MINNEHAHA CREEK WATERSHED DISTRICT

QUALITY OF WATER QUALITY OF LIFE

MEMORANDUM

To: Board of Managers

From: Yvette Christianson and Kelly Dooley, Water Quality Managers

CC: Lars Erdahl, Craig Dawson

Date: September 10, 2015

RE: **Ecosystem Evaluation (E-Grade) Program Update**

This memorandum is a periodic update on the progress of the development of criteria and metrics for deep and shallow lakes, streams, and wetlands in the Ecosystem Evaluation (E-Grade) Program.

Background:

To promote greater understanding of the overall health of the watershed, Minnehaha Creek Watershed District (MCWD) is embarking on an Ecosystem Evaluation (E-Grade) Program. The E-Grade Program, which is currently under development, will not only assess deep lakes, but assess six other ecosystems - shallow lakes, streams, wetlands, land use, groundwater and hydrology throughout the Minnehaha Creek watershed. The ecosystems will be evaluated for their performance of the following functions to determine the overall health of the watershed:

- Habitat diversity
- Biodiversity
- Nutrient cycling
- Recreation
- Drinking water supply
- Flood control

Different types of data (e.g., nutrients, fish, aquatic insects, wetland vegetation, etc.) will be collected to examine the function and health of deep and shallow lakes, streams, wetlands, land use, groundwater and hydrology in each of the District's eleven subwatersheds. The eleven subwatersheds will be separated into three groups and will be assessed and reported on a 3-year cycle. The entire watershed will be assessed and reported on a 10-year cycle.

E-Grade Program Update since May 2015:

Subwatershed Groups and E-Grade Schedule

In response to the 5% levy that Board of Managers are considering, staff has adjusted the subwatershed groups and schedule for the E-Grade program. This adjusted schedule does not affect the development of the E-Grade Program. The E-Grade Program will still be completed in 2017.

Adjusted Subwatershed Groups –

Group #1: Schutz Lake, Six Mile Marsh, Minnehaha Creek

Group #2: Dutch Lake, Langdon Lake, Long Lake Creek, and Painter Creek

Group #3: Christmas Lake, Gleason Lake, Lake Minnetonka, and Lake Virginia

Adjusted E-Grade Schedule –

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Program Development												
Subwatershed Monitoring	Group 1										Group 1	
					Group 2							
								Group 3				
Reports					G1			G2			G3/WD	

Note: G# = Group # Report
WD = Watershed-Wide Report

Revised List of Metrics

Working with the Technical Advisory Committee (i.e. USGS, MNDNR, MPCA, and UMN) and small groups specialized in a particular area of focus, staff and Wenck Associates revised the preliminary List of the Metrics (See Attachment 1) for developing the deep and shallow lakes, streams, wetlands portion of E-Grade. Metrics will be developed for the additional features (land use, groundwater and hydrology) in 2016-2017. Each metric table follows a similar format:

Column 1: Ecosystem Services – The services upon which the feature (e.g., wetland) will be graded
Column 2: Functions – The function of the ecosystem service
Column 3: Measure – What will be measured or graded
Column 4: Metric – The data to be collected

The List of Metrics will not be finalized until E-Grade is completely developed in 2017.

Note: For the Lakes Metric Table, the Fish Index of Biological Integrity (IBI) measure will only be collected on deep lakes. Shallow lakes, which often winter kill, will be graded on the measure of Floristic Quality measure instead.

Data Collection

MCWD staff and Wenck Associates have been collecting the data this summer to develop the deep and shallow lakes, streams and wetlands portion of E-Grade. MCWD staff has been working with other agencies to use pre-existing metrics and to prevent data collection duplication.

Lakes

1) Fish Index of Biological Integrity (F-IBI) measure
   - To meet the criteria for the F-IBI, lakes have to be over 100 acres and maximum depth greater than 15 ft
   - Two types of fish surveys are needed at each lake:
     - Near shore seining and electrofishing
     - Trap nets and gillnets
   - The MN DNR already completed the fish surveys on Calhoun, Cedar, Harriet, Nokomis, Parley, and Wassermann lakes (e.g., some of the lakes in Group 1)
   - MCWD staff with Wenck Associates conducted fish surveys on the remaining, qualifying lakes in Group 1 this summer (Auburn, Piersons, Steiger, Schutz, and Zumbra lakes)
   - The MN DNR already conducted the trap nets and gillnets surveys on all the qualifying lakes within the Group 1, but Schutz Lake
     - Late July – the near shore seining and electrofishing surveys were conducted
     - Middle of August – the trap nets and gill nets surveys were conducted on Schutz Lake

