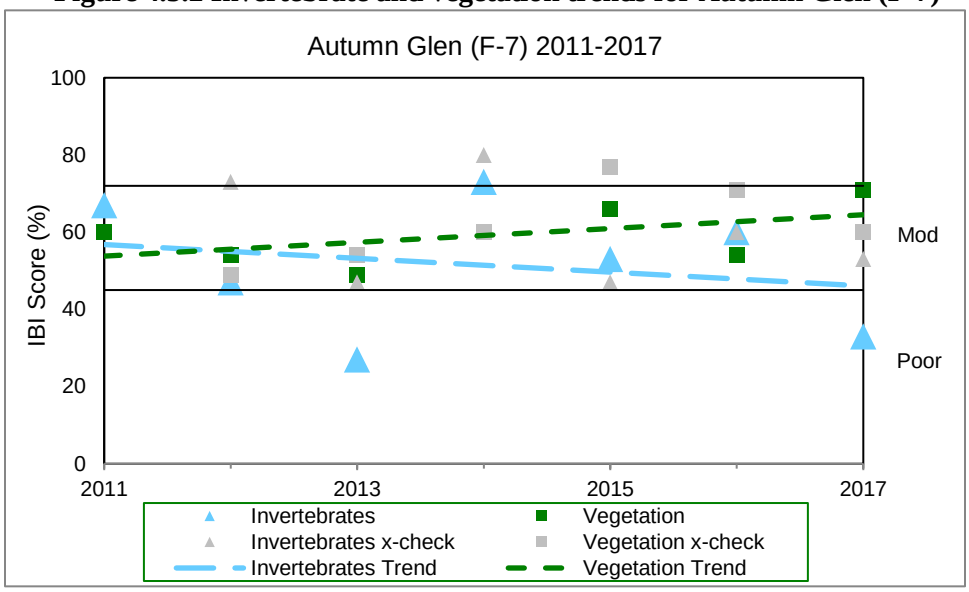
Josiah Hakala, Marcia Richter, Ben Letourneau, Rick Schuldt, and Rollie Greeno

Site Observations: The wetland slope is gentle, and the substrate is moderately mucky. Reed canary grass surrounds the wetland. Low water has made monitoring challenging in past years, but frequent rains this year maintained suitable water levels. Spike-rush, bulrush, coontail, bladderwort, duckweed, water-meal, and bur-reed were present. Snails and leeches are abundant. The wetland is natural and secluded. A bicycle path runs along the south side of the wetland separated by a wide stand of reed canary grass. The site provides ideal breeding habitat for frogs and attracts hungry egrets and great blue herons. Frogs, dragonflies, and water fowl observed. The City team sampled two weeks later this year.

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

2017 Data (F-7)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (10)	Moderate (25)
Cross-check Rating (IBI score)	Moderate (16)	Moderate (21)
Trend 2011-2017	Variable	Improving

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



Site Summary: This is the seventh consecutive year that Autumn Glen has been monitored. This wetland was cross-checked by another WHEP team in 2017. The invertebrate and vegetation scores surveyed by the City team were not consistent with each other, differing by 38 percent. The invertebrate rated poor and

the vegetation rated moderate. The invertebrate and vegetation scores surveyed by the cross-check team were consistent, though, both rating moderate. In 2017, the vegetation scores between the City team and the cross-check team were consistent, but the invertebrate scores were not. The City team and cross-check team found very similar plant species; however, the City team identified sedges which improved their vegetation score. Each of the teams found an abundance of leeches, bugs, and beetles in the bottle traps. One species of snail and one species of truefly were the only other species of invertebrate collected by the City team in 2017. The cross-check team collected dragonflies, caddisflies, and multiple snail and truefly taxa. Both teams commented that tadpoles were present in the bottle traps. Fortin Consulting also completed a vegetation survey in Autumn Glen in 2017. FCI observed similar plant species as the City team, and calculated an identical vegetation health score. The vegetation trend appears to be improving. The invertebrate scores are variable, but the trend appears to be declining slightly.

4.5.3 Mystic Meadows (F-8)

Mystic Meadows (F-8) is a 6.2-acre, type 2 wetland within the Vermillion River Watershed. The wetland drainage area is 8.2 acres and flows north to North Creek. There is one inlet on the southwest corner of the wetland. There is one outlet in the southeast corner and one outlet in the northeast corner of the wetland.

Mystic Meadows wetland is a created wetland which accompanied a City road construction project. The wetland is being managed to better understand the dynamics of a created wetland and actively managed upland prairie. There is development to the south and agriculture to the north. Wetland buffers are in place.

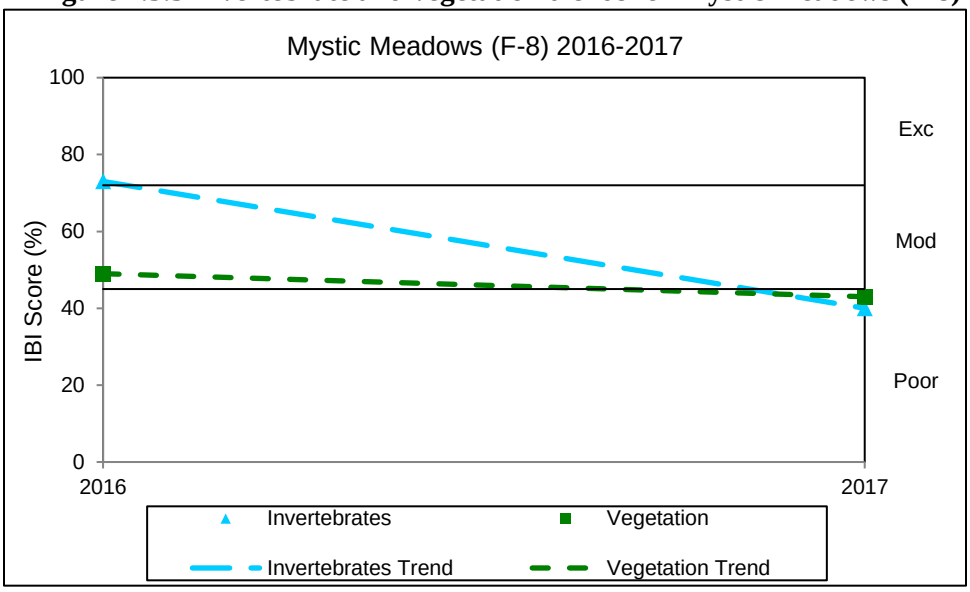
Wetland Health

Site Observations: The sampling site is in a circle of open water at the center of the wetland, surrounded by cattails. The team commented, "the hike in through the cattails is a real adventure. This year we were surprised by a neighbor who flew his drone overhead documenting our trek into the site. He filmed our adventure and we await its showing on one of those survival episodes on TV. We were disappointed with our survey this year as neither plants nor invertebrates fared as well. Toad tadpoles were extremely abundant this year and their decaying black bodies filled the bottle traps. We also captured brook sticklebacks in the traps and observed a large snapping turtle. Since the site is surrounded by cattails, there is no opportunity in the vegetation surveys to collect common shoreline plants."

Table 4.5.3 Mystic Meadows (F-8) Wetland Health based on Index of Biotic Integrity

2017 Data (F-8)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (12)	Poor (15)
Trend 2016-2017	Not enough data	Not enough data

Figure 4.5.3 Invertebrate and vegetation trends for Mystic Meadows (F-8)



Site Summary: This is the second time that Mystic Meadows has been surveyed. Invertebrate and vegetation scores were consistent with each other, both rating poor health. Muskgrass, duckweed, and water-meal dominated the vegetation community. Only six species of vegetation were present in the vegetation plot. The vegetation data is similar to 2016. The team commented that the dense stand of cattails deprives the vegetation plot from emergent and grasslike vegetation. Leeches, snails, dragonflies, and scuds were collected in the dipnets. Tadpoles and fish were present in the bottle traps. The invertebrate score declined. In 2016, the invertebrate collection included multiple taxa of leeches and dragonflies, which enhanced the diversity and health score.

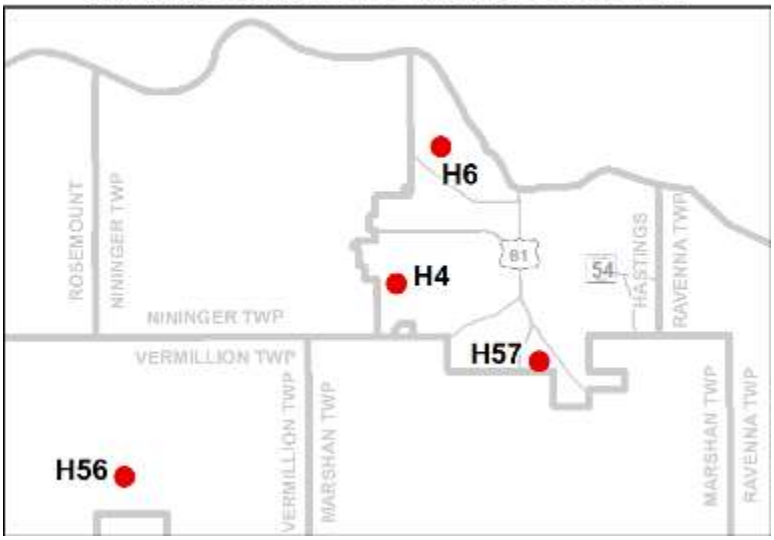
4.6 Hastings Wetlands

Four wetlands were monitored within the City of Hastings in 2017. The City has 19 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: Cody Dalrymple, Alex Franzen, Sue Gerlach, Brian Huberty, Mike Nelson, and Dwight Smith

Hastings WHEP Sites Monitored in 2017



Jessie Eckroad

This was Jessie Eckroad's third year as a WHEP team leader. She wrote, "I joined WHEP in the Spring of 2015 with the intent to gain experience as a leader and scientist, and although field sessions and lab ID work were incredibly fascinating and educational, I found that my favorite part of WHEP was the amazing group of people I am privileged to call my team and my friends. Because of their incredible patience, dedication, experience, and support, I transformed from an apprehensive rookie into a confident, knowledgeable, fun-loving leader. This summer, it was great to build on the relationships I formed with my team mates in past years, and we made many great memories this season!"

John Caven

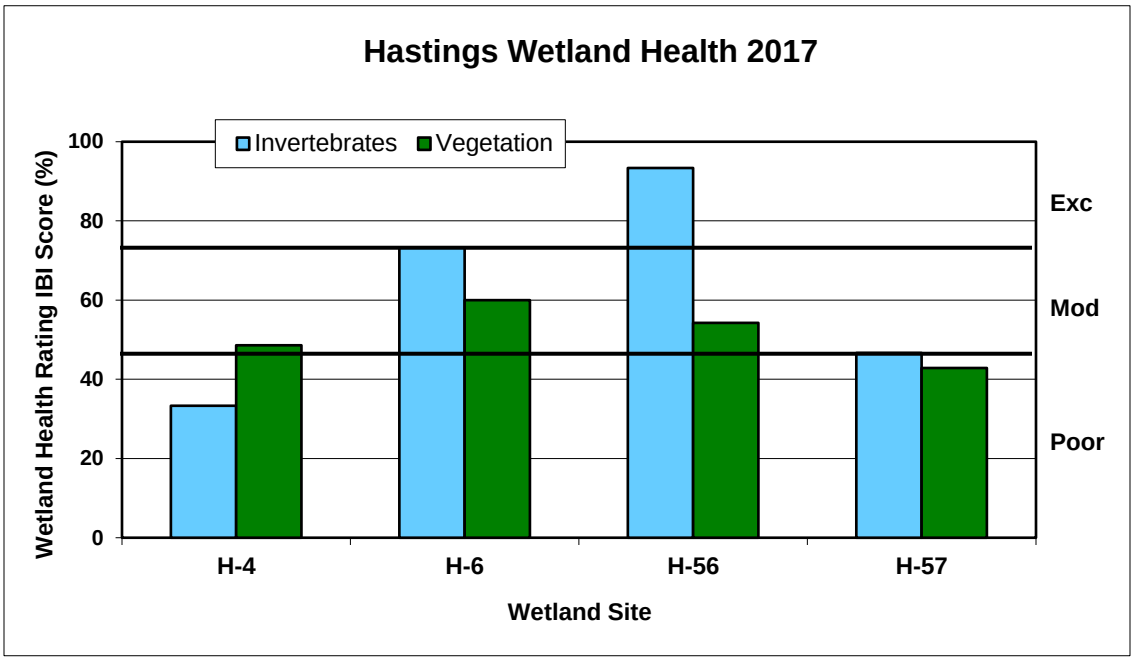
John Caven is the Assistant City Engineer for the City of Hastings. He has been the WHEP City contact and administrator since 2010. His role includes selecting the wetlands to be monitored as well as being a communication link for the City. He said, "The City really appreciates the volunteer's hours of hard work. The data collected provides the City a biological snapshot of the health of area ponds. Through time, the City can see how surrounding land management practices affect a local ponding basin."

Hastings General Wetland Health

Hastings team at
WHEP Invertebrate Training

Figure 4.6 presents an overall view of wetland health for all of the 2017 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 2017. Invertebrate and vegetation scores for H-4, H-6, and H-56 were inconsistent, differing by 16, 13, and 39 percent, respectively. H-56 scored excellent for invertebrates.

Figure 4.6 Hastings site scores (percent) for the 2017 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 with a goal 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.

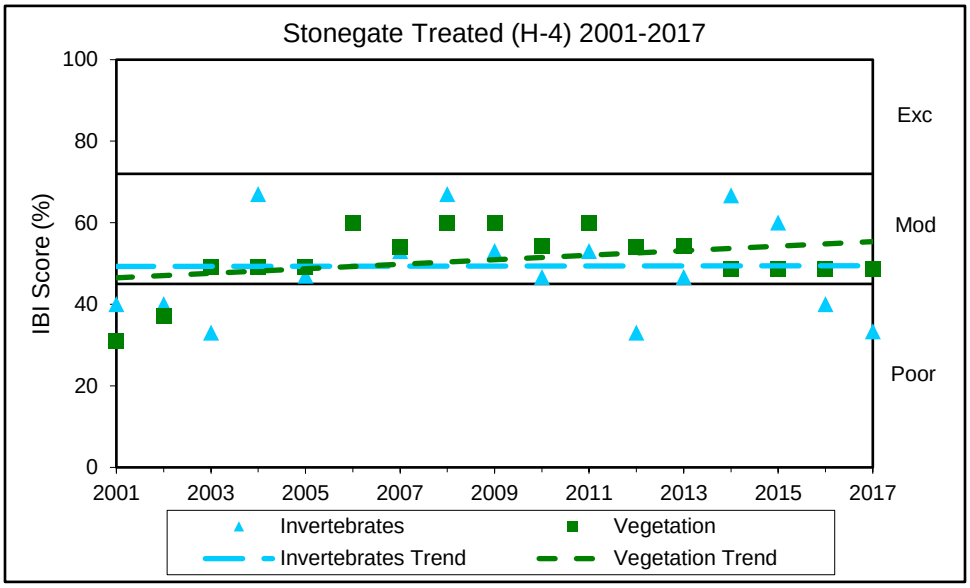
Wetland Health

Site Observations: The wetland slope is moderate. The substrate is very mucky. The cattail population is very dense. Willows overhang the sample area. There was no submergent vegeation present in the vegetation plot; however, curly leaf pondweed was noted during the invertebrate sampling.

