BCMWC 2015 Watershed Management Plan

Section 3 – Assessment of Issues and Opportunities

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3.0 Assessment of Issues and Opportunities

This section of the Plan presents and discusses the issues and opportunities facing the Bassett Creek Watershed Management Commission (BCWMC), organized by various water topic categories. Issue identification was an important task in development of this Plan, and included a gaps analysis, the development of a Gaps Analysis document (see Appendix D), and a rigorous public participation process called the Watershed Assessment and Visioning Exercise (WAVE). The WAVE included an online survey with 174 respondents, a small group discussion and issues identification session in each city with city officials and/or city staff, a Watershed Summit event where the public prioritized issues, and a prioritization of issues by the Commission, Technical Advisory Committee (TAC) members, and technical partners (see Appendix E for WAVE results). The key issues identified through this process are among the following topic areas: 1) water quality; 2) water quantity and flooding; 3) erosion/sedimentation; 4) streams; 5) wetlands, habitat, and shoreland areas; 6) groundwater; 7) education and outreach; and 8) implementation and responsibilities (administration). The issues are discussed in the respective topical subsections below.

3.1 Water Quality

Pollutants are discharged to surface waters as either point sources or non-point sources. Point source pollutants discharge to receiving surface waters at a specific point from a specific identifiable source. Discharges of treated sewage from a wastewater treatment plant or discharges from an industry are examples of point sources. Unlike point sources, non-point source pollution cannot be traced to a single source or pipe. Instead, pollutants are carried from land to water in stormwater or snowmelt runoff, in seepage through the soil, and in atmospheric transport. All these forms of pollutant movement from land to water make up non-point source pollution.

For most waterbodies, non-point source runoff—especially stormwater runoff—is a major contributor of pollutants. As urbanization increases and other land use changes occur in the watershed, nutrient and sediment inputs (i.e., loading) from stormwater runoff can far exceed the natural inputs to waterbodies. In addition to phosphorus and sediment, stormwater runoff may contain pollutants such as chlorides, oil, grease, chemicals (including hydrocarbons), nutrients, metals, litter, and pathogens, which can severely reduce water quality.

For lakes, ponds, and wetlands, phosphorous is typically the pollutant of major concern. Land use changes resulting in increased imperviousness (e.g., urbanization) or land disturbance (e.g., urbanization, construction, or agricultural practices) result in increased amounts of phosphorus carried in stormwater runoff. In addition to watershed (stormwater runoff) sources, other possibly significant sources of phosphorus include atmospheric deposition, internal loading (e.g., release from anoxic sediments, algae die-off, aquatic plant die-back, and fish-disturbed sediment), and failing subsurface sewage treatment systems (SSTS).

As phosphorus loadings increase, it is likely that water quality degradation will accelerate, resulting in unpleasant consequences such as profuse algae growth or algal blooms. Algal blooms, overabundant aquatic plants, and the presence of nuisance/exotic species, such as Eurasian watermilfoil, purple loosestrife, and curlyleaf pondweed, interfere with ecological function as well as recreational and aesthetic uses of waterbodies. Phosphorus loadings must often be reduced to control or reverse water quality degradation.

The Minnesota Pollution Control Agency (MPCA) is the state regulatory agency primarily tasked with protecting and improving water quality in Minnesota. In its enforcement of the federal Clean Water Act (CWA), the MPCA administers the Municipal Separate Storm Sewer System (MS4) permit program (see Section 5.1.3.3). All BCWMC member cities are required to maintain an MS4 permit from the MPCA and annually submit an MS4 report to the MPCA. The numerous and expanded requirements of the MPCA's MS4 permit present opportunities for the BCWMC to cooperate with member cities to prevent redundancy in implementing or reporting on activities related to water quality.

In administering the CWA in Minnesota, the MPCA also maintains a list of impaired waters (see Section 2.7.2.1). The MPCA performs Total Maximum Daily Load (TMDL) studies to address impaired waters. A watershed restoration and protection strategy (WRAPS) is similar to a TMDL and may examine other waterbodies in the watershed in addition to impaired waterbodies. Both TMDLs and WRAPSs may result in implementation plans to address water quality issues of the affected waterbodies. Future TMDL and/or WRAPS implementation presents an opportunity for the BCWMC to coordinate water quality improvement efforts between the member cities, especially for waterbodies with intercommunity drainage areas.

Improving and protecting water quality is a primary focus of the BCWMC. Prior to the development of this Plan, the BCWMC and its member cities implemented several projects aimed at improving water quality (see Table 5-5). During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Lack of consistency between BCWMC water quality standards ("Level I") and other applicable standards, such as the MS4 permit
- Updates needed in the list of acceptable best management practices (BMPs) in the *BCWMC Requirements for Improvements and Development* (BCWMC Requirements document, see Appendix H)
- Interest in implementing an infiltration performance standard
- Need for additional clarity in Total Maximum Daily Load (TMDL) study roles
- Maintenance responsibilities for water quality improvement projects
- Exploring partnerships for water quality monitoring

In addition to the Gaps Analysis, the public weighed in on water quality issues through the WAVE. Survey respondents ranked water pollution, water clarity, and sedimentation among their highest concerns for waterbodies in the watershed. Reducing stormwater runoff volumes, contaminants, and algal blooms were viewed by the public as having the most positive impact on water quality. When prioritizing issues at the Watershed Summit, the public ranked the effects of stormwater runoff and degraded water quality as the 3rd and 4th highest priorities, respectively. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked the effects of stormwater runoff and degraded water quality as their 1st and 3rd highest priorities, respectively (see Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies and implementation program. Specifically, the BCWMC identified strategic waterbodies, updated its water quality monitoring program, established policies, and adopted the MPCA's Minimal Impact Design Standards (MIDS) and Flexible Treatment Options performance standards.