2) Floristic Quality and Vegetation Abundance measures
   - Vegetation surveys in the spring and fall are needed to assess the plant communities in deep and shallow lakes
   - April to June – MCWD staff conducted the spring vegetation surveys
   - August to September – MCWD staff are currently conducting the fall vegetation surveys

3) Aquatic Invasive Species (AIS) measure
   - July – MCWD staff conducted the AIS surveys
   - UMN staff conducted carp surveys in Six Mile Marsh subwatershed

4) Sediment Chemistry measure
   - Wenck Associates – currently compiling lake sediment chemistry data within the test subwatersheds to provide a list of lakes that will need cores samples collected

5) Shoreline Condition measure
   - Wenck Associates – using GIS application to calculate lake shoreline condition from aerial photos

Wetlands

1) Vegetation measure
   - Rapid Floristic Quality Assessment (RFQA), developed by the Minnesota Pollution Control Agency (MPCA), is the monitoring protocol commonly used for assessing the wetland vegetation communities
   - 50 wetlands will be assessed, which is 5% of the total number of wetlands throughout Group 1
   - If statistical analysis indicates that 50 wetlands is not representative of the larger wetland population throughout Group 1, then additional wetland assessment may need to be conducted next year
   - Wenck Associates is conducting the RFQA
     - Assessment timeframe - middle of July through late September
     - By early September, 40 wetlands have been assessed

2) Soils measure
   - Wenck Associates will be collecting sediment cores from a sub-set of the wetlands surveyed
   - Staff will be coming to the Board for funding approval in September

Streams

1) Four measures - Habitat Complexity, Vegetation Uptake, Macroinvertebrate Index of Biological Integrity (M-IBI), and Aquatic Invasive Species (AIS)
   - For Habitat Complexity, Vegetation Uptake and AIS measures
     - Minnesota Stream Habitat Assessment (MSHA) is the monitoring protocol
   - For AIS and M-IBI measures
     - MPCA Invertebrate Community Sampling Protocol for Stream Monitoring Sites is the monitoring protocol
   - Staff will be conducting the stream habitat and AIS assessments, and invertebrate monitoring on
     - Early September – Six Mile Creek and Schutz Lake Creek
     - Middle of September – Minnehaha Creek

Next Steps:

Once data collection is complete, MCWD staff and Wenck Associates will be working on developing preliminary scores for the deep and shallow lakes. In October, the preliminary scores will be brought to the Technical Advisory Committee for feedback.

The Board of Managers can expect a presentation of the preliminary scores for deep and shallow lakes in late October or early November.

If there are questions about the E-Grade Program, please contact:

Yvette Christianson - 952-641-4514
Kelly Dooley - 952-641-4515

Attachment 1: Minnehaha Creek Watershed District - E-Grade Preliminary Metrics – REVISED

STREAMS

Ecosystem Service	Function	Measure	Metric
Habitat Diversity	Resilient biological community, food, nesting, refuge, streambank protection	Habitat complexity	Minnesota Stream Habitat Assessment (MSHA) - Instream Zone
			MSHA - Riparian Zone
			MSHA-Channel Morphology
		Connectivity	MSHA-Surrounding Land Use
			Access to floodplain - Bank height, width of floodplain
		Water Quality	Total Suspended Solids concentration
			Dissolved Oxygen concentration
		Hydrology	Flashiness Index
			Days of low flow
Biodiversity	Resilient biological community	Fish – Biological Integrity	Fish-Index of Biological Integrity
		Macroinvertebrate – Biological Integrity	Macroinvertebrate-Index of Biological Integrity
Nutrient Cycling	Nutrient sink, source, transformer	Vegetative uptake	MSHA - Aquatic Vegetation
		Nutrient concentration	Total Phosphorus concentration
			Total Kjeldahl Nitrogen (TKN) concentration (i.e., organic nitrogen + ammonia)
			Nitrate (NO_3) concentration
Recreation	Recreation, food, aesthetic or spiritual enjoyment	Access	Riparian public land (GIS)
			Public launch or access (GIS)
		Water Quality	*E. coli* concentration
		Aquatic Invasive Species	Categorize: absent, low, nuisance
Drinking Water Supply	Groundwater recharge	TBD	TBD
Flood Control	Conveyance	TBD	TBD