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

2017 Data (H-4)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (10)	Moderate (17)
Trend 2001-2017	Variable, but stable	Stable

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



Site summary: This is the seventeenth consecutive year that Stonegate Treated has been surveyed. The invertebrates and vegetation scores were inconsistent in 2017, differing by 16 percent. The invertebrates rated poor, while the vegetation rated moderate. The vegetation trend analysis indicates that wetland health is gradually improving; although it has been fairly stable remaining in the moderate category since the poor scores found in 2001 and 2002. Despite only a few individual plants of each recorded species, the vegetation health rated moderate. Since 2014, the vegetation health has received the same score. The plant community has been similar in all four years with slight variability of emergent forbs. The invertebrate data varies from year to year; however, the trend analysis indicates stable invertebrate health. The invertebrate health has scored poor the past two years. Fish were present in the bottle traps and may have impacted the invertebrate diversity. In addition, there was little to no submergent plants present to provide habitat in the sampling area.

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.

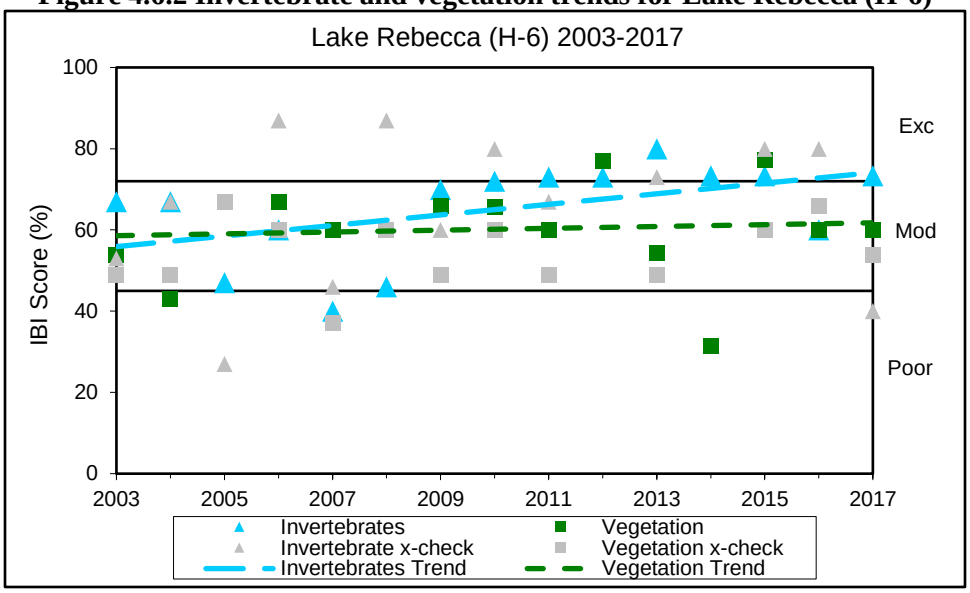
Wetland Health

Site Observations: 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 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. Water has algae on the surface. There is a small fringe of cattails and a ring of reed canary grass. Eagles and great blue Herons were observed.

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

2017 Data (H-6)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (21)
Cross-check Rating (IBI score)	Poor (12)	Moderate (19)
Trend 2003-2017	Improving	Variable, stable

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



Site summary: This is the fifteenth consecutive year of monitoring for Lake Rebecca. There was a lot of variability in the invertebrate data prior to 2009; however, since then, the invertebrate health has remained stable and the long term trend appears to be improving for invertebrates. The vegetation data is still variable; however, the long term trend appears stable. The vegetation scores were the same in 2016 and 2017. This wetland was cross-checked by another WHEP team in 2017. The invertebrate and vegetation scores were not consistent for the City team, differing by 13 percent. The scores of the cross-check team were also inconsistent, differing by 14 percent. The invertebrate scores compared between the teams were inconsistent, differing by 33 percent. The City team calculated higher invertebrate and vegetation scores than the cross-check team. The City team collected a larger diversity of invertebrates, including multiple species of dragonflies, caddisflies, snails, and trueflies. There was only one water boatman and two beetles caught in the cross-check team's bottle traps. The vegetation species present in each team plot were similar.

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.

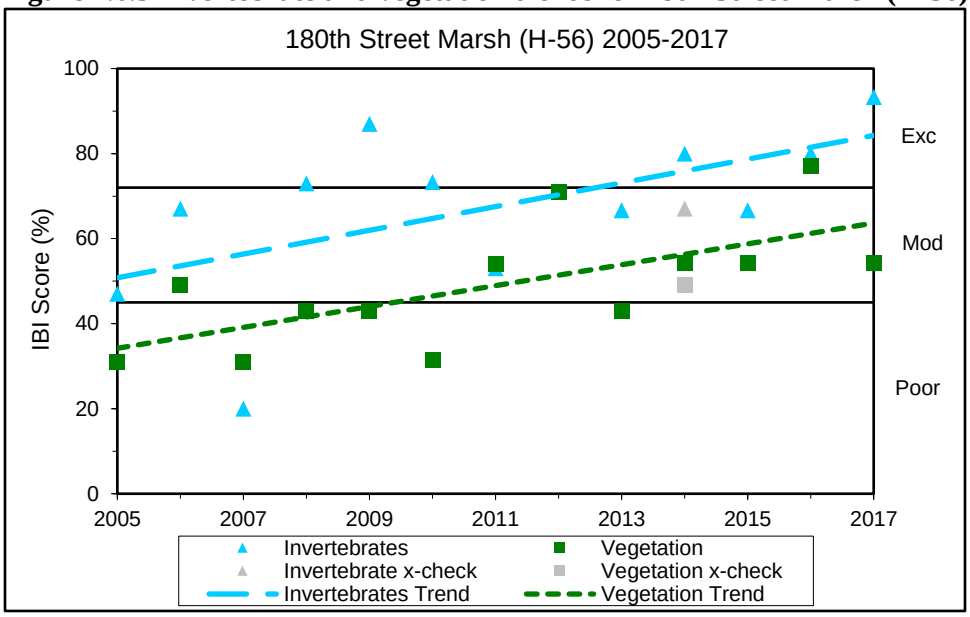
Wetland Health

Site Observations: The wetland slope is moderate. The wetland substrate is somewhat solid, but not rocky, with matted vegetation. Reed canary grass and cattail dominate the shoreline. Other emergent and submergent forbs are present in deeper water. Tadpoles were present in bottle traps. Water was very high in 2017, connecting the adjacent ponds.

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

2017 Data (H-56)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (28)	Moderate (19)
Trend 2005-2017	Improving	Variable, but improving

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



Site summary: This is the thirteenth consecutive year that H-56 has been monitored. Both the invertebrate and vegetation data are variable from year to year; however, both trends appear to be increasing. The invertebrate score in 2017 is the highest for this wetland over all the years of monitoring. The vegetation score is lower in 2017 than in 2016; however, vegetation scored the same as in 2014 and 2015. Invertebrate and vegetation data were not consistent in 2017, differing by 39 percent. Multiple species of dragonflies, damselflies, mayflies, caddisflies, leeches, snails, and trueflies were present. Reed canary grass dominated the emergent plant community. Coontail, pondweed, duckweed, and arrowhead dominated the submergent and floating leaved forb communities. Bulrush, bur-reed, waterweed, and water-meal were also present.

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.

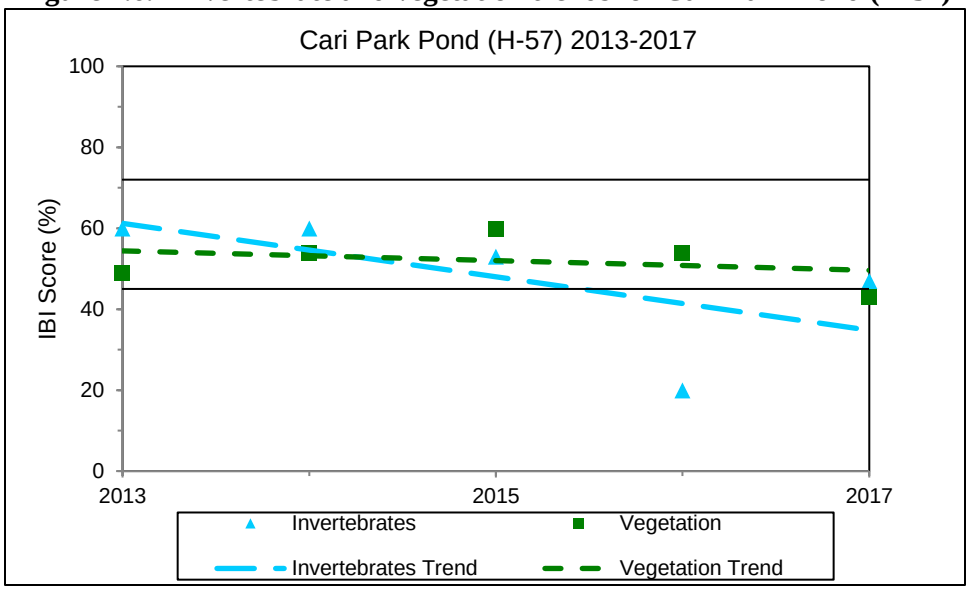
Wetland Health

Site Observations: The wetland is surrounded by residential homes, and a nearby park. The wetland substrate is very mucky, and the slope is moderate. Tadpoles and fish were present in the bottle traps. Trees overhang portions of the wetland shoreline. Grasslike plants dominated the vegetation, and little to no submergent vegetation were present. There was a lot of trash and the wetland was smelly (similar notes in 2016 and 2017). Mallards were observed.

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

2017 Data (H-57)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Poor (14)	Poor (15)
Trend 2013-2017	Variable	Stable

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



Site summary: This is the fifth consecutive year that Cari Park Pond has been monitored. The vegetation and invertebrate scores were consistent with each other in 2017. The vegetation rating dropped just below moderate; however, the vegetation trend is remaining stable over the five years of surveys. The invertebrate health rated moderate in 2017. Except for a large drop in score in 2016, the invertebrate scores have remained stable. Additional years of data will help determine more reliable health trends. Multiple species of leeches, snails, and trueflies were collected. The invertebrate make-up was different in 2017 than 2016.

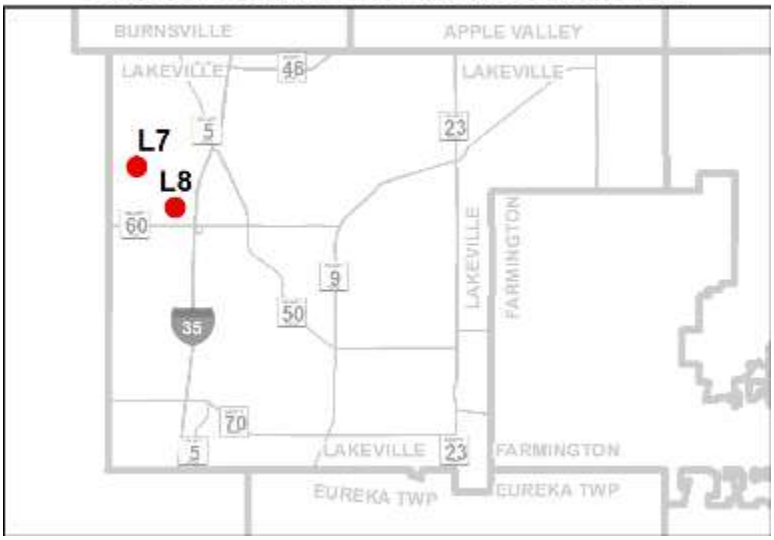
4.7 Lakeville Wetlands

Two wetlands were monitored within the City of Lakeville in 2017. The City has 20 years of data! Ten wetlands have been sampled in the City of Lakeville through the WHEP program since 1998.

Team Leader: Steve Weston

Team Members: David Collins, David Leard, Dominique Menard, Shelby Richard, and Emily Smith

Lakeville WHEP Sites Monitored in 2017



Steve Weston

Steve Weston has participated in WHEP for over 15 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."

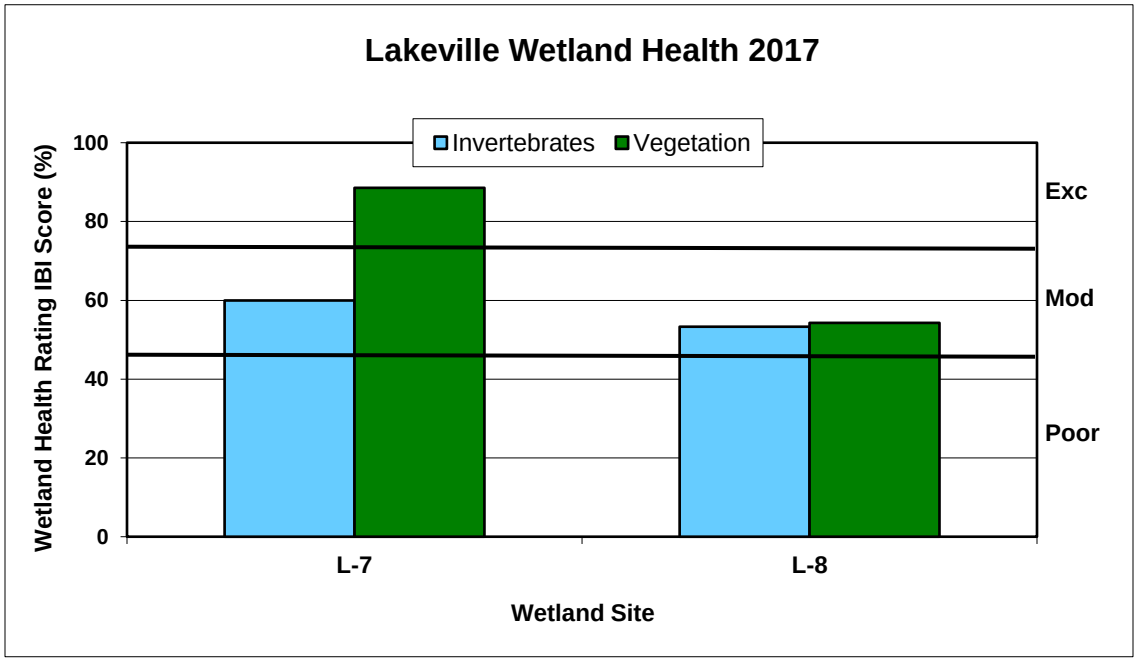
Ann Messerschmidt

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 2017 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. L-7 scored moderate invertebrate health and excellent vegetation health. L-8 scored moderate health for both invertebrates and vegetation. Invertebrate and vegetation data for site L-7 were inconsistent, differing by 29 percent.