3.2 Water Quantity and Flooding

In a natural, undeveloped setting, the ground is often pervious, which means that water (including stormwater runoff) can infiltrate into the soil. Land development dramatically changes how stormwater runoff moves in the local watershed. The changes begin during construction, when clearing and grading of the site results in less infiltration, higher rates and volumes of stormwater runoff, and increased erosion. As construction continues, ground surfaces become covered with impervious materials (e.g., asphalt and concrete) that prevent infiltration of water into the soil. As a result, the rate and volume of stormwater runoff from the site further increases, which can create significant problems for downstream water resources. Further, the reduced amount of infiltration means less water is being recharged into the groundwater system, which can result in decreased baseflows in creeks and streams and, potentially, a loss to the long-term sustainability of groundwater drinking supplies.

If the land drains to a landlocked basin, the additional volume of runoff can increase the water level and flood level of the basin. If the land drains to a stream, the additional runoff volume can cause the stream to flow full for longer durations, which increases the erosion potential. The increase in runoff rates from sites can also increase flooding risks and erosion.

Although both high-water levels (flooding) and low-water levels are of concern to watershed residents and public officials/staff, more concern and attention is usually paid to flooding because it is a greater threat to public health and safety and can result in significant economic losses. Flooding may cause other damages that are harder to quantify, including the following:

- Flooding of roads so they are impassable to emergency vehicles and residents
- Shoreline erosion
- Destruction of riparian habitats and vegetation such as grass, shrubs, trees, etc.
- Unavailability of recreational facilities for use by the public (e.g., inundation of shoreline) and/or restricted recreational use of waterbodies

- More strain on budgets and personnel for repairing flood-damaged facilities and controlling public use of facilities during flooding events
- Alterations to the mix and diversity of wildlife species as a result of inundation of habitats

Of special concern is flooding on landlocked waterbodies, which prolongs the damages and impacts. When there is no surface outlet, runoff which collects in these depressions is removed only by seepage and evaporation. As water tables rise during periods of above-average precipitation, seepage out of landlocked basins can also decrease. As a result, landlocked basins are subject to wide variations in water levels and their 100-year floodplains typically cover large areas. Landlocked basins can also provide benefits. The long-lasting seepage from landlocked basins provides important groundwater recharge benefits. Also, landlocked basins do not discharge surface waters to downstream basins, which could otherwise be negatively impacted by the additional stormwater volume. Lost Lake is the largest landlocked basin in the BCWMC (see Section 2.6.4.4).

Aging stormwater control facilities and rapid urbanization caused the Bassett Creek watershed to experience flooding problems beginning in the 1960s. Severe storms in the summers of 1974, 1978, and 1987 resulted in millions of dollars in damage to homes and infrastructure. A modest storm (2.5 inches over 24 hours) in the spring of 1975 was exacerbated by wet antecedent conditions, again resulting in damage to homes. In a 1982 design memorandum, the US Army Corps of Engineers (USACE) estimated the damages sustained by Bassett Creek flooding were approximately $4 million per year (extrapolated to 2014 dollars). The worst problem was the 1.5-mile long Bassett Creek Tunnel, which was undersized and severely deteriorated.

To address the major flooding along Bassett Creek, the BCWMC cooperated with the USACE, Minnesota Department of Transportation (MnDOT), Minnesota Department of Natural Resources (MDNR), and its member cities to construct the Bassett Creek Flood Control Project (see Section 2.8.1). Although major flooding along Bassett Creek has been addressed, some homes remained in the floodplain following the construction of the Flood Control Project. In addition, the BCWMC and member cities are aware of local flooding issues within the watershed that are not adjacent to Bassett Creek (e.g., DeCola Ponds, Medicine Lake Road).

The current flood control issues include maintenance and repair of the Flood Control Project system, flood-proofing or removal of homes that are remaining in the floodplain, and implementing appropriate stormwater volume and rate controls during development and redevelopment to prevent additional flooding.

Low water levels on Medicine Lake is another water quantity-related issue where the BCWMC has been involved in recent years. The following list summarizes the recent involvement of the BCWMC:

- In 2009, lake residents requested that the BCWMC address low water levels in the lake because of the impact on some recreational activities. The lake residents requested that the BCWMC analyze the effect of altering the height of the lake’s outlet structure (i.e., raising the elevation) on lake levels.

- In 2009, the BCWMC Engineer summarized and reported data on recent precipitation and lake levels throughout the Metro Area.

- In 2012, the BCWMC presented further information on the dam and the history of water levels in Medicine Lake.

- In 2014, in response to continued requests from lake residents for the BCWMC to perform a study of the effect of alterations to the Medicine Lake outlet structure on lake water levels, the BCWMC Engineer prepared a list of components likely needed for such a study.

- In 2014, the BCWMC hosted a Medicine Lake stakeholder meeting that included presentations from technical experts about the lake and its various issues, including water levels.

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to update precipitation frequency estimates from TP-40 to Atlas 14 figures

- Opportunity to clarify and update rate control performance standards

- Inconsistency between BCWMC-determined 100-year flood elevations and FEMA's 100-year flood elevations

- Opportunity to incorporate flood control objectives into other capital projects

In addition to the Gaps Analysis, the public weighed in on water quantity and flooding issues through the WAVE. Survey respondents ranked flooding quite low in their list of concerns for waterbodies. However, they ranked the stability of water levels among their highest concerns – with most respondents referring to water levels on Medicine Lake. When prioritizing issues at the Watershed Summit, participants ranked Medicine Lake water levels as a high priority, while flooding and water levels in other areas of the watershed ranked 7th out of 10 issues. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked water quantity and flooding as a top priority, just below the effects of stormwater runoff on water quality (Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies and implementation program. Specifically, the BCWMC updated policies addressing rate control, clarified maintenance responsibilities for elements of the Flood Control Project, and seeks to update its floodplain and flood elevations to reflect the most current precipitation data.