Wetlands

Ecosystem Service	Functions	Measure	Metrics
Habitat Diversity	Resilient biological community (watershed scale), shoreline protection	Connectivity	Barriers
			Proximity to other wetlands of same or different type and hydroperiod
			Width and continuity of unmanicured upland buffer
			Adjacent buffer land cover/land use (average width of naturalized buffer within 500 ft).
			Contiguity with Permanent Waterbody
			Fringing Deepwater Habitat
			Outlet Type/Hydrology/Flooding
		Size	Wetland Size
		Shoreline protection	Rooted shoreline vegetation (macrophyte cover along shoreline)
			Width of wetland between shoreline/streambank and deepwater/stream.
Biodiversity	Resilient biological community (wetland scale), food, nesting, refuge, shoreline protection	Vegetation	Rapid Floristic Quality Assessment (RFQA) -Weighted Coefficeint (wC) Score
			RFQA-Vegetation Community Interspersion (Horizontal)
			RFQA-Vegetation Strata (Vertical)
			RFQA-Vegetation Community Classification
			Vegetation Community Classification
			Vegetation Strata (Woody Vegetation)
			Vegetation Community-Water Interspersion
Nutrient Cycling	Nutrient sink, source, transformer	Vegetation	Percentage of woody, emergent, submergent, or floating-leaved vegetation.
			Vegetative Cover
			Decomposition of litter
			Adjacent area management for water quality
		Soils	Soil chemistry (National Wetland Condition Assessment) Phosphorus speciation in first 10 centimeters of sediment
		Connectivity	Stormwater pretreatment
		Land use	Dominant land use and condition of upland watershed or within 500 feet (Lee et al. 1997)
			Adjacent area management: average condition of vegetative cover for water quality, within 50 feet surrounding wetland assessment area.

Ecosystem Service	Functions	Measure	Metrics
Drinking water supply	Groundwater recharge	TBD	TBD
Flood Control	Watershed storage	Vegetation	Percentage of woody, emergent, submergent, or floating-leaved vegetation.
			Dominant land use and condition of upland watershed or within 500 feet
		Wetland Density	Proportion of wetlands within the subwatershed.

Deep and Shallow Lakes

Ecosystem Service	Functions	Measure	Metrics
Habitat Diversity	Fish, macroinvertebrate, and wildlife habitat	Floristic Quality	Species Richness
			Floristic Quality Index (FQI)
		Shoreline	Fringing Deepwater Habitat
			Rooted shoreline vegetation (macrophyte cover along shoreline.
			Width of wetland between shoreline/streambank and deepwater/stream.
			Adjacent buffer land cover/land use (average width of naturalized buffer within 500 ft). Different scales given for water quality, wildlife habitat.
			Percent developed shoreline
		Connectivity (# of culverts, dams, etc.)	Percent of connections to other lakes impeded by a culvert, dam or other water control structure.
Biodiversity	Resilient biological community	Fish IBI	Number of Native Species.
			Number of Intolerant Species.
			Number of Tolerant Species.
			Number of Insectivores.
			Number of Omnivores.
			Number of Cyprinids.
			Number of Small Benthic Dwellers.
			Number of Vegetation Dwellers.
			Ratio of Intolerants in Nearshore.
			Ratio of Small Benthic Dwellers in Nearshore.
			Ratio of Vegetation Dwellers in Nearshore.
			Ratio of Insectivore Biomass in Trapnet.
			Ratio of Omnivore Biomass in Trapnet.
			Ratio of Tolerant Biomass in Trapnet.
			Ratio of Carnivore Biomass in Gillnet.
			Presence or absence of intolerant fish species in the Gillnet.
		Floristic Quality	Plant richness
			Floristic Quality Index (FQI)
		Aquatic Invasive Species	Presence/absence and density of zebra mussels.
			Presence/absence and density of carp (shallow lakes).

Ecosystem Service	Functions	Measure	Metrics
			Presence/absence and density of Curly-leaf pondweed.
			Presence/absence and density of Eurasian watermilfoil.
			Presence/absence of flowering rush
Nutrient Cycling	Nutrient sink, source, transformer	Eutrophication indicators	Total Phosphorus concentration
			Chlorophyll-a concentration
		Sediment chemistry	Redox-Phosphorus concentration (iron bound, loosely bound, and labile P)
Public Recreation	Access	Public access	Presence/absence of public access (boat ramp, fishing pier, marinas, swimming beach)
	Navigation	Vegetation abundance	Density or aerial coverage of aquatic vegetation
	Swimmability	Water Quality	Secchi Depth
			E. Coli or Fecal Coliform counts
			Presence/absence and density of zebra mussels
Drinking Water Supply	Groundwater recharge	TBD	TBD
Flood Control	Watershed storage	TBD	TBD