Figure 4.7 Lakeville site scores (percent) for the 2017 sampling season



4.7.1 DNR Wetland #387 (L-7)

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

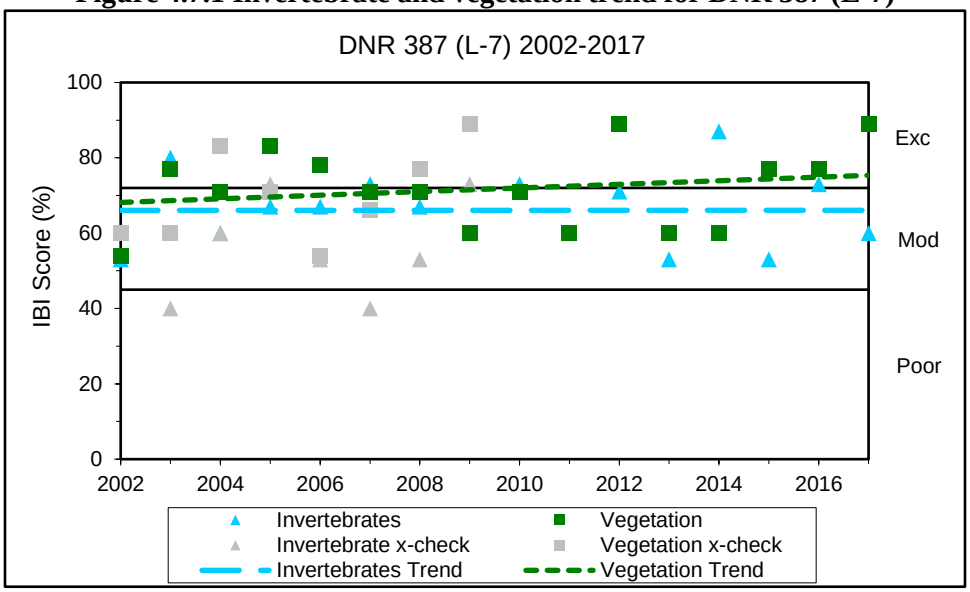
Lakeville and North Cannon River at WHEP Invertebrate Training

Site Observations: The slope is gentle and the substrate muddy. The wetland is dominated by cattails, although the area around the site is quite diverse in vegetation including sedges, bulrush, bladderwort, arrowhead, water plantain, and duckweed. Invasive purple loosestrife and reed canary grass are present. Leaves of the Purple Loosestrife show significant damage from biological control insects that were introduced to control this exotic invasive.

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

2017 Data (L-7)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Excellent (31)
Trend 2002-2017	Variable but stable	Variable but stable

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



Site summary: This is the sixteenth consecutive year that DNR 387 has been monitored. The invertebrate and vegetation scores are both variable throughout the years. The vegetation scores remain moderate to excellent while the invertebrate scores fluctuate from poor to moderate to excellent. In 2017, the invertebrate and vegetation scores were inconsistent, differing by 29 percent. The vegetation scored excellent health while the invertebrates scored moderate health. Both categories indicate variable, yet stable health trends. Many species of emergent grasslike plants and forbs, submergent forbs, and floating leaved forbs were present. Leeches, dragonflies, damselflies, snails, and trueflies were present.

4.7.2 DNR #393 (L-8)

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.

Wetland Health

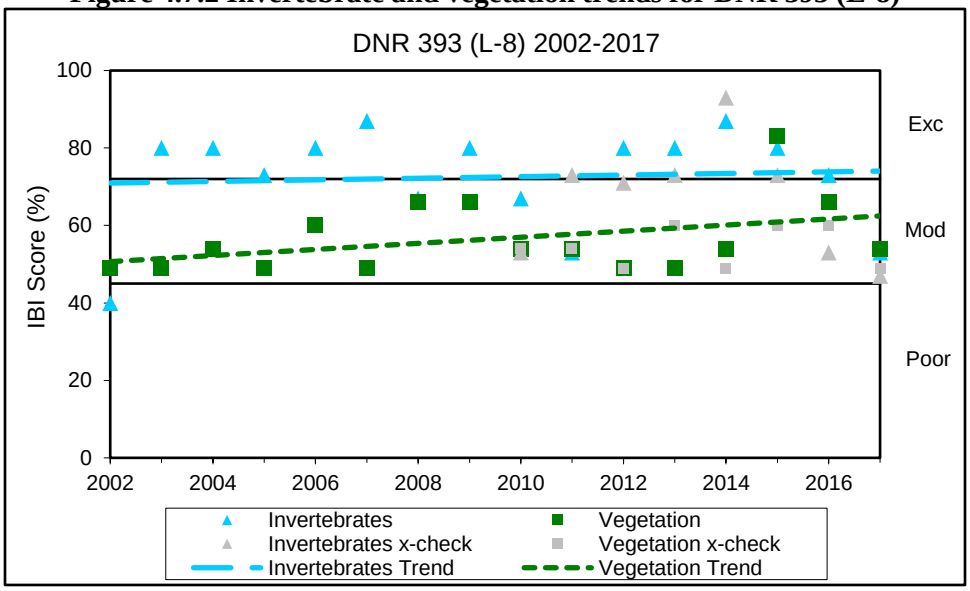
Site Observations: The wetland slope is gentle at the shoreline, but moderate in the water. The substrate is solid, but covered with some mud. Willows and aspens grow near the water. Dense populations of

submergent vegetation are present, including coontail, pondweed, and water-milfoil. Several grasslike emergent plants are also present, including multiple varieties of rush, and reed canary grass.

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

2017 Data (L-8)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (19)
Cross-check Rating (IBI score)	Poor (14)	Moderate (17)
Trend 2002-2017	Stable	Improving

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



Site summary: DNR 393 has been monitored sixteen consecutive years. This wetland was cross-checked by another WHEP team in 2017. The invertebrate and vegetation scores were consistent with each other for both teams' data. The invertebrates score has maintained an excellent rating for most years of monitoring; however, in 2017, the invertebrates score dropped to moderate. Fewer taxa of invertebrates were identified in 2017 than in the past. The invertebrates trend remains stable, though. The vegetation score has been variable throughout the years; however, the vegetation health trend shows improvement. The City scores and cross-check scores were consistent with each other for both invertebrates and vegetation; however, the City team calculated higher invertebrate and vegetation scores than the cross-check team. Though neither team found an abundance of beetles and bugs in their bottle traps, the cross-check team did find a higher percentage of water boatman which lowered their Corixid Proportion Metric Score. The teams identified very similar vegetation species.

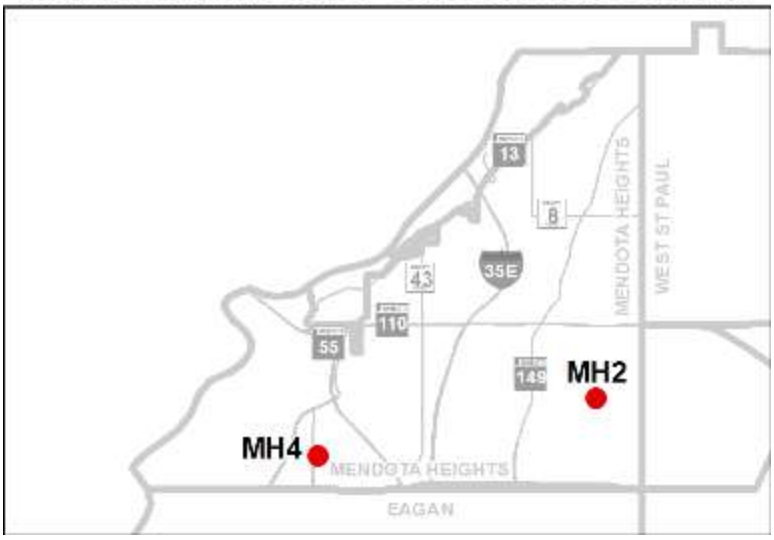
4.8 Mendota Heights Wetlands

Two wetlands were monitored within the City of Mendota Heights, in 2017. The City has 20 years of WHEP data! Seventeen wetlands have been monitored in Mendota Heights since the start of the WHEP program.

Team Leader:
Darcy Tatham

Team Members: Devor Barton, John Bottomley, Nancy Brandes, James Chastek, Alison Hruby, Jessica Larson, Randall Mateo, Rachel Quick, Marjorie Savage, Michelle Skog, Mary Stade, Anneliese Tatham, and Allyson Tenold

Mendota Heights WHEP Sites Monitored in 2017



Darcy Tatham

Mendota Heights' team leader, Darcy Tatham, has been part of the WHEP for more than 17 years. She remarked, "I enjoyed another year monitoring the wetlands. I like seeing how the ponds change over time. Copperfield, being our reference site, is a prime example since it has been monitored every year for several years. Whether the change is a natural progression, or influenced by human activity or by weather/climate changes, there is always change. Thank you to my wonderful crew of volunteers, both seasoned and new. I remember only one instance of someone getting water in their waders. Thank you also to Ryan at the City for his support and confidence in what we are doing. It was another successful year!

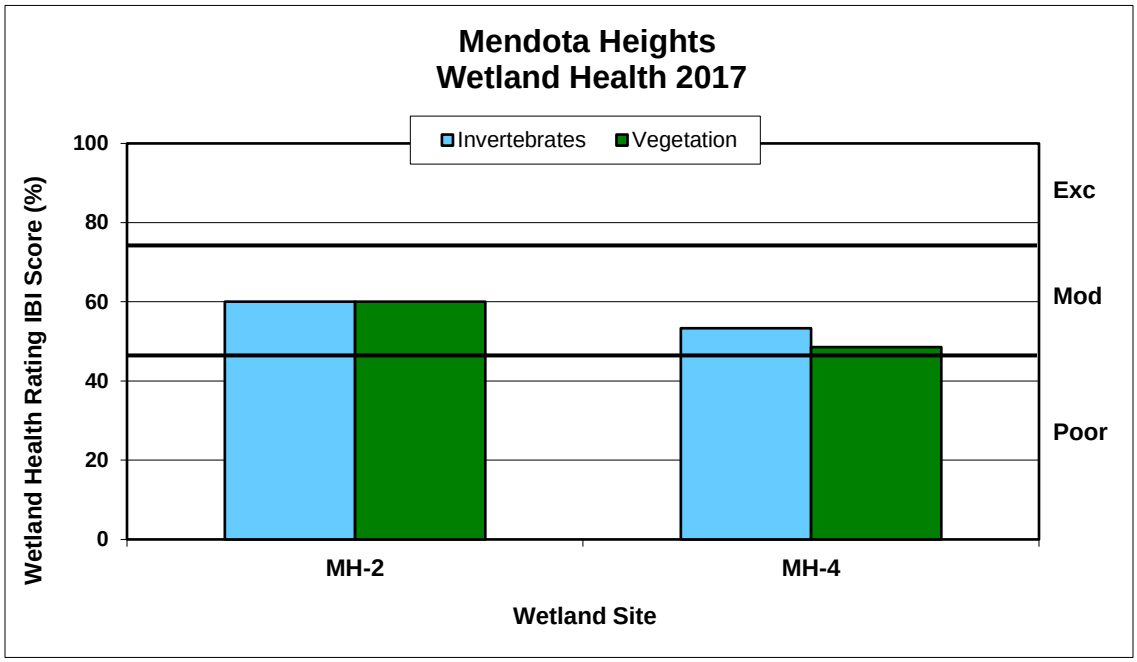
Ryan Ruzek

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 2017 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 2017. Invertebrate and vegetation scores were consistent with each other for both sites, all categories rating moderate for each site.

Figure 4.8 Mendota Heights' site scores (percent) for the 2017 sampling season



4.8.1 Copperfield (MH-2)

Copperfield (MH-2) is a 6.9-acre, type 4 wetland within the IV-24 subwatershed of the Lower Mississippi River watershed. The subwatershed is 965.4 acres and is 20 percent impervious. There is one inlet in the northeast corner of the wetland, and one inlet in the southeast corner. There is one outlet in the northwest corner, near Huber Drive, as well. The wetland is included in the City's stormwater management plan and is designated PUBG (intermittently exposed, unconsolidated bottom). It is a natural park area surrounded completely by development. The basin is surrounded by grasslands and trees within a residential neighborhood in Mendota Heights. Many of these ponds receive surface runoff from residential and road development. The two wetlands are connected when water levels are high. It is monitored for invasive species and vegetative growth trends that impact water quality. Copperfield is designated as a reference site.

Wetland Health

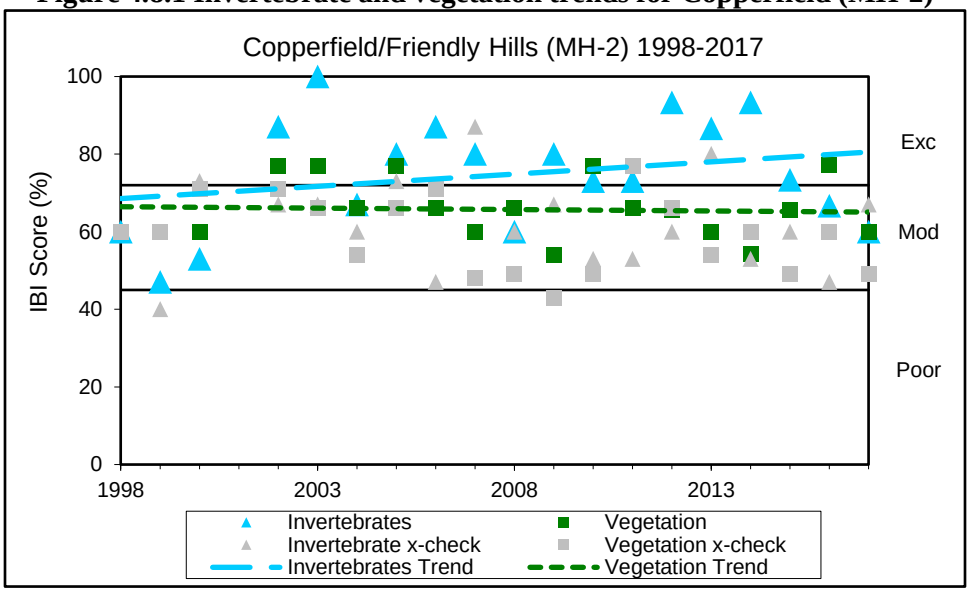
Site Observations: Copperfield is part of a chain of ponds within an established neighborhood, but is City-owned with no houses around it. The wetland slope is gentle, and the substrate is very mucky. Dominant vegetation includes grasses, coontail, waterweed, duckweed, white water-lilies, and water-meal. A large diversity of submergent, floating-leaved, and emergent vegetation were present. Reed canary grass and purple loosestrife were present.