3.2.1 Floodplain Management

Floodplain management is the management of development and other activities in or near the floodplain to prevent flood damages. The MDNR defines floodplain management as *"the full range of public policy and action for ensuring wise use of the floodplains. It includes everything from collection and dissemination* *of flood control information to actual acquisition of floodplain lands, construction of flood control measures, and enactment and administration of codes, ordinances, and statutes regarding floodplain land use."*

Minnesota law defines the floodplain as the land adjoining lakes, water basins, rivers, and watercourses that has been or may be covered by the "100-year" or "regional" flood. Floodplains of larger basins and streams are mapped by the Federal Emergency Management Agency (FEMA) on Flood Insurance Rate Maps (FIRMs), which are included in community Flood Insurance Studies (FIS). The BCWMC reviews proposed activities in designated floodplain, as described in the BCWMC Requirements document.

Floodplains within the BCWMC were established prior to the publication of the National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 precipitation data (see Section 2.2). Updating BCWMC floodplains based on current precipitation data may increase floodplain areas within the BCWMC and result in additional structures located within the floodplain.

As development and redevelopment occur within the watershed, appropriate rate and volume controls are necessary to avoid creating future flooding issues or exacerbating existing flooding issues. The BCWMC established rate control performance standards as described in Policy 31 (see Section 4.2.2) and its Requirements document. Volume control is directly addressed through the BCWMC's adoption of the MPCA's Minimal Impact Design Standards (MIDS) and Flexible Treatment Options performance standards.

3.3 Erosion and Sedimentation

Sediment is a major contributor to water pollution. Stormwater runoff from streets, parking lots, and other impervious surfaces carries suspended sediment consisting of fine particles of soil, dust, and dirt. Abundant amounts of suspended sediment are carried by stormwater runoff from actively eroding areas.

Although erosion and sedimentation are natural processes, they are often accelerated by human activities, especially during construction activities. Prior to construction, the existing vegetation on the site intercepts rainfall and slows down stormwater runoff rates, which allows more time for runoff to infiltrate into the soil. When a construction site is cleared and graded, the vegetation (and its beneficial effects) is removed. Also, natural depressions that provided temporary storage of rainfall are filled and graded, and soils are exposed and compacted, resulting in increased erosion, sedimentation, and decreased infiltration. As a result, the rate and volume of stormwater runoff from the site increases (*Minnesota Urban Small Sites BMP Manual*, 2001). The increased stormwater runoff rates and volumes cause increased soil erosion, which releases significant amounts of sediment that may enter water resources.

Regardless of its source, sediment deposition decreases water depth, degrades water quality, smothers fish and wildlife habitat, and degrades aesthetics. Sediment deposition can also wholly or partially block culverts, manholes, storm sewers, etc., causing flooding. Sediment deposition in detention ponds and wetlands also reduces the storage volume capacity, resulting in higher flood levels and/or reducing the amount of water quality treatment provided. Suspended sediment carried in water can cloud lakes and streams and disturb aquatic habitats. Sediment also reduces the oxygen content of water and is a major source of phosphorus, which is frequently bound to the fine particles. Erosion also results in channelization of stormwater flow, increasing the rate of stormwater runoff and further accelerating erosion.

As erosion and sedimentation increase, the stormwater management systems (e.g., ponds, pipes) require more frequent maintenance, repair, and/or modification to ensure they will function as designed. In recognition of these issues, the BCWMC reviews projects which result in more than 200 yards of cut or fill or more than 10,000 square feet of grading. For these projects, the BCWMC requires an erosion and sediment control plan meeting requirements specified in the BCWMC Requirements document.

In addition to meeting BCWMC and member city requirements, owners and operators of construction sites disturbing 1 or more acres of land must obtain a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit from the MPCA. Owners/operators of sites smaller than 1 acre that are a part of a larger common plan of development or sale that is 1 acre or more must also obtain permit coverage. A key permit requirement is the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) with appropriate best management practices (BMPs). The SWPPP must be a combination of narrative and plan sheets that: (1) address foreseeable conditions, (2) include a description of the construction activity, and (3) address the potential for discharge of sediment and/or other potential pollutants from the site. The SWPPP must include the following elements:

- Temporary erosion prevention and sediment control BMPs
- Permanent erosion prevention and sediment control BMPs
- Permanent stormwater management system
- Pollution prevention management measures

A project's plans and specifications must incorporate the SWPPP before applying for NPDES Permit coverage. The permittee must also ensure final stabilization of the site, which includes final stabilization of individual building lots.

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Outdated references to the NPDES Construction Stormwater Permit
- Opportunity to refine triggers for BCWMC review of erosion and sediment control plans and coordinate erosion and sediment control inspections with member cities
- Accumulation of sediment deltas downstream of stormwater system outfalls

In addition to the Gaps Analysis, the public weighed in on sedimentation and erosion issues through the WAVE. Survey respondents ranked shoreline erosion and sedimentation among their highest concerns for waterbodies in the watershed. When prioritizing issues at the Watershed Summit, the public ranked degraded habitats as their 2nd highest priority, especially noting the issues of eroded streambanks and sedimentation. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked degraded streams and shorelines (mostly due to erosion) as the 5th most important issue out of 10 issues (Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies and implementation program. Specifically, the BCWMC updated policies to reference current state requirements for erosion and sediment control, deferred inspection of erosion and sediment control practices on BCWMC-reviewed projects to member cities, and established a policy to address sediment deltas downstream of intercommunity stormwater outfalls.