Mendota Heights team members
at WHEP Invertebrate Training

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

2017 Data (MH-2)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (21)
Cross-check Rating (IBI score)	Moderate (20)	Moderate (17)
Trend 1998-2017	Variable, but stable	Variable, but improving

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



Site Summary: This is the nineteenth year that MH-2 has been monitored since 1998. There is a lot of variability in the data throughout the years of monitoring. The invertebrate and vegetation scores calculated by the City team are exactly consistent. The invertebrate scores have been in decline the last three years, but the health trend is showing improvement. The vegetation health trend remains stable. This wetland was cross-checked by another WHEP team in 2017. The invertebrate scores between the two teams were consistent, but the vegetation scores were not consistent, differing by 11 percent. The City team surveyed a vegetation releve with a higher diversity of submergent and emergent forbs which improved the vegetation health score. Fortin Consulting also completed a vegetation survey at Copperfield. There were minor differences in species identification between the City team and FCI, and FCI did observe bladderwort; however, the differences averaged out, and the calculated vegetation health scores were identical.

Mendota Heights Team in the wetland

4.8.2 Industrial Park (MH-4)

Industrial Park (MH-4) is a 0.3-acre, type 4 wetland located within the IP-12 subwatershed of the Lower Mississippi River Watershed. The watershed is 30.1 acres and 80 percent impervious. There are three inlets on the south/southeast side of the wetland, and one outlet on the southwest side. Industrial Park is part of the City's stormwater management plan with a management goal, and used for stormwater treatment. There are steep slopes around the wetland, and a slope failure occurred in 2006.

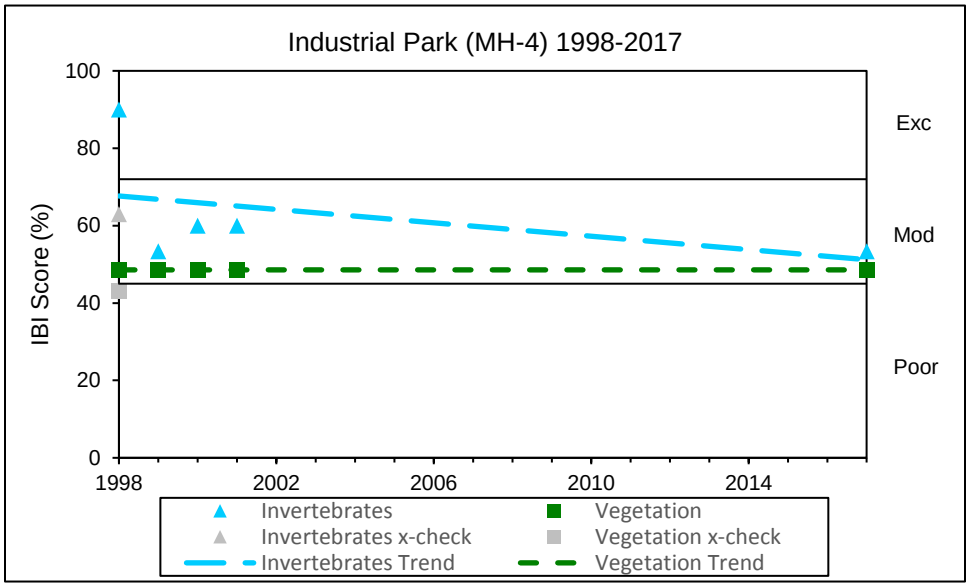
Wetland Health

Site Observations: The wetland is located in a developed industrial area. There are steep slopes all around the wetland. The wetland substrate is mucky. There is some diversity and some wildlife around the wetland, but not a lot. Trees surround most of the wetland. Waterweed and pondweed dominate the submergent vegetation. Rabbits, muskrat, dragonflies, tadpoles, ducks, frogs/toads were observed. A lot of garbage is present. Tadpoles and fish were caught in the bottle traps.

Table 4.8.2 Industrial Park (MH-4) Wetland Health based on Index of Biotic Integrity

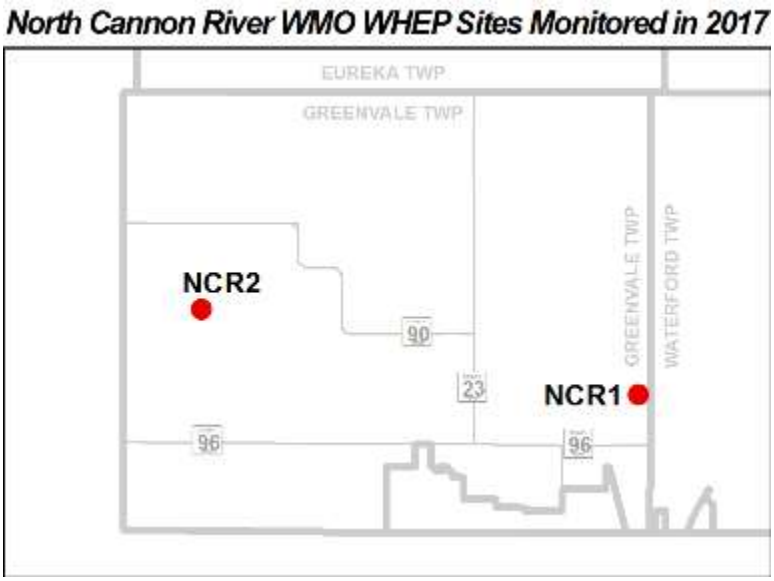
2017 Data (MH-4)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (17)
Trend 1998-2017	Not enough data	Not enough data

Figure 4.8.1 Invertebrate and vegetation trends for Industrial Park (MH-4)



Site summary: This is the fifth time that Industrial Park has been monitored for WHEP, but the first time since 2001. The invertebrate and vegetation scores are consistent with each other. Both categories received a moderate health rating. Because the invertebrate health scores dropped since the first year of monitoring (rating excellent), the invertebrate health trend shows decline; however, since 1999, the invertebrate ratings have remained moderate and stable. The vegetation scores have been identical all five surveys. Multiple species of leeches, snails, and trueflies were collected. Waterweed and pondweed dominated, but several emergent grasslike plants and forbs were present in low quantities, including sedge, spike-rush, swamp-milkweed, bidens, jewelweed, and bugle weed. 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 2017. This is the first year that North Cannon River WMO has monitored wetlands with WHEP.

Team Leaders: Tom Loretto and Steve Weston

Team Members: Marcel Derosier, Makeen Loretto, Adam Seibert, Dawn Seibert, Rachel Seibert, and Tom Seibert

Tom Loretto

Tom Loretto is the new co-team leader for North Cannon River Watershed Management Organization. He is a geologist with a career in oil and gas exploration. Tom has worked in New Orleans, Nigeria and Saudi Arabia, reviewing and selecting well locations in those regions. In 2015, Tom and his family moved to Northfield, and admitted that he is "back in touch with his childhood pursuits of chasing wildlife in open fields." Tom recently completed (2017) the Professional Certificate program in Geographic Information Systems (GIS), through Itasca Community College. He uses GIS to generate maps in support of sustainable agriculture projects, and to monitor the health of wetlands.

Steve Weston

Steve Weston is co-team leader for North Cannon River Watershed Management Organization, and also team leader to Lakeville. He has participated in WHEP for over 15 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."

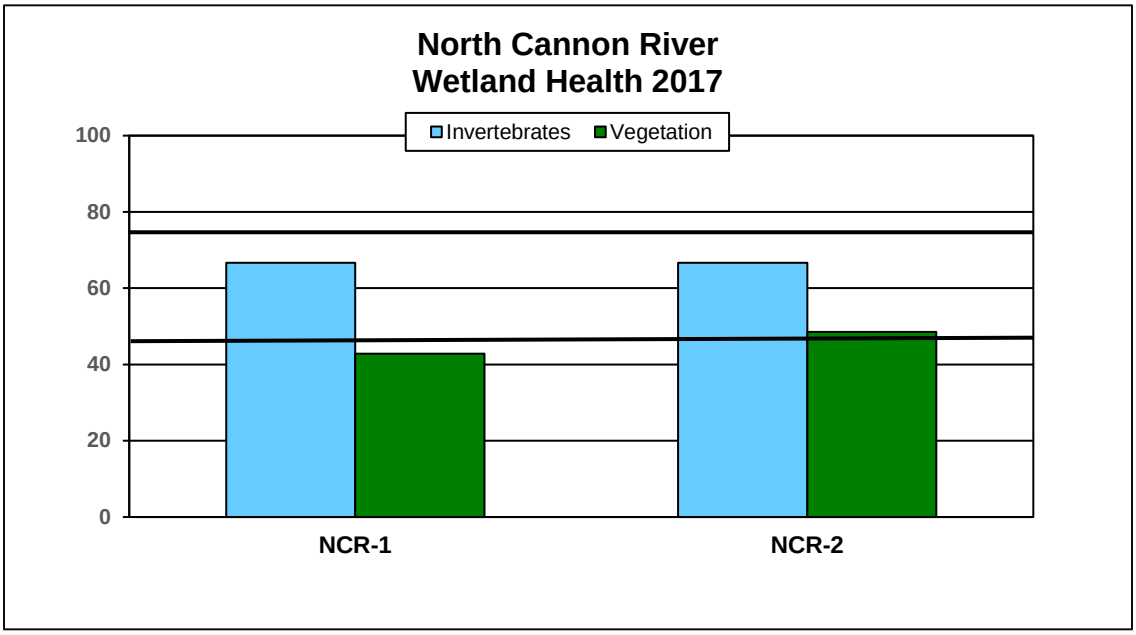
Ashley Gallagher

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 two wetlands, both in rural landscapes, for monitoring in 2017. It is likely that the same two wetlands will continue to be monitored 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 2017 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 inconsistent with each other. NCR-1 rated moderate for invertebrate health and poor for vegetation health, and their scores differed by 24 percent. NCR-2 rated moderate health for both invertebrates and vegetation, but their scores differed by 18 percent.

Figure 4.9 North Cannon River WMO site scores (percent) for 2017



4.9.1 Wasner (NCR-1)

Wasner (NCR-1) 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

North Cannon River team in the wetland

Site Observations: The wetland substrate is muddy. Leeches, dragonflies, snails, and trueflies were present. Pondweed, a submergent forb, dominated the wetland. Duckweed and water-meal covered most of the wetland surface. Bur-reed, bidens, smartweed, and spike-rush were present. Reed canary grass dominated the shoreline with some patches of cattails. Green heron, great egret, common yellowthroat, song sparrow, marsh wren, and tree swallow were observed.

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

2017 Data (NCR-1)	Invertebrates	Vegetation
Wetland Health Rating (IBI score)	Moderate (20)	Poor (15)
Trend 2017	Not enough data	Not enough data

Site summary: This is the first time that Wasner has been monitored by WHEP volunteers. The invertebrate and vegetation health scores were not consistent, differing by 24 percent. The invertebrate health rated moderate while the vegetation health rated poor. 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 and reed canary grass surround this open water wetland in the middle of farm fields. Coontail dominates the submergent vegetation. A gelatinous, black material covers the coontail. Lemna and water-meal cover the surface of the wetland. Leeches, dragonflies, mayflies, snails, trueflies, and crustaceans were collected.

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

2017 Data (NCR-2)	Invertebrates	Vegetation
Wetland Health Rating (IBI score)	Moderate (20)	Moderate (17)
Cross-check Rating (IBI score)	Moderate (16)	Poor (13)
Trend 2017	Not enough data	Not enough data

Site summary: This is the first year that Peterson wetland has been monitored by WHEP volunteers. This wetland was also cross-checked by another WHEP team in 2017. The invertebrate and vegetation scores were not consistent with each other for either team. The NCR team calculated moderate ratings for both invertebrate and vegetation health, but the scores differed by 18 percent. The invertebrate and vegetation scores differed by 16 percent for cross-check team. The scores between teams were not consistent either. While the City team and cross-check team both calculated moderate ratings for invertebrates, the scores differed by 14 percent. The vegetation scores differed by 12 percent. The results of both teams showed the invertebrates scoring better health than vegetation. Bulrush, reed canary grass, coontail, duckweed, water-meal, bur-reed, and cattail were the dominant vegetation. Only small populations of a few other species of vegetation were represented. Fortin Consulting also completed a vegetation survey in Peterson wetland. FCI observed vegetation species similar to the City team, and the vegetation health scores were identical. Additional years of monitoring will help to determine more reliable wetland health trends.

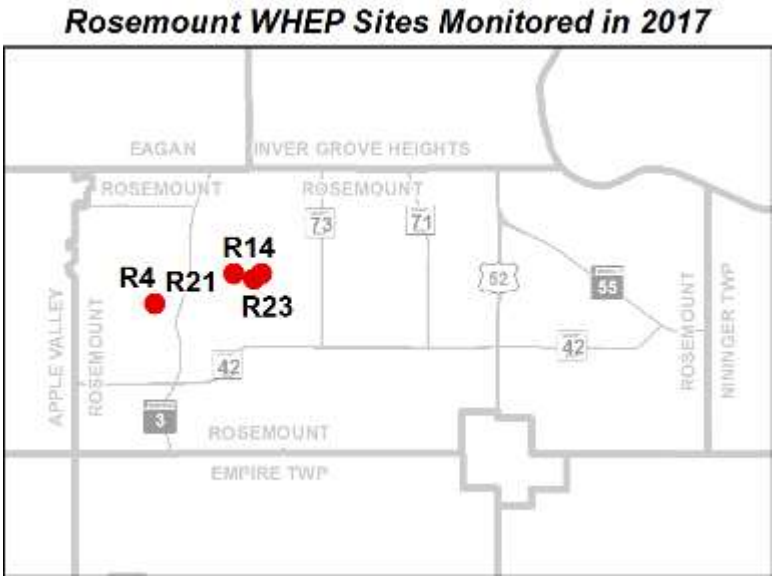
North Cannon River and Lakeville teams at WHEP Invertebrate Training

4.10 Rosemount Wetlands

Four wetlands were monitored in the City of Rosemount in 2017. The City has 20 years of WHEP data! Twenty-four wetlands have been monitored in Rosemount since the start of WHEP.

Team Leaders: Amy Jo Forslund

Team Members: Maisy Bach, Cody Bahr, Jacob Geller, Greg Lund, Bill Meyer, Eric Nelson, Janet Pettersen, Jane Porterfield, Geri Reinardy, Andy Simon, Averie Simon, Peyton Simon, and Denise Wilkens



Amy Jo Forslund

Amy Jo Forslund is the team leader for Rosemount. She explained, "This was my second 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 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."

The City of Rosemount considers its wetlands a critical part of its Natural Resources. We have participated in the WHEP program since it began because it provides essential information that allows the city to better manage and restore its wetland biodiversity both now and in the future.

Christine Watson,
City of Rosemount

Over the years, the WHEP volunteers have provided the city with high-quality quantitative data for numerous wetlands, which would otherwise be very difficult to obtain with our limited staff time and resources. The data they collect is primarily used to document wetland quality and track changes in wetland health trends. The volunteer efforts are greatly appreciated!

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 2017

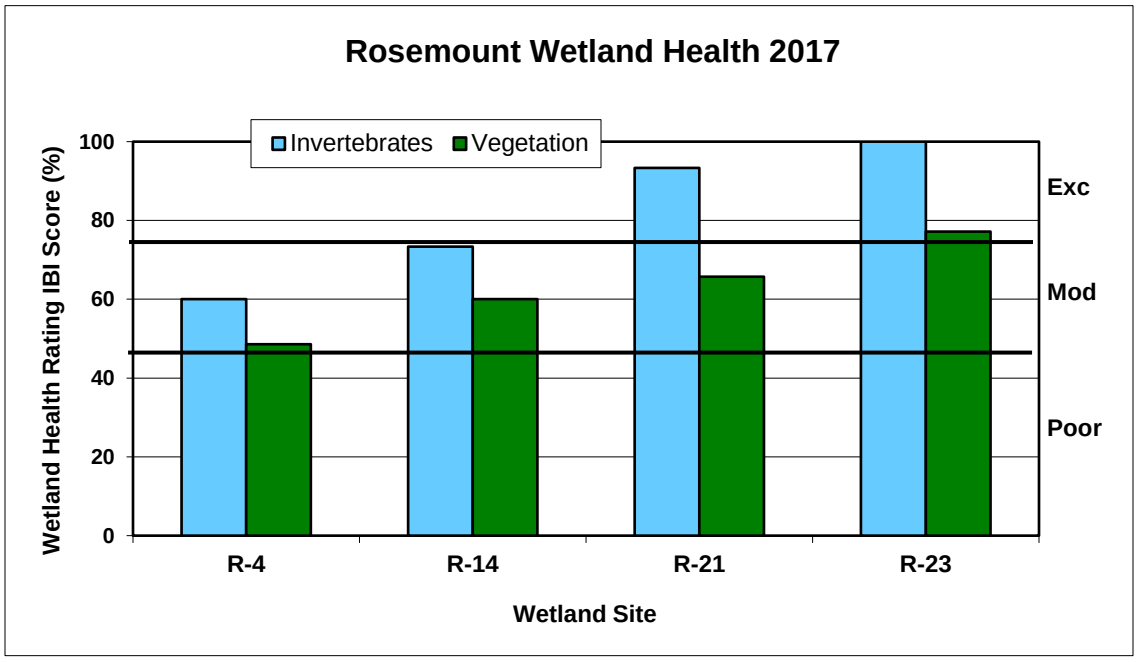
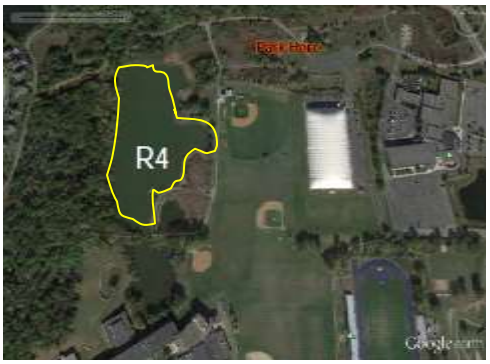


Figure 4.10 presents an overall view of wetland health for all the 2017 monitoring sites in Rosemount based on the scores for invertebrates and vegetation presented as a percent. Figure 4.10 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate 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 moderate to excellent health. Wetland site R-23 rated excellent for both invertebrate and vegetation health. The invertebrate and vegetation scores for all four wetlands were inconsistent.

4.10.1 Schwarz Pond (R-4)

Schwarz Pond (R-4), also known as WMP #431, is an 11-acre, type 5 wetland in the Erickson Pond watershed. The watershed is 1,832 acres with 25 percent impervious surface. The wetland has no inlets or outlets. It 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.



Schwarz Pond sits in a depressional area surrounded by wooded areas to the north and west. There are baseball fields to the east and Rosemount High School to the south. There are no dedicated buffers, and excess nutrient runoff may occur from turf maintenance of the baseball fields.

Rosemount Team at
WHEP Invertebrate Training

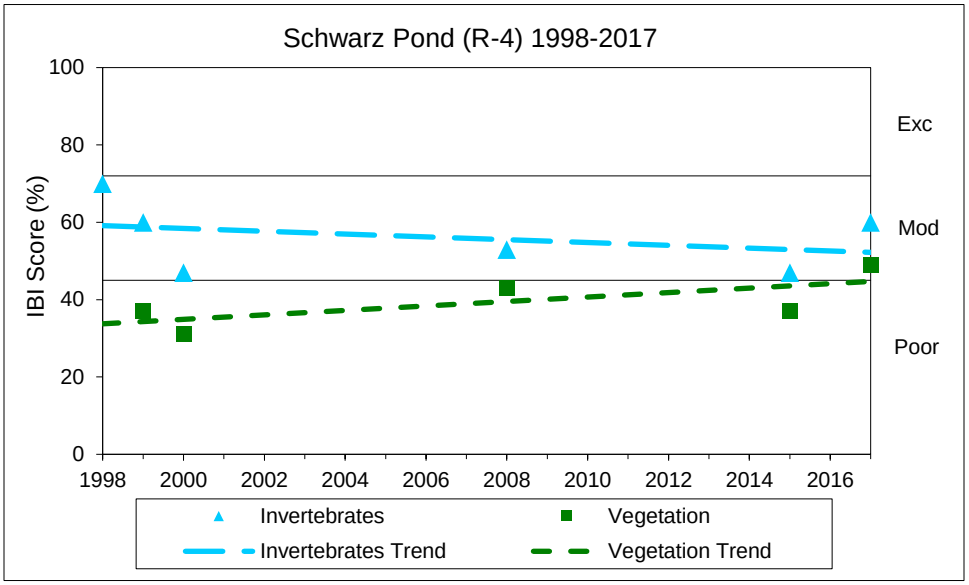
Wetland Health

Site Observations: The wetland slope is gentle. The wetland substrate is solid with a layer of muck on top. Tadpoles and fish were collected in the bottle traps. Willows grow along the shoreline. Arrowhead and reed canary grass were the dominant vegetation. Small populations of pondweed, smartweed, and bulrush were present. Leeches, dragonflies, mayflies, snails, trueflies, and crustaceans were collected.

Table 4.10.1 Schwarz Pond (R-4) Wetland Health based on Index of Biotic Integrity

2017 Data (R-4)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Moderate (18)	Moderate (17)
Trend 1998-2017	Variable	Improving slightly

Figure 4.9.1 Invertebrate and vegetation trends for Schwarz Pond (R-4)



Site summary: This is the sixth time Schwarz Pond has been monitored since 1998. The invertebrate and vegetation health scores were inconsistent in 2017. Both categories rated moderate, but the scores differed by 11 percent. The invertebrate scores have been variable throughout the years of monitoring, but maintaining a moderate health rating. In 2017, the vegetation rating jumped from poor to moderate. The health trend appears to be improving slightly. More years of data will help determine more reliable health trends.

4.10.2 Mare Pond North (R-14)

Mare Pond North (R-14), also known as WMP #379, is a 4.8-acre, type 5 wetland within the White Lake watershed. The wetland watershed is 81-acres with 30 percent impervious surface. R-14 is part of the City's stormwater management plan and is designated to preserve with a management goal to maintain the wetland and its existing functions, values, and wildlife habitat.

The wetland is located in a basin surrounded by grassland with sparse trees and shrubs. The wetland receives stormwater runoff from the adjacent road along the south side of the wetland. Nutrient loading from nearby agriculture to the north and residential development to the south are of concern. New developments in the area require a 75-foot buffer.

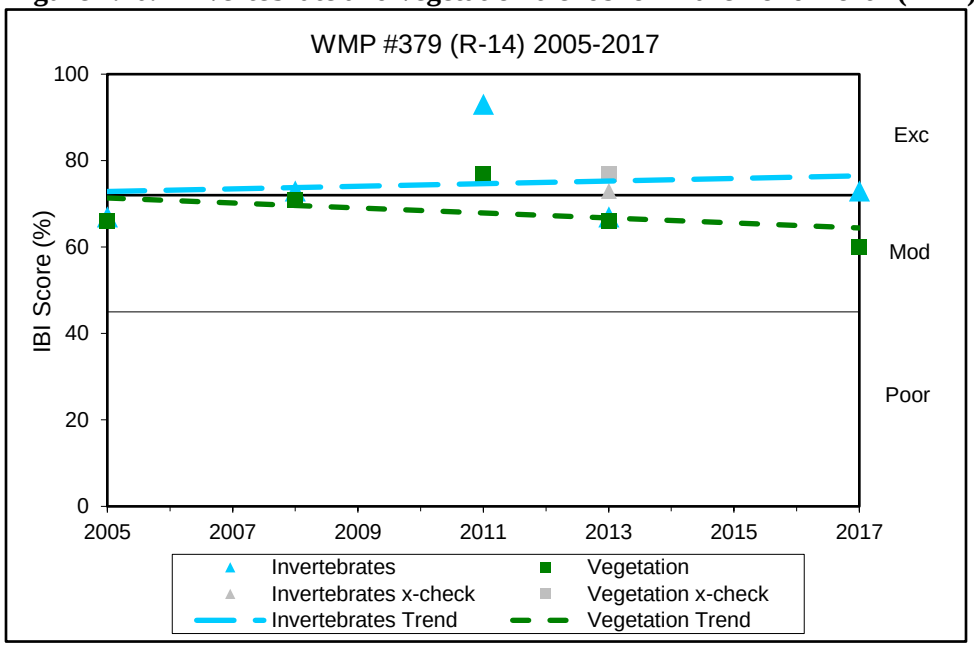
Wetland Health

Site Observations: There is a steep, 45 degree slope into the wetland. The wetland substrate is somewhat mucky. Dominant vegetation include reed canary grass, coontail, pondweed, and arrowhead. Leeches, dragonflies, snails, trueflies, and crustaceans were collected. There is a lot of litter in the water.

Table 4.10.2 Mare Pond North (R-14) Wetland Health based on Index of Biotic Integrity

2017 Data (R-14)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (22)	Moderate (21)
Trend 2005-2017	Stable	Declining slightly

Figure 4.10.2 Invertebrate and vegetation trends for Mare Pond North (R-14)



Site summary: This is the fifth year that R-14 has been monitored since 2005. The invertebrate and vegetation health both rated moderate in 2017; however, the scores were inconsistent, differing by 13 percent. Besides an excellent score in 2011, the invertebrate scores have rated high-moderate. The invertebrates health trend is stable. The vegetation score is at its lowest in 2017, causing the health trend to decline slightly. More years of data will help determine more reliable health trends.

4.10.3 CR-38 Mitigation Site 1 (R-21)

CR-38 Mitigation Site 1 (R-21) is a 1.7-acre, type 3 wetland in the Kegan Lake watershed. The watershed is 1,530 acres and 30 percent impervious. The wetland has one inlet on the east side which receives stormwater overflow from a storm pond. There are no outlets. R-21 is included in the City's stormwater management plan. It is designated as Manage II, and is managed to maintain the wetland quality and monitor wetland mitigation.

R-21 is a depressional shallow marsh wetland. The southern portion of this wetland complex was constructed

as mitigation for impacts to other wetlands as a result of street reconstruction, and is an extension of an existing wetland dominated by reed canary grass. The nutrient loading from adjacent agriculture and reed canary grass impede upon this wetland.

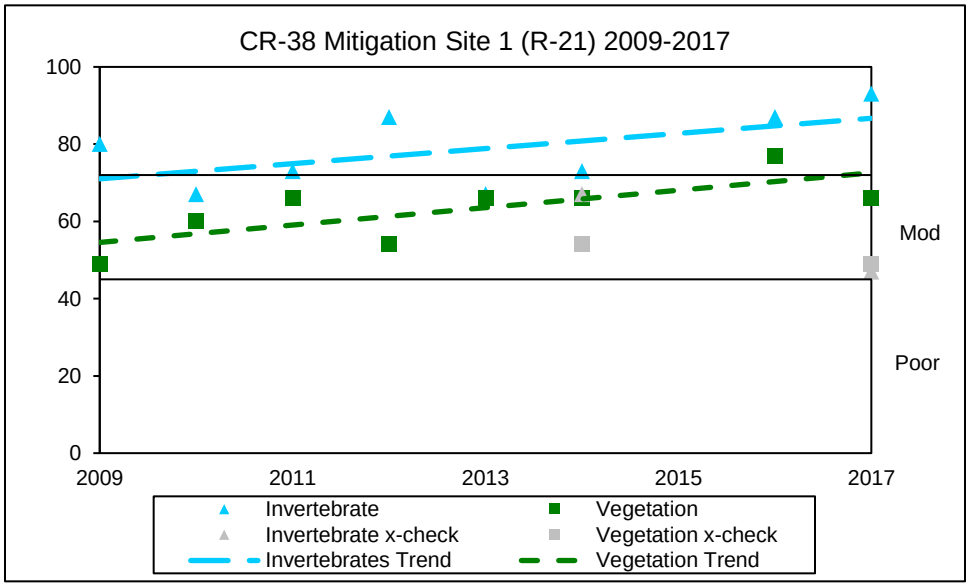
Wetland Health

Site Observations: The slope of the wetland is steep from the road and becomes flat entering the wetland. The wetland substrate is mucky with a thick layer of submergent vegetation. The wetland is choked with cattails. Only a small area of open water exists. The cattail population seems thicker than previous years. The wetland is in between a housing development and farmland with woods nearby. Muskrat trails and deer observed.

Table 4.10.3 CR-38 Mitigation Site 1 (R-21) Wetland Health based on Index of Biotic Integrity

2017 Data (R-21)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Excellent (28)	Moderate (23)
Cross-check Rating (IBI score)	Poor (14)	Moderate (17)
Trend 2009-2017	Improving	Improving

Figure 4.10.3 Invertebrate and vegetation trends for CR-38 Mitigation Site 1 (R-21)



Site summary: This is the eighth year that R-21 has been monitored by the WHEP volunteers since 2009. The invertebrate health rated excellent in 2017, and achieved the highest score for the wetland. The wetland has rated excellent several different years, sometimes dropping to high-moderate. The invertebrate health trend shows improvement. The vegetation health rating has fluctuated between low-to-high-moderate. The

Rosemount team at
WHEP Invertebrate Training

vegetation health also shows improving trends. The invertebrate and vegetation scores were not consistent, in 2017. This wetland was also cross-checked by another WHEP team in 2017. The scores between the two teams were not consistent. The invertebrates scores differed by 46 percent. The vegetation scores differed by 17 percent. The City team collected and identified a more diverse collection of macroinvertebrates including multiple species of leeches, dragonflies, damselflies, mayflies, caddisflies, snails, trueflies, and crustaceans. The City team identified slender Riccia and purple-fringed Riccia which enhanced the nonvascular metric and the aquatic guild metric. Both teams found an abundance of bladderwort in their vegetation plots.