3.4 Streams

Increased rates and volumes of runoff, resulting from urbanization and other activities, can degrade a stream's hydrology and physical condition, its water quality, its function as aquatic habitat, and can reduce the amount of groundwater flowing to a stream. Negative impacts resulting from increased development are summarized in Table 3-1, developed from information published in the *Minnesota Stormwater Manual*.

Hydrologic, geomorphic, and water quality changes can impact the overall ecological health of streams. Insects and other inhabitants are indicators of stream health. Some insects can only survive in high quality water, whereas others can survive in much poorer quality of water. A healthy stream has a good diversity of insects and stream inhabitants. The BCWMC monitors macroinvertebrates in Bassett Creek to assess overall stream health (see Section 2.7.1.1.2).

Streambank, ravine and gully erosion degrade the appearance, usability, ecological health and water quality of streams. The BCWMC has implemented erosion control and stabilization capital projects along Bassett Creek. To prevent potential future impacts to BCWMC streams, the BCWMC reviews projects that may affect the water surface elevation, shoreline, or streambank areas. The BCWMC reviews projects located within in the floodplains of BCWMC creeks and streams, per the BCWMC Requirements document.

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to create a more comprehensive approach to prioritizing stream restoration projects
- Opportunity to emphasize soft armoring techniques for streambank restoration and stabilization projects

In this Plan, the BCWMC addresses the above issues through its policies. Specifically, the BCWMC updated policies related to capital project selection and prioritization, placed an emphasis on specific stream restoration and stabilization practices referenced by the Minnesota Department of Natural Resources (MDNR), and created a policy requiring buffers along streams during some development and redevelopment projects.

Table 3-1 Impacts of Urbanization on Streams

Type of Impact	Specific Impacts
Stream Hydrology Impacts	• **Increased frequency of bankfull and near bankfull events**: Increased runoff volumes and peak flows increase the frequency and duration of smaller bankfull and near bankfull events, which are the primary channel forming events. • **Increased flooding**: Increased runoff volumes and peak flows also increase the frequency, duration and severity of out-of-bank flooding. • **Lower dry weather flows (baseflow):** Reduced infiltration of stormwater runoff could cause reduced shallow groundwater inflow during dry weather periods resulting in less baseflow in streams.
Stream Geomorphology Impacts	• **Stream widening and bank erosion**: Stream channels widen to accommodate increased runoff and higher stream flows from developed areas. More frequent small and moderate runoff events undercut and scour the lower parts of the streambank, causing the steeper banks to slump and collapse during larger storms. • **Higher flow velocities**: Higher flow velocities result in increased streambank erosion rates, which can cause a stream to widen many times its original size. • **Stream downcutting**: Streams accommodate higher flows by downcutting their streambed. This causes instability in the stream profile, or elevation along a stream's flow path, which increases velocity and triggers further channel erosion both upstream and downstream. • **Loss of riparian canopy**: As streambanks are gradually undercut and slump into the channel, the vegetation (e.g., trees, shrubs) that had protected the banks are exposed at the roots. This leaves them more likely to be uprooted or eroded during major storms, further weakening bank structure. • **Changes in the channel bed due to sedimentation**: Due to channel erosion and other sources upstream, sediments are deposited in the stream as sandbars and other features, covering the channel bed, or substrate, with shifting deposits of mud, silt and sand. • **Increase in the floodplain elevation:** To accommodate the higher peak flow rate, a stream's floodplain elevation typically increases following development in a watershed. Property and structures that had not previously been subject to flooding may now be at risk.

Table 3-1 Impacts of Urbanization on Streams

Type of Impact	Specific Impacts
Aquatic Habitat Impacts	• **Degradation of habitat structure**: Higher and faster flows can scour channels and wash away entire biological communities. Streambank erosion and the loss of riparian vegetation reduce habitat for many fish species and other aquatic life, while sediment deposits can smother bottom-dwelling organisms and aquatic habitat. • **Loss of pool-riffle structure**: Streams draining undeveloped watersheds often contain pools of deeper, more slowly flowing water that alternate with "riffles" or shoals of shallower, faster flowing water. These pools and riffles provide valuable habitat for fish and aquatic insects. Increased flows and sediment loads from urban watersheds can replace pools and riffles with more uniform streambeds that provide less varied aquatic habitat. • **Reduced baseflows**: Reduced baseflows that may result from increased impervious cover in a watershed and the loss of rainfall infiltration into the soil and water table adversely affect in-stream habitats, especially during periods of drought. • **Increased stream temperature**: Runoff from warm impervious areas (e.g., streets and parking lots), storage in impoundments, loss of riparian vegetation and shallow channels can all cause an increase in temperature in urban streams. Increased temperatures can reduce dissolved oxygen levels and disrupt the food chain. Certain aquatic species, such as trout, can only survive within a narrow temperature range. • **Decline in abundance and biodiversity:** When there is a reduction in various habitats and habitat quality, both the number and the variety, or diversity, of organisms (e.g., wetland plants, fish, and macroinvertebrates) are also reduced. Sensitive fish species and other life forms disappear and are replaced by those organisms that are better adapted to the poorer conditions. Fish and other aquatic organisms are impacted not only by the habitat changes brought on by increased stormwater runoff quantity, but are often also adversely affected by water quality changes.

3.5 Wetlands, Habitat, and Shoreland Areas

Diverse wetland systems and shoreland areas are critical components of a healthy hydrologic system and positively affect soil systems, groundwater and surface water quality and quantity, wildlife, fisheries, aesthetics, and recreation. The benefits of wetlands and shoreland can be compromised by hydrologic alterations, exotic and invasive species, and erosion and sedimentation. The effectiveness of wetland communities for wildlife habitat, and for human appreciation, is greatly increased when they are physically or functionally connected with other native communities.