4.10.4 CR-38 Mitigation Site 2 (R-23)

CR-38 Mitigation Site 2 (R-23) is 0.3-acre, type 3 wetland in the White Lake Watershed. The White Lake watershed is 998 acres of which 30 percent is impervious surface. There are no inlets or outlets. This wetland is not part of the City's stormwater management plan. It was created in 2008 after the plan was developed. The wetland management goal is to maintain the wetland without any loss of function and value, and to monitor the success of this wetland's creation.

R-23 is a small depressional shallow marsh wetland. The wetland was constructed to mitigate impacts to other wetlands as a result of street reconstruction. It was constructed near an existing wetland that is dominated by reed canary grass.

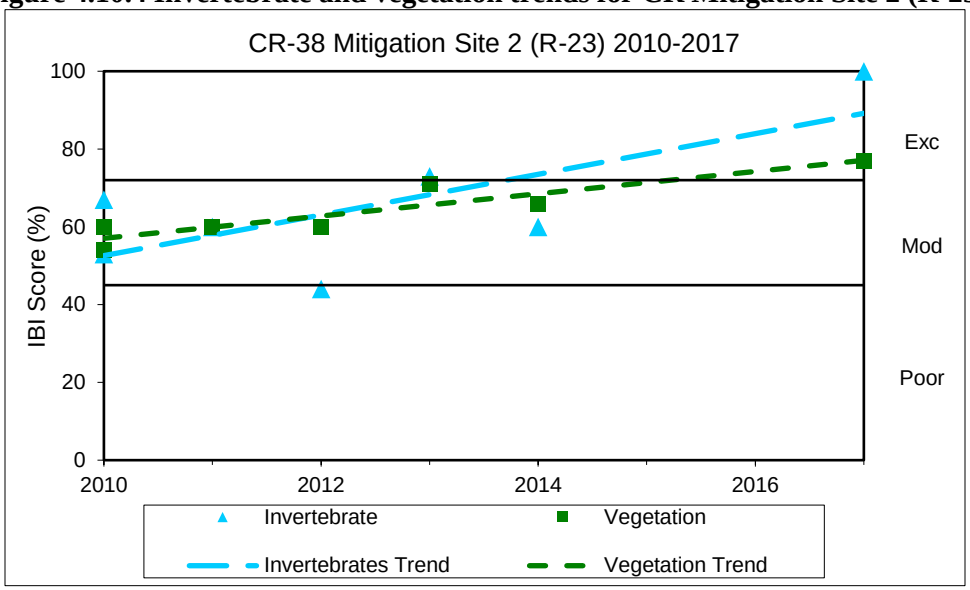
Wetland Health

Site Observations: The wetland is shallow and small with a gentle slope and firm substrate. It is adjacent to Mare Pond North. Reed canary dominates the shoreline.

Table 4.10.4 CR Mitigation Site 2 (R-23) Wetland Health based on Index of Biotic Integrity

2017 Data (R-23)	**Invertebrates** 	**Vegetation** 
Wetland Health Rating (IBI score)	Excellent (30)	Excellent (27)
Trend 2010-2017	Variable	Improving

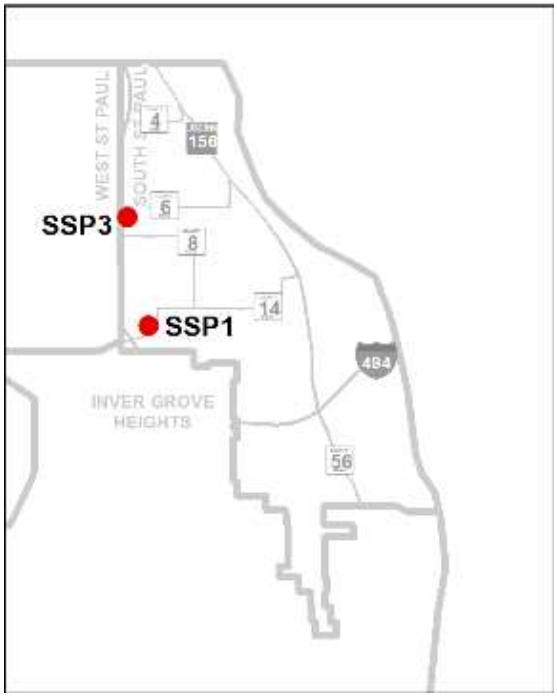
Figure 4.10.4 Invertebrate and vegetation trends for CR Mitigation Site 2 (R-23)



Site summary: This is the sixth time R-23 has been monitored since 2010. The invertebrate and vegetation scores were not consistent in 2017, differing by 23 percent. Both invertebrates and vegetation health rated excellent, and the invertebrates calculated a perfect score. Both scores are the highest that the wetland has had through the years of WHEP monitoring. Multiple species of leeches, dragonflies, damselflies, mayflies, caddisflies, snails, trueflies, and crustaceans were collected. Multiple species of emergent grasses, including sedges, spike-rush, and bulrush were present. Reed canary grass dominated. Slender Riccia, waterweed, duckweed, water-plantain, bur-reed, and cattail were also present. The diversity of grasses and abundance of sedges, as well as the presence of slender Riccia boosted several of the metric scores.

4.11 South St. Paul Wetlands

South St. Paul WHEP Sites Monitored in 2017



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: Emily Anderson, Andrea Bauer, Tim Kuehn, Roger Larson, and Dawn McLean

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

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. One of my favorite 2017 WHEP memories from this summer was working with Sondra and the volunteers to identify bugs in the lab. I love looking at the intricate casings of the different tricoptera!"

Kristine Maurer

Sondra Larson

Sondra explained, "It was my first year being involved with WHEP. I studied environmental science in school and have always loved spending time outdoors whether it is just relaxing and enjoying +-my surroundings or hiking around with my field guide trying to ID everything! I learned a lot from my first year as a co-team lead in WHEP. My favorite parts of the summer were taking our wetland vegetation inventory. It was an amazing opportunity putting on waders, getting in the water and being able to spend time observing each wetland closely to really recognize their differences and similarities. I am excited for the new learning opportunities that the next field season will bring!"

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".

Chris Hartzell

South St. Paul General Wetland Health

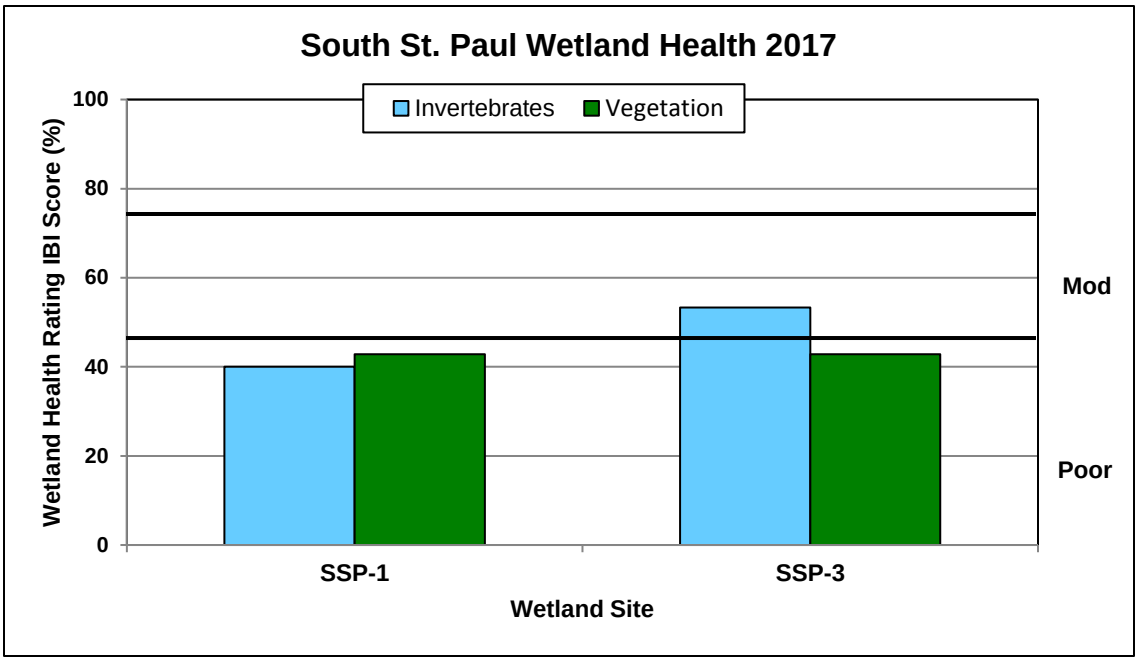
Figure 4.11 presents an overall view of wetland health for all of the 2017 monitoring sites in South St. Paul based on the IBI scores for invertebrates and vegetation presented as a percent. Figure 4.11 also illustrates the consistency between the IBI scores (in percent form) for each wetland sampled. Invertebrate and vegetation scores that differ by ten percent or less are considered consistent. Based on the IBI scores, a wetland health rating is assigned as excellent, moderate or poor. In 2017, the invertebrates and vegetation health both rated poor at wetland site SSP-1. Wetland site SSP-3 rated moderate health for invertebrates and poor health for vegetation. The invertebrates and vegetation scores of each wetland were consistent.

Sondra Larson and Tim Kuehn

South St. Paul WHEP members

Roger Larson

Figure 4.11 South St. Paul site scores (percent) for the 2017 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.

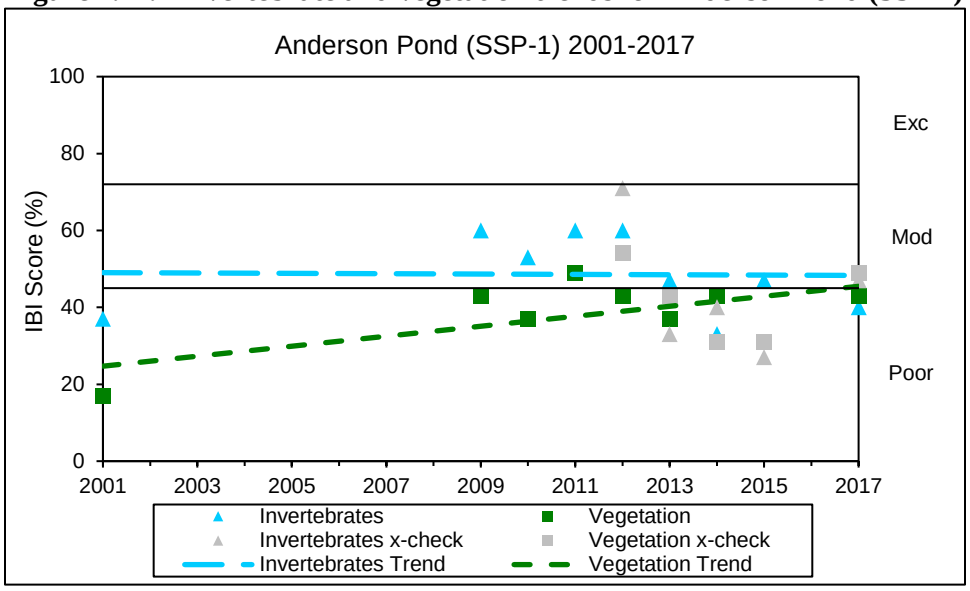
Wetland Health

Site Observations: The wetland slope is gradual to the edge of the water, but then the water gets deep quickly. The deep water requires a 5x20 meter vegetation plot. The substrate is firm, with a layer of muck. Sunken tree branches and cattail roots make walking difficult. A thick band of cattails surrounds about 75 percent of the wetland shoreline. The area without the cattails has large overhanging trees. Fish were caught in the bottle traps.

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

2017 Data (SSP-1)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (12)	Poor (15)
Cross-check Rating (IBI score)	Poor (14)	Moderate (17)
Trend 2001-2017	Stable	Stable

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



Site Summary: This is the ninth time that SSP-1 has been monitored since 2001. The invertebrate and vegetation scores are consistent, in 2017. Initial low scores in 2001 make the vegetation health trend appear to be increasing; however, since 2009, the vegetation scores seem to be remaining stable. Invertebrates scores have ranged from poor to moderate health. Invertebrate scores have been lower in recent years of surveys compared to moderate ratings in previous years. Despite these score differences, the invertebrate health trend remains stable. 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 2017. The scores between teams were consistent. The invertebrate and 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.

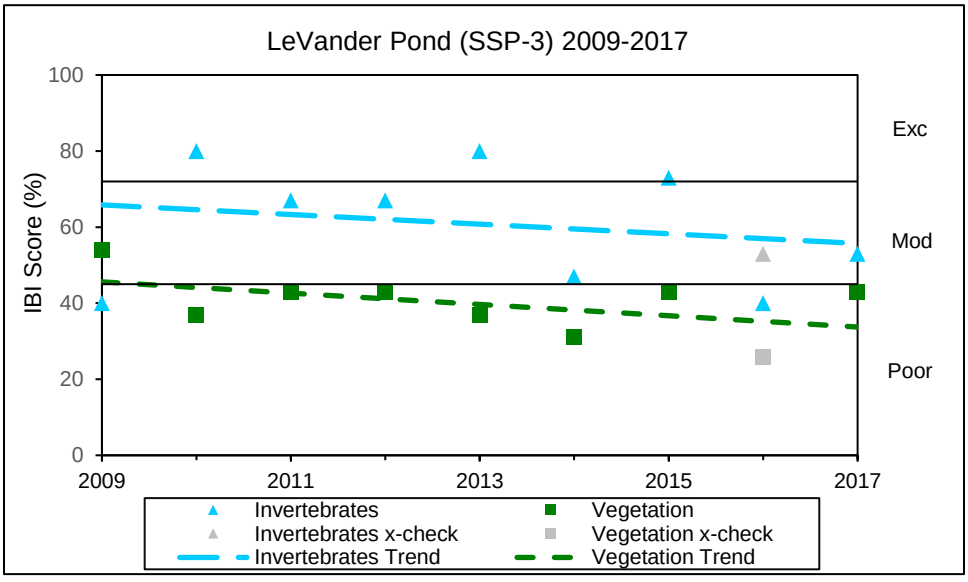
Wetland Health

Site Observations: The wetland slope is gentle. The substrate is very mucky. Cattails, tall grass, and algae cover the entire wetland. A lot of litter present. Ducks and geese observed.