Wetlands are a key element of the hydrologic system. Wetlands have several functions that can provide hydrologic and water quality benefits, including:

- Maintaining stream baseflow

- Recharging groundwater
- Providing flood storage and attenuating peak flows
- Providing erosion protection
- Physically filtering particulates (and pollutants attached to particulates) from runoff
- Biologically removing nutrients from runoff in some wetlands and at certain times of the year

Development of land and other human activities can affect the hydrology in wetlands and shoreland areas. Numerous wetlands within the BCWMC have already been affected by hydrologic alterations, both direct and indirect. Some of the activities that can affect wetland hydrology include:

- Ditching and drain tiling; often for agricultural purposes, but also for flood control
- Groundwater pumping; typically from surficial aquifers, but also from confined aquifers
- Lowering natural outlet elevations; thereby draining water from areas that naturally flooded
- Reducing the volume of water reaching a wetland through watershed diversions
- Filling, which can impact remaining wetland areas by increasing water level fluctuations
- Removing wetland vegetation; often to improve access or for aesthetic reasons

Wetlands and shoreland areas are important for protecting and maintaining downstream water quality and the ecological integrity of the communities that inhabit these areas. Overloading wetlands beyond their natural capacity with water, sediment, or nutrients can diminish their effectiveness in providing water quality benefits. Most natural wetland systems have developed with relatively low levels of sediment and nutrient inputs (riparian wetlands located in floodplains are an exception). When land use and/or upstream hydrologic systems become altered, the hydraulic, natural sediment, and nutrient loads can (and often do) increase in magnitude and frequency. These changes may result in tipping the ecological balance to benefit non-native and invasive plant species, thereby reducing the benefits to wildlife, fisheries, amphibians, and humans. Degraded water quality in wetlands can pass on to downstream waters, contributing to degradation of additional resources.

Wetlands and shoreland areas provide valuable habitat for many types of wildlife including waterfowl, songbirds, raptors, mammals, fish, and many species of amphibians. It is difficult to determine the value of wetlands for wildlife due to the specialized requirements of each species. However, it is possible to determine wildlife, fisheries, and amphibian habitat values in a general sense. Maintaining and improving wildlife viability requires that water resources and land management activities consider the life cycles of various animals. By considering habitat benefits or detriments when approaching water resources projects, the BCWMC has the opportunity to enrich the ecological fabric of the area.

The overall ecological health of wetland and shoreland areas can be significantly impacted by the presence or absence of vegetated buffers (see Section 3.5.1) and aquatic invasive species (see Section 3.5.2).

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to develop more comprehensive wetland management regulatory controls
- Opportunity to develop more comprehensive buffer width requirements
- Opportunity to address protection of rare and endangered species
- Need to clarify the BCWMC's role in managing aquatic invasive species (AIS)

In addition to the Gaps Analysis, the public weighed in on wetlands, habitat, and aquatic invasive species (AIS) issues through the WAVE. Survey respondents ranked the spread of AIS as their #1 concern, while "abundance and diversity of wildlife" ranked in the middle of the issues. When prioritizing issues at the Watershed Summit, the public ranked degraded habitats as their 2nd highest priority, especially noting AIS. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked the lack of biodiversity and wetlands as their 8th and 9th highest priorities out of 10 issues (see Appendix E).

In this Plan, the BCWMC addresses the above issues through its goals, policies and implementation program. Specifically, the BCWMC requires member cities to adopt wetland management ordinances meeting specific criteria, requires minimum buffer widths for high quality wetlands and priority waterbodies (see Policy 68, Section 4.2.6), developed policies addressing its role in the management of aquatic invasive species (see Policy 72 in Section 4.2.6 and Policy 79 in Section 4.2.8), and developed a policy to cooperate with the MDNR and others to protect and report rare and endangered species.

3.5.1 Wetland and Shoreland Buffers

Buffers are upland, vegetated areas located adjacent to wetlands and shoreland areas. Many of the hydrologic, water quality, and habitat benefits achieved by wetland and shoreland areas are directly attributable to or dependent on the presence of buffers. Vegetation and organic debris shield the soil from the impact of rain and bind soil particles with root materials, reducing erosion. Vegetation obstructs the flow of runoff, thereby decreasing water velocities, allowing infiltration, and reducing the erosion potential of stormwater runoff. Leaf litter from vegetation can also increase the organic content of the soil and increase adsorption and infiltration. As a physical barrier, vegetation also filters sediment and other insoluble pollutants from runoff. Vegetation scatters sunlight and provides shade, reducing water temperature in the summer, limiting nuisance algae growth, and reducing the release of nutrients from the sediment. Buffers also have habitat benefits; native plants provide the best food and shelter for native wildlife, fish, and amphibians. Buffers provide needed separation and interspersion areas for animals, to reduce competition and maintain populations.

The presence of adequate buffers surrounding wetland and shoreland areas is critical to preserving the ecological functions and environmental benefits of downstream waterbodies, including wetlands. Establishing buffers in developed areas may be difficult, as existing structures may be located within the desired buffer area. Redevelopment offers an opportunity to establish adequate buffers in areas that are already developed.

3.5.2 Aquatic Invasive Species (AIS)

The term "invasive species" describes plants, animals, or microorganisms within lakes and streams that are non-native and that 1) cause or may cause economic or environmental harm or harm to human health, or 2) threaten or may threaten natural resources or the use of natural resources in the state (Minnesota Statutes Chapter 84D.01). Aquatic invasive species (AIS) is a term given to invasive species that inhabit lakes, wetlands, rivers, or streams and overrun or inhibit the growth of native species. Aquatic invasive species pose a threat to natural resources and local economies that depend on them.

The presence of non-native species and invasive species can impair the ecological, aesthetic, and recreational functions of aquatic, wetland and shoreland areas. Not all non-native species are invasive; "invasive" refers to those non-native species that are able to out-compete, displace, and even eliminate native species (i.e., some "non-native" species to the region are able to coexist with native species).

Under direction from the Minnesota Legislature, the MDNR established the Invasive Species Program in 1991. The program is designed to implement actions to prevent the spread of invasive species and manage invasive aquatic plants and wild animals (Minnesota Statutes 84D). The goals of the MDNR Invasive Species Program are to:

1. Prevent the introduction of new invasive species into Minnesota
2. Prevent the spread of invasive species within Minnesota
3. Reduce the impacts caused by invasive species to Minnesota's ecology, society, and economy

As part of its Invasive Species Program, the MDNR maintains a list of waters infested with specific AIS (MDNR Designation of Infested Waters, 2013 as amended). The MDNR list includes several BCWMC priority waterbodies as infested with Eurasian watermilfoil, including:

- Medicine Lake
- Parkers Lake
- Wirth Lake

In 2014 the MN Legislature approved Statute 477A.19, instituting a new county aid tax bill that will provide $4.5 million in 2014 and $10 million a year in 2015 and years after to Minnesota counties to help prevent the spread of aquatic invasive species. Find more information at http://www.dnr.state.mn.us/invasives/ais/prevention.html.

The MDNR's list of AIS infested waterbodies may not include all known AIS occurrences within the BCWMC. The MDNR infested waters list does not include curlyleaf pondweed, which has been identified in several BCWMC waterbodies.

Of the AIS identified in the BCWMC, curlyleaf pondweed is of special concern due to its potential as a source of internal phosphorus loading. This submersed aquatic plant grows vigorously during early spring, outcompeting native species for nutrients. After curlyleaf pondweed dies out in early to mid-summer, decay of the plant releases nutrients and consumes oxygen, exacerbating internal sediment release of phosphorus. This process may result in algal blooms during the peak of the recreational use season, which further inhibit native macrophytes by reducing water clarity and blocking sunlight necessary for growth.

Invasive aquatic animals present in the BCWMC include common carp, which can degrade water quality, especially in shallow lakes and wetlands. Carp feeding techniques disrupt shallow-rooted plants, which can reduce water clarity and possibly release phosphorus bound in sediment, leading to increased algal blooms and a decline in native aquatic plants. Common carp are also present in the Mississippi River. Common carp are typically spread between lakes by the accidental inclusion and later release of live bait, but can also migrate through natural or built channels as adults.

Zebra mussels have not been identified in BCWMC waterbodies, but are present in several surrounding watersheds. Zebra mussels can cause problems for lakeshore residents and recreationists by clogging water intakes and attaching to motors and possibly clogging cooling water areas. Zebra mussel shells can cause cuts and scrapes if they grow large enough on rocks, swim rafts and ladders. Zebra mussels can also attach to native mussels, killing them. Zebra mussels filter plankton from the surrounding water, which can result in improved water clarity and result in more aquatic vegetation. In large populations, zebra mussel filter feeding could impact the food chain, reducing food for larval native fish. Zebra mussels are typically spread as adult mussels attached to boats or aquatic plants, or as larvae carried in bait buckets, bilges, or any other water moved from an infested lake or river.

Based on their potential environmental impact and the difficulty of eradication once a waterbody is infested, the BCWMC is interested in preventing the spread of AIS and managing the AIS already present in BCWMC waterbodies. To this end, this Plan clarifies the BCWMC's role as a supporter of collaborative AIS management efforts (see Policy 79 in Section 4.2.8) and continues BCWMC monitoring for AIS as part of its ongoing monitoring efforts.

3.5.3 Member City Wetland Management and Wetland Classification

The BCWMC currently acts as the local governmental unit (LGU) responsible for administering the Wetland Conservation Act (WCA) in the Cities of St. Louis Park, Robbinsdale, and Medicine Lake. The remaining BCMWC member cities serve as the LGUs for their own communities.

Per the requirements of WCA, each BCWMC member city must maintain a comprehensive wetland inventory or inventory, classify, and assess the functions and values of wetlands on an as-needed basis. The BCWMC adopts the Minnesota Rapid Assessment Method (MnRAM) and encourages member cities to use this method when performing functions and values assessments. The BCWMC encourages member cities to complete comprehensive wetland management plans as part of their local water management plans.

Wetland management performance standards implemented through member city ordinances are a primary means for protecting BCWMC wetlands. To promote consistency in wetland management, the BCWMC requires that member cities develop and implement wetland protection ordinances (or other local controls applicable to wetlands) that:

- Consider the results of functions and values assessments
- Are based on comprehensive wetland management plans, if available
- Include performance standards for wetlands classified as Preserve or Manage 1 similar to BWSR guidance that address:
    - bounce
    - inundation
    - runout control

Section 4.2.6 of this Plan describes other wetland management policies of the BCWMC.

3.6 Groundwater

Groundwater is a finite resource with inputs and outputs. The input is generally rainwater and snowmelt that seeps into the ground (recharge). The outputs can be groundwater that is pumped out for human use and groundwater that naturally discharges to lakes, wetlands, and streams. The inputs and outputs need to be managed to ensure a sustainable groundwater supply. While rainfall and snowmelt are variable factors the BCWMC cannot control, the amount of rainfall or snowmelt that becomes recharge is affected by land use. Development generally results in larger impervious areas and more compacted soils, thus decreasing opportunities for infiltration and recharge. In addition, population increases may result in additional groundwater appropriations to meet municipal demands.