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

2017 Data (SSP-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Poor (15)
Trend 2009-2017	Variable	Declining

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



Site summary: This is the ninth consecutive year of monitoring LeVander Pond. The vegetation and invertebrates scores were consistent with each other in 2017. The invertebrate scores have fluctuated between poor and excellent over the years. In 2017, invertebrate health rated moderate. The vegetation health score remains poor, as it has been since the second year of monitoring. Three families of leeches, one family of dragonfly, one family of damselfly, one family of caddisfly, two families of snails, and one family of crustaceans were collected in 2017. The vegetation presence in 2017 was very similar to 2016. The only emergent vegetation included reed canary grass and cattail, which dominate the shoreline. Duckweed and water-meal covered the water surface, and little to no submergent vegetation was present. Only a few small sprigs of coontail were identified. Otherwise, the vegetation diversity is sparse.

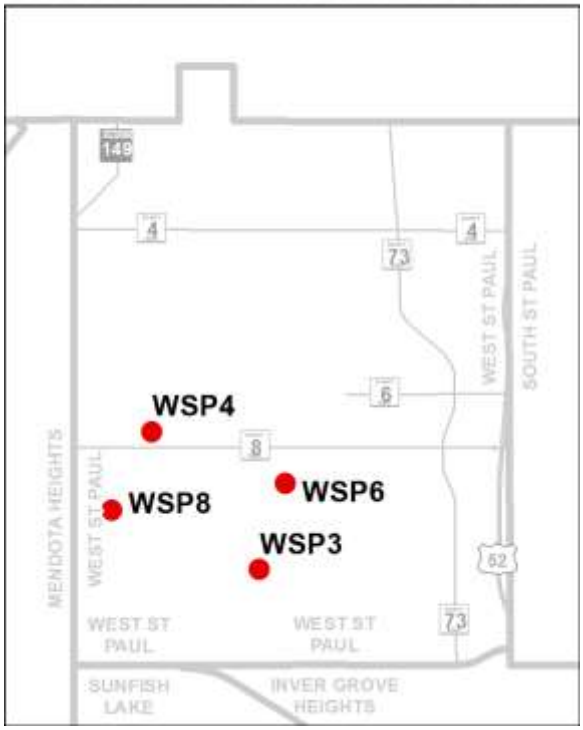
4.12 West St. Paul Wetlands

Four wetlands were monitored in West St. Paul in 2017 by the West St. Paul team. The City of West St. Paul has 18 years of WHEP data! Twelve wetlands have been monitored in West St. Paul since the City became involved with WHEP in 1999. This is the fourth year that the City of West St. Paul has had its own designated WHEP team again since 1999-2003.

Team Leaders: Maggie Karschnia and Tim Martin

Team Members: Rachel Crownhart, Jan Henley, Delaney Karschnia, Alana Karschnia, Mike Lynn, Christian O'Hare, and Kelsey White

West St. Paul WHEP Sites Monitored in 2017



Maggie Karschnia

Tim Martin

Maggie became a WHEP volunteer in 2007 for Hennepin County, and was eventually enlisted as a team leader for West St. Paul ahead of the 2013 season. This was her fourth year as team leader. She expressed, "We had another great monitoring season this year with one of the best volunteer teams I've ever worked with. I couldn't imagine a more fun, capable, and supportive team. This year, we also had the opportunity once again to represent WHEP at a booth at the Take a Kid Fishing event held at Thompson Park in West St Paul. It was a great opportunity to highlight what we're doing to the residents in the local community."

This was Tim Martin's fourth year as team leader of West St. Paul. He admitted, "I developed a passion for field biology during my undergraduate studies in environmental science and WHEP has given me an outlet to expand my knowledge of wetland ecosystems. Partly inspired by my work with WHEP, I entered a Master's degree in Water Resource Science at the University of Minnesota in 2015. In addition to the educational benefits, this program also gives me a chance to spend time outdoors, which I greatly

appreciate after a long day of working at a desk. It also helps to have a great team helping us. Such a dedicated group makes all of the work much easier"

Ross Beckwith

Ross Beckwith is the City of West St. Paul's City Engineer/Public Works and Parks Director. He commented, "This is my second year in the WHEP program at West St. Paul, and I certainly value the importance of a functioning wetland. The data collected through this program is so valuable as it allows us to track the condition of these precious resources over time. Thank you to all the volunteers who make this program happen and allow it to remain affordable."

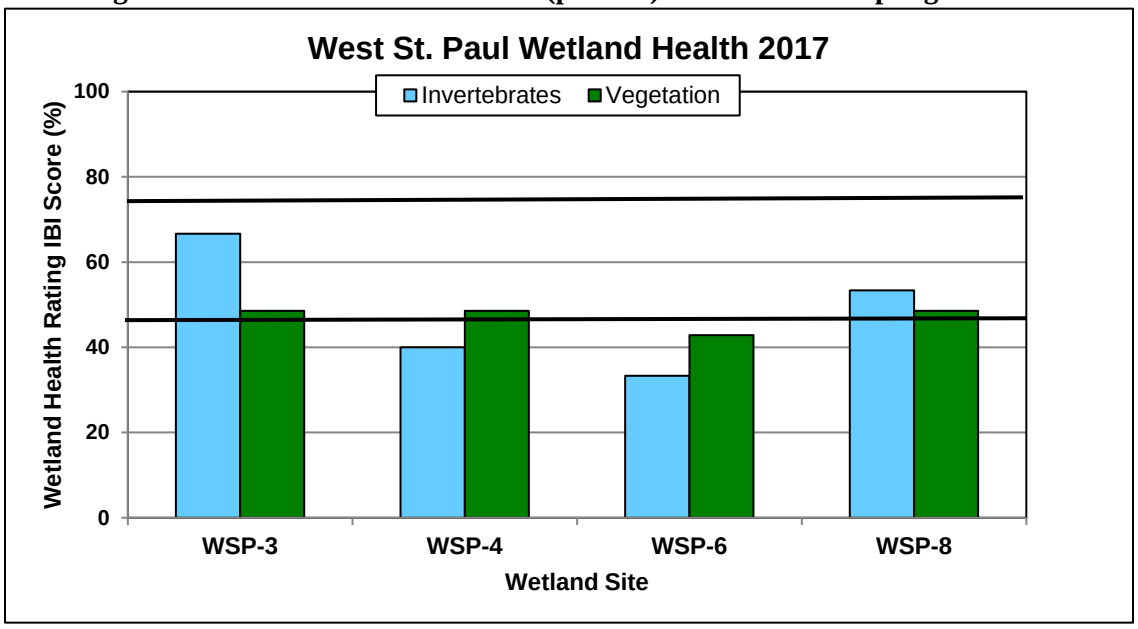
Dave Schletty

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 five years. Dave helps select which wetlands to monitor each year and reviews the data. He also supervises the City's Environmental Committee, shares WHEP data with the group, and together they educate the community about improving water quality. He said, "With so few wetlands within the mostly developed five square mile City, I understand the importance of keeping them healthy."

West St. Paul General Wetland Health

Figure 4.12 presents an overall view of wetland health for all of the 2017 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 2017. The invertebrate and vegetation scores for WSP-4, WSP-5, and WSP-8 were each consistent. Although both the invertebrates and vegetation health scores rated moderate, they were inconsistent with each other, differing by 18 percent.

Figure 4.12 West St. Paul site scores (percent) for the 2017 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

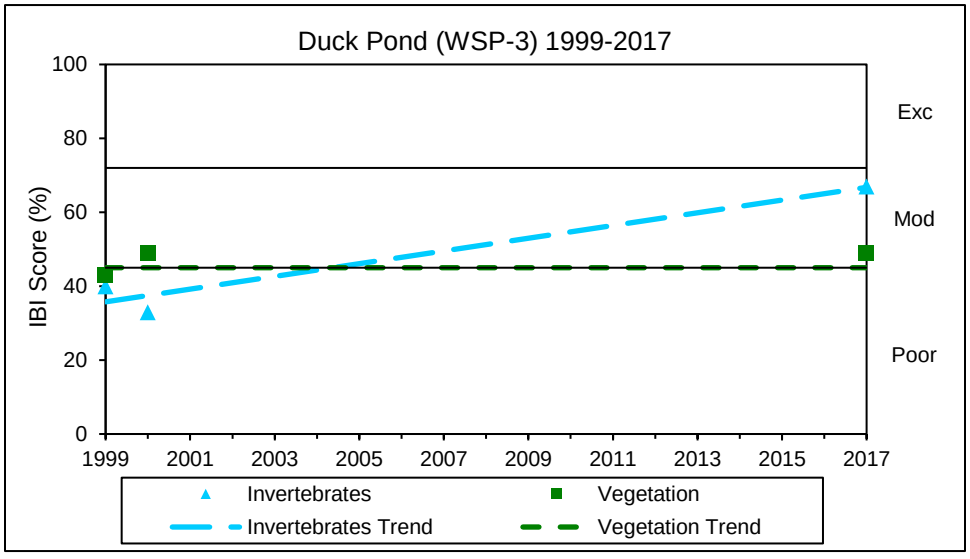
Site Observations: The wetland slope is gentle, and the wetland is not very deep. The wetland substrate is mucky, and WHEP volunteers sunk into about six inches of muck. Little to no submergent vegetation is present, but duckweed and watermeal floated on the surface of the pond. Few other species of vegetation were represented in the plot. Reed canary grass is present along the shoreline. Muscrat may have cut down vegetation. Tadpoles were present in the bottle traps. Nearby residents have observed a wide variety of ducks on the pond over the years, hence its name.

Tim Martin and Alana Karschnia at Duck Pond

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

2017 Data (WSP-3)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (20)	Moderate (17)
Trend 1999-2017	Not enough data	Not enough data

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



Site Summary: This is the third year 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 both rated moderate health; however, their scores are not consistent with each other, differing by 18 percent. In 2017, the invertebrate was higher than previous surveys, but the vegetation score is similar to previous surveys. More years of data will help determine a more reliable health trend. Despite the lack of vegetation in the pond, invertebrates were present, including five families of leeches, one family of dragonfly, one family of damselfly, two families of snail, three families of trueflies, and one family of crustacean. There was little to no submergent vegetation at the time of the vegetation survey. The wetland vegetation present included only small populations of muskgrass, bulrush, water-nymph, duckweed, and water-meal.

Christian O'Hare, Jan Henley, Kelsey White, Mike Lynn, Tim Martin, and Alana Karschnia (in front)

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.

Jan Henley, Tim Martin, Kelsey White, Christian O'Hare and Mike Lynn at Weschcke Pond

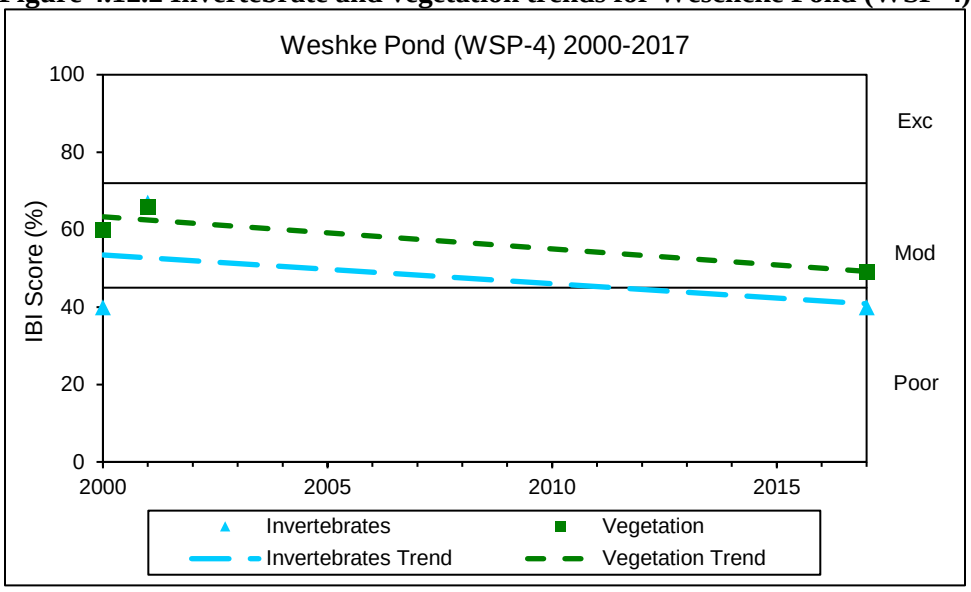
Wetland Health

Site Observations: The wetland is located within Weschcke Park. It has a gentle slope and a very mucky substrate. The surface of the water is completely covered in duckweed and water-meal, and there is little to no submergent vegetation. Trash was littered along the shoreline and there was woody debris on the bottom of the wetland.

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

2017 Data (WSP-4)	Invertebrates	Vegetation
Wetland Health Rating (IBI score)	Poor (12)	Moderate (17)
Trend 2000-2017	Not enough data	Not enough data

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



Site Summary: This is the third time that WSP-4 has been surveyed for WHEP since 2000. Prior to 2017, it had not been surveyed since 2001. The invertebrates rated poor while the vegetation rated moderate; however, the scores were consistent with each other. The vegetation score is lower in 2017 than previous years of surveys, while the invertebrate score is the same. The vegetation diversity was great enough to boost the vegetation health rating, but the density of each species represented was very low. Small populations of sedge, spike-rush, reed canary grass, coontail, pondweed, and purple loosestrife were represented. The dominating vegetation were the floating leaved forbs, which included duckweed and water-meal. The lack of vegetation may be impacting the invertebrate population. Three families of leeches, one family of snail, two families of trueflies, and one family of crustacean were collected. More years of monitoring will help determine a more reliable health trend.

West St. Paul team in the wetland

4.12.3 Marthaler Park (WSP-6)

Marthaler Park (WSP-6) is a 4.5-acre, type 5 wetland within the Simon 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

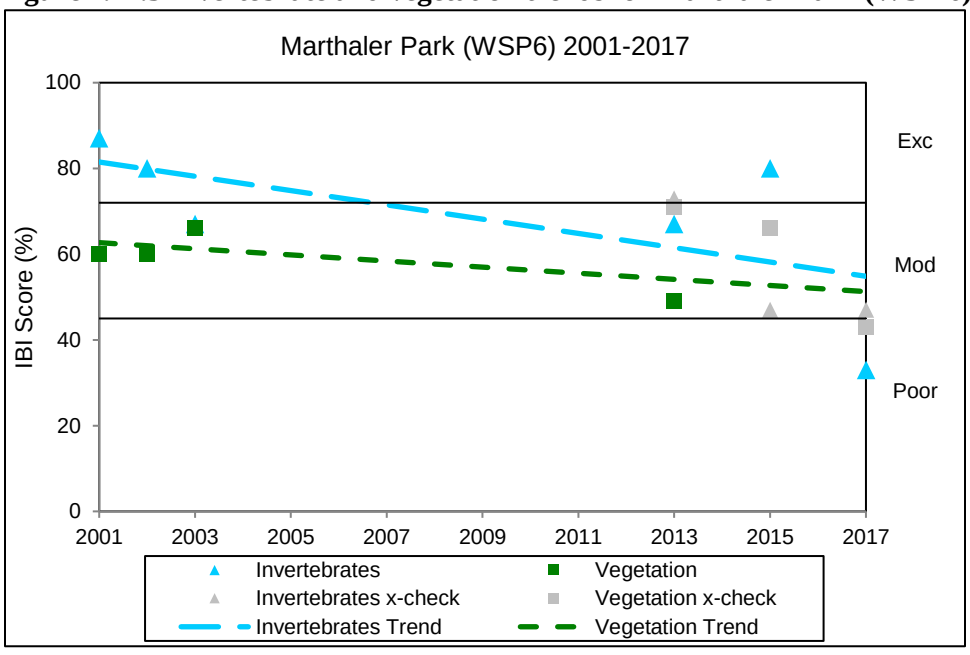
Site Observations: The wetland slope is gentle. The wetland substrate is firm with sand, but mucky on top. The water was high in 2017. Many willow trees were standing in water. Coontail, duckweed, and water-meal were abundant. A walking path surrounds the wetland. Playground areas and tennis courts are nearby.