Long-term well data collected by the MDNR, United States Geological Survey (USGS), and others identifies declines in groundwater levels across the state. In response to mounting concern about groundwater supply, the MDNR published a draft strategic plan identifying strategies and actions intended to achieve sustainable use of groundwater resources (MDNR, 2013), and established three pilot Groundwater Management Areas (GWMAs).

The BCWMC recognizes that surface water resources and groundwater resources are interdependent. Precipitation and snowmelt that infiltrate the ground surface may ultimately discharge to streams, lakes, and wetlands. Groundwater levels that are higher than the water level of adjacent surface waters create a gradient (or head differential) driving groundwater flow toward the surface water. When groundwater levels are lower than adjacent surface water elevations, the gradient is reversed and surface water recharges groundwater. The rate of inflow and outflow from surface waters to groundwater is a function of the difference in water level as well as soil and bedrock characteristics. The temporal and spatial variability of each of these factors make it extremely difficult to quantify the exchange of water between surface waters and the groundwater.

The interaction of groundwater and surface water can have negative consequences on either resource. Contaminated groundwater discharged to surface waters may have a direct impact on surface water quality and/or habitat. Declines in groundwater levels may result in decreased baseflow to streams, which can in turn result in decreased water quality and ecosystem function. Decreased baseflow is especially problematic for streams supporting fish populations (e.g., trout streams), as decreased baseflow may result in higher stream temperatures. Lower water levels in lakes may limit recreational use, reduce habitat areas, and result in increased growth of aquatic plants including invasive species (via an increased littoral zone).

Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of communities. Groundwater can be contaminated by commercial and industrial waste disposal, landfills, leaking underground storage tanks, subsurface sewage treatment systems (SSTS), mining operations, accidental spills, feedlots, and fertilizer/pesticide applications.

Prevention of groundwater contamination through best management practices is critical. Once contaminated, groundwater may remain contaminated for long periods of time. Groundwater clean-up is expensive and technically complex, even when feasible. Increased public awareness of the importance of drinking water protection on the public's general health and well-being is critical to promote practices that protect the quality of groundwater.

While infiltration is often a preferred method of stormwater treatment, it may have negative consequences in areas with vulnerable groundwater resources. To protect these resources, the BCWMC requires that infiltration practices be implemented with consideration of guidance provided by the MPCA in its NPDES General Construction Stormwater permit (2013, as amended) and MIDS guidance (2013, as amended), and the Minnesota Department of Health's (MDH), *Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas* (2007) (see Policy 48 in Section 4.2.3).

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to expand or clarify the BCWMC's role in groundwater management
- Lack of information regarding protection of groundwater resources as related to infiltration practices (e.g., MIDS)
- Opportunity to include groundwater protection guidance developed by the Minnesota Department of Health (MDH)

In addition to the Gaps Analysis, the public weighed in on groundwater issues through the WAVE. When prioritizing issues at the Watershed Summit, the public ranked groundwater as their lowest priority out of 10 issues. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked groundwater as their 4th highest priority out of 10 issues (see Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies. Specifically, the BCWMC policies identify the BCWMC's role as a collaborator in the development of groundwater management strategies (see Policy 47 in Section 4.2.3) and cite guidance for infiltration practices intended to protect groundwater resources (see Policy 48 in Section 4.2.3).

3.7 Education and Outreach

Public education and outreach plays an important role in protecting water resources. Education and public outreach provides opportunities for the BCWMC to raise awareness of its role in managing water resources and increase public confidence in its expertise. The BCWMC and member cities also use education and outreach to raise awareness of the impact that individuals, businesses, and organizations can have on the watershed, both positive and negative, and reinforce positive actions.

The BCWMC performs its education and public outreach duties through a variety of means. The BCWMC Education and Outreach Plan describes the topics, key messages, and implementation methods used by the BCWMC to educate its target audiences (see Appendix B). The BCWMC also maintains a website containing meeting minutes, contact information, and reports and studies, including the watershed management plan. The BCWMC website also contains links to other reference and educational material. More information is available at the BCWMC website: http://www.bassettcreekwmo.org/

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to identify specific training opportunities for member city staff
- Opportunity to update or establish metrics to track progress towards educational goals
- Opportunity to incorporate latest technology in distributing information and engaging the public
- Opportunity to establish educational programs/events in association with projects or programs
- Opportunity to expand education programs to address TMDL implementation and specific citizen concerns (e.g., value of studies versus projects)
- Opportunity to further develop educational partnerships with member cities

In addition to the Gaps Analysis, the public weighed in on education and outreach issues through the WAVE. Sixty-one percent (61%) of survey respondents indicated they did not receive enough information about Commission projects. When prioritizing issues at the Watershed Summit, the public ranked a lack of information and education as their 6th most important issue out of 10 issues, as did the BCWMC Commissioners, TAC members, and technical partners (Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies and implementation program. Specifically, the BCWMC Education and Outreach Plan (see Appendix B) identifies the BCWMC's target audiences and types of messages the BCWMC seeks to convey, the methods or actions the BCWMC will perform or support, and evaluation methods to track success. As described in the Education and Outreach Plan, the BCWMC will also seek collaborative groups and partners to help achieve the goals set out in the plan. Some of the partners include Metro Blooms, West Metro Watershed Alliance, Metropolitan Council, Metro WaterShed Partners, various schools, and Hennepin County. Many of the activities will be designed to meet member city MS4 education, outreach, and citizen participation goals.

3.8 Implementation and Responsibilities

Because the BCWMC is a joint powers organization, many of the responsibilities for implementing activities, programs, and projects are delegated to the member cities. The BCWMC and its administrator are responsible for coordinating these responsibilities to ensure implementation of the goals and policies of this Plan. The following sections address key management and coordination issues for successful plan implementation.