Christian O'Hare, Jan Henly, and Kelsey White at Marthaler Park

Table 4.12.3 Marthaler Park (WSP-6) Wetland Health based on Index of Biotic Integrity

2017 Data (WSP-6)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Poor (10)	Poor (15)
Cross-check Rating (IBI score)	Poor (14)	Poor (15)
Trend 2001-2017	Declining	Declining

Figure 4.12.3 Invertebrate and vegetation trends for Marthaler Park (WSP-6)



Site summary: This is the sixth time that Marthaler Park has been monitored since 2001. The invertebrates and vegetation health both rated poor. Scores for both categories are at their lowest in 2017, and both categories are showing declining health trends. The scores have been variable over the years, and more years of data will help determine more reliable health trends. This wetland was cross-checked by another WHEP team in 2017. The vegetation scores between the teams were the same, while the invertebrate scores were inconsistent. Though both teams calculated invertebrate health ratings of poor, the cross-check team

collected a larger diversity of invertebrates which boosted their invertebrate score. Fish were present in the wetland, possibly impacting the City team's bottle traps. Only two families of trueflies, one family of crustacean, and two families of snails (including the invasive mystery snail) were collected with dipnets. The cross-check team collected one family of dragonfly, one family of mayfly, three families of snails (none invasive), two families of trueflies, and two families of crustacean. The vegetation diversity and abundance represented in each of the team plots were very similar, and this reflected in the identical vegetation score. Vegetation included several woody species and reed canary grass. The dominant vegetation included coontail, waterweed, pondweed, duckweed, and water-meal. Fortin Consulting also complete a vegetation survey at Marthaler Park wetland. The observed vegetation species were similar, and the vegetation health score were identical between all parties.

4.12.4 Dodge Nature Center Prairie Pond (WSP-8)

Dodge Nature Center Prairie Pond (WSP-8) is a 2.9-acre, type 3 wetland within the Valley Creek (Marie) drainage area. Its watershed is 113 acres and is publicly owned by the City. There are no inlets or outlets. The wetland is part of the City's stormwater management plan. It is designated as MR8P Dodge Center Pond.

It is located within the Olivia Dodge Nature Center. The surrounding area is undisturbed with trees and other vegetation.

Wetland Health

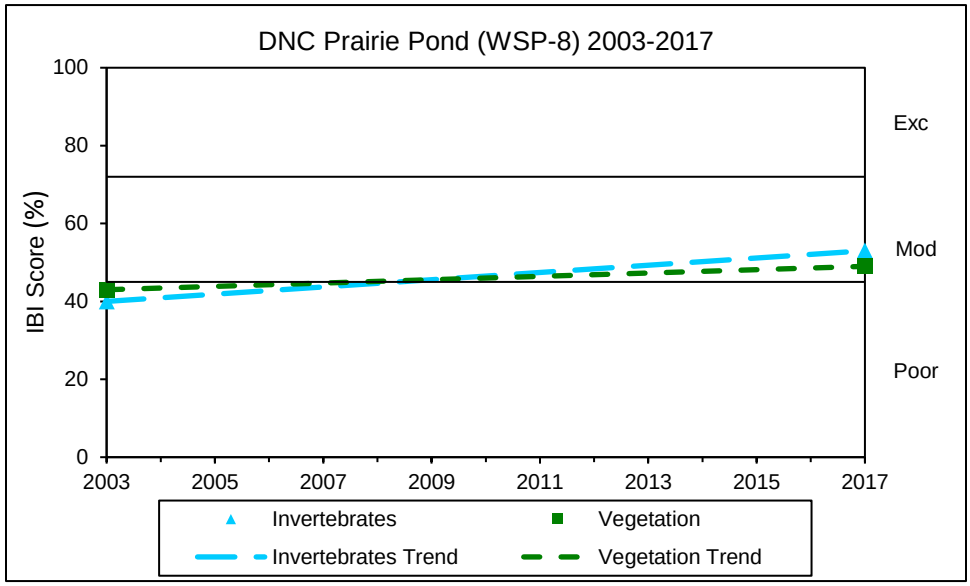
Dodge Nature Center Prairie Pond

Site Observations: The wetland slope is gentle, and the wetland substrate is mucky. Submergent vegetation, including coontail and pondweed, are dominant. Duckweed and water-meal cover the water surface. Reed canary grass surrounds the wetland. Tadpoles and fish were collected in the bottle traps. A bunch of small frogs were found at the site which delighted the younger volunteers!

Table 4.12.4 DNC Prairie Pond (WSP-8) Wetland Health based on Index of Biotic Integrity

2017 Data (WSP-8)	Invertebrates 	Vegetation 
Wetland Health Rating (IBI score)	Moderate (16)	Moderate (17)
Trend 2003-2017	Not enough data	Not enough data

Figure 4.12.4 Invertebrate and vegetation trends for DNC Prairie Pond (WSP-8)



Site summary: This is the second year WSP-8 has been monitored since 2003. The invertebrate and vegetation scores are consistent with each other in 2017, as well as in 2003. Both categories scored higher in 2017 than in 2003; however, the scores for each category have remained consistent. More years of data will help determine more reliable health trends. One family of leech, one family of mayfly, one family of caddisfly, three families of snails, and one family of crustacean were collected with dipnets. Fish and tadpoles were present in the bottle traps which probably impacted the invertebrate collection.

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-10	1	3	1	1	1	1	8
AV-12	1	3	1	3	3	3	14
AV-20	5	5	1	1	1	3	16
B-1	1	3	1	3	5	5	18
B-3	1	5	1	5	5	5	22
B-8	3	5	1	3	5	5	22
B-13	1	3	1	3	5	5	18
DC-1	1	5	3	3	3	3	18
DC-2	1	5	3	1	1	3	14
DC-3	3	1	1	1	1	1	8
DC-4	3	5	1	3	1	5	18
E-18	3	5	1	1	1	3	14
E-41	5	5	1	5	1	5	22
E-42	1	5	1	1	1	3	12
F-3	1	5	1	3	1	3	14
F-7	3	3	1	1	1	1	10
F-8	1	3	1	3	1	3	12
H-4	1	1	1	3	1	3	10
H-6	1	3	5	3	5	5	22
H-56	3	5	5	5	5	5	28
H-57	5	3	1	1	1	3	14
L-7	1	5	1	3	3	5	18
L-8	1	5	3	3	1	3	16
MH-2	1	3	3	5	1	5	18
MH-4	3	3	1	1	3	5	16
NCR-1	3	5	1	3	3	5	20
NCR-2	3	5	1	3	3	5	20
R-4	3	1	5	3	1	5	18
R-14	5	5	1	3	3	5	22
R-21	3	5	5	5	5	5	28
R-23	5	5	5	5	5	5	30
SSP-1	3	3	1	1	1	3	12
SSP-3	3	5	1	3	1	3	16
WSP-3	5	3	1	3	3	5	20
WSP-4	3	3	1	1	1	3	12
WSP-6	1	5	1	1	1	1	10
WSP-8	1	5	1	3	3	3	16

Appendix A-2. Vegetation Metric Scores

Site #	Nonvascular Taxa	Grasslike Genera	Carex Cover	Utricularia Presence	Aquatic Guild	Persistent Litter	Total IBI Score
AV-10	3	1	1	1	3	5	14
AV-12	1	3	3	1	3	5	16
AV-20	1	1	1	1	3	5	12
B-1	3	3	1	1	5	5	18
B-3	1	1	1	1	5	5	14
B-8	3	1	1	1	1	1	8
B-13	1	3	1	1	5	3	14
DC-1	3	3	1	1	3	5	16
DC-2	1	3	1	1	3	5	14
DC-3	1	3	1	1	1	5	12
DC-4	3	1	1	1	5	5	16
E-18	3	1	1	1	3	5	14
E-41	3	3	1	1	5	5	18
E-42	3	3	1	1	3	5	16
F-3	3	1	1	5	5	3	18
F-7	1	3	3	5	5	5	22
F-8	3	1	1	1	3	5	14
H-4	3	3	1	1	1	5	14
H-6	3	3	1	1	5	5	18
H-56	1	3	1	1	5	5	16
H-57	1	3	3	1	1	3	12
L-7	5	5	5	5	3	3	26
L-8	3	3	1	1	5	3	16
MH-2	3	3	1	1	5	3	16
MH-4	1	3	1	1	3	5	14
NCR-1	1	3	1	1	3	3	12
NCR-2	1	3	1	1	3	5	14
R-4	3	3	1	1	1	5	14
R-14	1	5	1	1	3	5	16
R-21	5	3	1	5	5	3	22
R-23	5	5	5	1	3	3	22
SSP-1	3	1	3	1	3	1	12
SSP-3	1	1	1	1	3	5	12
WSP-3	3	3	1	1	3	5	16
WSP-4	1	3	1	1	3	5	14
WSP-6	1	1	1	1	3	5	12
WSP-8	3	1	1	1	3	5	14

Appendix B. Invasive Species Presence 2012-2017

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-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	
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						
E-7		1					1	
E-10		1						
E-11		1					1	
E-18		1				1		
E-20		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	

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
E-41		1				1		
E-42		1						
F-3	1	1		1			1	
F-6		1					1	
F-7		1					1	
H-4		1	1				1	
H-6	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	
MH-4		1						
MH-16		1					1	
MH-17		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	
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						
WSP-4	1	1						
WSP-5		1						
WSP-6	1	1			1	1	1	
WSP-7		1						

Site	Purple loose-strife	Reed canary grass	Curly-leaf pond-weed	Eurasian Water-milfoil	Honey-suckle	Buckthorn	Chinese mystery snail	Banded mystery snail
WSP-8		1						
WSP-9		1						
WSP-10		1					1	
WSP-12	1							
WSP-18	1							
Totals:	23	79	2	2	1	8	43	2

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

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

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater wetlands	Natural Wetlands	Created Wetlands	Stormwater wetlands	Natural Wetlands
E-26		14			15	
E-27		18			21	
E-28		16			21	
E-29			12			27
E-31		20			13	
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	
F-1		14			16	
F-3		12			16	
F-4	11			15		
F-5		17			16	
F-6		16			10	
F-7		15			18	
F-8	17			16		
H-4	15			18		
H-6		20			21	
H-30	14			14		
H-56		20			17	
H-57	14			18		
L-4	16			20		
L-7		20			25	
L-8			22			20
L-9	17			17		
L-10			13			11
LD-1			14			17
MH-2		22			23	
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	

	Invertebrates			Vegetation		
Wetland	Created Wetlands	Stormwater wetlands	Natural Wetlands	Created Wetlands	Stormwater wetlands	Natural Wetlands
NCR-1			20			15
NCR-2			20			17
R-1		19			19	
R-2		21			17	
R-4		17			14	
R-6			18			18
R-14			22			24
R-18			26			19
R-20		17			16	
R-21	24			22		
R-22		22			22	
R-23	20			23		
R-25		12			23	
R-26			13			11
SSP-1		14			14	
SSP-3		18			14	
SSP-4		18			11	
WSP-1			18			18
WSP-2		17			16	
WSP-3		17			18	
WSP-4		15			20	
WSP-5			20			17
WSP-6			21			20
WSP-7		19			18	
WSP-8			20			16
WSP-9			12			11
WSP-10		22			17	
WSP-12		10			15	
AVERAGES	16	17	17	18	18	18

Appendix D. Wetland and Watershed Data for 2008-2017

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
AV-1	Hidden Valley	2	21	35	18	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	10	13
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	18	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	15
B-1	Crystal Lake West	0.9	444.5	5	18	21
B-1 Alt	Crystal Lake West Alternate	6	550	0	15	23
B-2	Cam Ram	0.41		0	12	11
B-3	Kraemer	30	93	30	22	17
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
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	28	21
DC-1	Empire Lake	21	1152	NA	18	21
DC-2	Buck Pond	1.6	25	NA	14	17
DC-3	Tamarck Swamp	7.7	40	0	8	15
DC-4	Jenson Lake	50	330	7	18	19
E-1	Thomas Lake Park Pond	0.4	4	37	18	21
E-7	Discovery Pond	4.1	16.5	0	20	21
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

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
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
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	2.5	20	13
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
F-1	Pine Knoll	35	107.5	10.4	NA	13
F-3	Kral Pond	10	41.8	6.6	14	21
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	10	25
F-8	Mystic Meadows	6.19	8.23	NA	12	15
H-4	Stonegate Treated	1	9.5	35	10	17
H-6	Lake Rebecca	19	56	1	22	21
H-30	Sand Coulee	1	107	25	8	13
H-56	180th Street Marsh	20	340	1	28	19
H-57	Cari Park Pond	0.78	29	14	14	15
L-4	Water Treatment Wetland Bank	22.85	99.8	20	14	15
L-7	DNR 387	10	2087	21	18	31
L-8	DNR 393	9.6	4987	17	16	19
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	18	21
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

Site ID	Site Name	Wetland size (Acres)	Watershed Size (Acres)	% Imperv	Invert. Score	Veg. Score
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
NCR-1	Wasner	0.5	160	2.5	20	15
NCR-2	Peterson	2	55	0	20	17
R-1	Kelly Marsh - Derryglen Ct in 2004	1	12.5	80	16	19
R-2	White Lake	333	998	10	18	23
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	30	14	19
R-21	CR-38 Mitigation Site 1	1.7	1530	30	28	23
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	16	13
SSP-1	Anderson Pond	2.4	168	15	12	15
SSP-3	LeVander	3.4	37.9	20	16	15
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	20	17
WSP-4	Wehke Pond	1.3	42.4	0	12	17
WSP-5	Lilly Lake	6.4	22	NA	20	19
WSP-6	Marthaler Park	4.5	23	NA	10	15
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