During the development of this Plan, the BCWMC, member cities, and other stakeholders identified the following issues/opportunities (see Appendix D – Gaps Analysis):

- Opportunity to establish quantifiable goals and policies
- Opportunity to quantify the costs of regulatory controls on cities
- Opportunity to clarify roles and re-evaluate maintenance/replacement responsibilities and funding mechanisms for the Commission's Flood Control Project
- Opportunity to develop a mechanism for evaluating member city implementation of Commission policies and requirements
- Lack of active management of public ditches may delay or complicate BCWMC projects involving public ditches
- Opportunity to incorporate Minnesota rules and statutes affecting watershed organizations that have been updated since the 2004 Plan
- Opportunity to identify and maximize cooperative relationships with agencies, organizations and adjacent WMOs
- Opportunity to refine the Commission's capital improvement program (CIP) implementation and funding process

In addition to the Gaps Analysis, the public weighed in on governance, management and funding issues through the WAVE. When prioritizing issues at the Watershed Summit, the public ranked the issues of governance, management and funding as their 8th most important issue out of 10 issues. Meanwhile, the BCWMC Commissioners, TAC members, and technical partners ranked these issues as their 7th out of 10 issues (see Appendix E).

In this Plan, the BCWMC addresses the above issues through its policies (Section 4) and implementation program (Section 5), which detail the delegation of responsibilities and further define the roles of the BCWMC and its member cities. Section 5.1 details the major responsibilities of the BCWMC, including:

- Reviewing improvements and developments
- Management of the BCWMC Trunk System (see Table 2-9 and Figure 2-15) and BCWMC Flood Control Project (see Tables 2-8 and Figure 2-14)
- Implementing the BCWMC capital improvement program (CIP)
- Reviewing and assisting with intercommunity planning and design
- Dispute resolution
- Reporting and evaluation
- Monitoring
- Total maximum daily load (TMDL) implementation

Section 5 of the Plan addresses the implementation responsibilities of the member cities versus the BCWMC and clarifies the role of the BCWMC and member cities regarding specific topics, including maintenance of the Flood Control Project (see Section 5.1.1.3). Section 5.2.1.1 describes the process for implementing the CIP program.

3.8.1 Maintenance of Stormwater Systems and Projects

Member cities and other MS4 permit holders are generally responsible for maintaining their stormwater management systems. Member cities manage these systems according to system maintenance plans detailed in each city's Stormwater Pollution Prevention Program (SWPPP) and local water management plan. Proper maintenance of the stormwater system will ensure that the stormwater system provides the necessary flood control and water quality treatment.

Other entities are responsible for maintaining the stormwater systems in the BCWMC that are within their jurisdiction, including:

- MnDOT is responsible for major maintenance and reconstruction of stormwater infrastructure associated with state highways. In the BCWMC, these locations include Interstate 494, Interstate 394, US Highway 169, Highway 100, and Highway 55.

- Hennepin County is responsible for maintaining only the "mainline" culvert crossings in their county state aid highways (CSAHs), including County Roads 4, 6, 9, 24, 61, 66, 70, 73, 81, 101, 102, and 156. Cities may maintain these mainline culvert crossings by agreement with the county. Cities are responsible for maintaining storm sewer catch basins and leads in the county roads.

- Owners of private stormwater facilities are responsible for maintaining their facilities in proper condition, consistent with the original performance design standards and any maintenance agreements with member cities.

The BCWMC and member cities are jointly responsible for management and maintenance of the BCWMC Flood Control Project. Responsibilities for routine maintenance and major rehabilitation or replacement are detailed in Section 5.1.1.3 and in the policies listed in Section 4.2.2. Member cities are responsible for routine maintenance of BCWMC Flood Control Project features located within their city, including debris removal (see Policy 24 in Section 4.2.2) and repairs that are primarily aesthetic improvements (see Policy 62 in Section 4.2.5).

Maintenance responsibilities for BCWMC-ordered water quality improvement projects are typically defined in the cooperative agreement between the BCWMC and the member city for each project. Generally, member cities are responsible for routine maintenance of BCWMC projects located in their city. The BCWMC will work with member cities to resolve issues related to BCWMC project maintenance or replacement as they arise.

3.8.2 Public Ditches

Judicial ditches and county ditches are public drainage systems established under Chapter 103E of Minnesota Statutes and are under the jurisdiction of the county (see Section 2.6.2). The BCWMC and member cities currently manage public ditches according to the policies listed in Section 4.2.7. Per Minnesota Statute 363B.61, cities or watershed management organizations (WMOs) within Hennepin County may petition the county to transfer authority over public ditches to the city or WMO.

The limitation that the BCWMC cannot own property (per the Joint Powers Agreement) prevents the BCWMC from petitioning Hennepin County to transfer authority over public ditches to the BCWMC. Hennepin County may transfer authority over public ditches to the member cities, if the member cities request such action (see Policy 75 in Section 4.2.7).

3.8.3 Funding and Financing

The extent to which the BCWMC may implement projects and programs to achieve its goals is limited by the availability of funding. The BCWMC is funded by public dollars collected by its member cities and Hennepin County and through grants from government agencies (which are also ultimately taxpayer-funded). The BCWMC has a duty to its taxpayers to spend its funds in a responsible manner that considers the relative benefits, per dollar, of its actions. The benefits of effective water resource management are extremely difficult to quantify in dollars (e.g., increased wildlife habitat or recreational use). Despite this, the BCWMC will continue to evaluate the relative cost/benefit through its CIP implementation process, using best professional judgment and drawing on resources including consultants, advisory committees, and other cooperating entities.