

### **3.8. Ecological Health**

#### **3.8.1. General Issue Statement**

The ecological integrity of Brown's Creek and many watershed lakes and wetlands has degraded to a point where the resources are not providing their original level of function or value. There are many high quality and high functioning natural resources with the BCWD. However the majority of these resources lack adequate protection from disturbances.

#### **3.8.2. Relevance to the District**

The Brown's Creek Watershed District has focused a significant amount of effort on the protection and restoration of Brown's Creek, a cold-water fishery located on the boundary of the Twin Cities Metropolitan Area. Given its designation as a cold-water fishery, Brown's Creek has been actively managed by the Minnesota Department of Natural Resources as a trout stream and a significant amount of attention has been given to the trout population of the creek. In addition to the trout, the Brown's Creek corridor is extremely unique: the creek is full of fish, frogs, turtles and macroinvertebrates, and the steep topography, geologic setting and high quality vegetation supports a variety of birds including rare species such as the Louisiana Waterthrush.

Many of the BCWD's surface water resources support unique species. For example, rare orchids have been found in the watershed and Snailseed Pondweed (*Potamogeton bicupulatus*), an endangered aquatic plant, was found in a watershed lake during a macrophyte survey conducted in 2014. The presence of these rare species is an indication of the watershed's health and should be protected in the future. Environmental stressors such as invasive species and land use conversion threaten terrestrial and aquatic habitat resources

#### **3.8.3. Sub-Issue Areas**

##### **Degraded Fisheries**

A healthy fish community is an indicator of resource health, and also an important component to maintaining a high quality aquatic resource. Environmental stressors continue to threaten the integrity of the watershed's fish-supporting resources. These stressors can include metals, nutrients, temperature, and AIS.

##### **Maintain Ecological Health**

Despite the fact that Brown's Creek and many of the BCWD's lakes are impaired, there is evidence that they still support species that are sensitive and valuable from an ecological standpoint. The BCWD intends to protect these waterbodies from surface water and groundwater impacts.

##### **Invasive Species**

Aquatic invasive species continue to spread throughout the region. The pathways by which each AIS is spread is not fully understood, however, the ecological harm caused by those organisms is well documented. Transport by humans and other vectors is certainly a cause. In other cases, environmental anomalies such as high water levels denude existing vegetation and provide opportunities for new colonies of AIS to establish. Regardless of the species, once established AIS threaten the ecological integrity of natural communities.

### 3.8.4. Policies, Goals, and Implementation

The policies, goals, and implementation items related to these sub-issue areas are summarized in the following tables. The sub-issue area is identified in a heading, followed by a related policy. The goals addressing that policy are lettered and stated, followed by the implementation items for that goal. This format is intended to clearly display how each policy and goal will be addressed.

**Table 30. Ecological Health Policies, Goals, and Implementation Activities**

SUB- ISSUE: Degraded fisheries			
POLICY: BCWD aims to support a robust and healthy fishery as a vital component to ecological health.			
GOALS		IMPLEMENTATION ITEM	
A	Promote healthy and diverse fish communities represented by species representative of the MNDNR lake or stream classifications	1	Conduct additional sampling on Brown's Creek to determine the population status and distribution of the Rainbow darter in the gorge.
		2	Conduct fish barrier assessment to determine potential for fish passage through 95 / 96 box culverts in 2016, then determine fish passage through remaining road crossings to Manning avenue if no barrier present in the gorge.
B	TSS loads within the contributing drainage area need to be reduced by 74% on average in order to meet these loading limits. (Brown's Creek TMDL Implementation Plan, EOR, 2012)	1	Annually analyze progress toward the TSS reduction goal based on evaluation of the collected monitoring data (conducted as part of the baseline monitoring program).
		2	<b>SEE IMPLEMENTATION ACTIVITIES IDENTIFIED UNDER BROWN'S CREEK MANAGEMENT PLAN (TABLE 61)</b>
C	Restore impaired lakes so that they meet state standards for total phosphorous, chlorophyll A concentration and Secchi depth.	1	<b>SEE IMPLEMENTATION ACTIVITIES IDENTIFIED UNDER LAKE MANAGEMENT PLAN (TABLE 62)</b>
D	Achieve the TP Load Reduction goal of 148 lbs. established at the Diversion Structure as identified in the McKusick Lake and Lily Lake Management Plans.	1	Re-assess water quality data collected in contributing drainage area to Diversion Structure to evaluate pollutant loading and identify sources.
POLICY: The BCWD is committed to ensuring that activities within the watershed provide for groundwater recharge, provide thermal protection to Brown's Creek, & reduce volume related impacts to the watershed's water bodies.			
GOALS		IMPLEMENTATION ITEM	
A	Protect and maintain the quantity and quality of groundwater recharge	1	<i>Addressed through administration of the BCWD Regulatory standards and criteria.</i>
B	Identify and implement methods to provide thermal protection to Brown's Creek to achieve the thermal loading reduction identified in the Brown's Creek TMDL Implementation Plan	1	<b>SEE IMPLEMENTATION ACTIVITIES IDENTIFIED UNDER BROWN'S CREEK MANAGEMENT (TABLE 61)</b>
C	Reduce volume-related impacts to the watershed's water bodies (e.g. stormwater impacts such as wetland bounce and duration)	1	Promote stormwater reuse by working with local businesses, local units of government and Washington County to incorporate BMPs into new development or redevelopment projects.
		2	<i>Addressed through administration of the BCWD Regulatory standards and criteria.</i>
POLICY: The BCWD is committed to ensuring that the rate of stormwater runoff is controlled in order to reduce impacts to the watershed's water bodies.			
GOALS		IMPLEMENTATION ITEM	

<b>A</b>	Ensure no-net increase in runoff rate from new development and redevelopment.	<b>1</b>	<i>Addressed through administration of the BCWD Regulatory standards and criteria.</i>
<b>B</b>	Identify and implement rate control projects to reduce rate-related impacts to water bodies.	<b>1</b>	<b>SEE IMPLEMENTATION ACTIVITIES IDENTIFIED UNDER BROWN'S CREEK MANAGEMENT (TABLE 61)</b>
<b>SUB-ISSUE: Maintain Ecological Health</b>			
<b>POLICY: The BCWD is committed to maintaining the ecological integrity and connectivity of intact ecosystems.</b>			
<b>GOALS</b>		<b>IMPLEMENTATION ITEM</b>	
<b>A</b>	Identify and preserve important aquatic wildlife habitat and fish spawning areas	<b>1</b>	Continue surveys for mussels in the lower gorge, particularly upstream of the 2015 unique Species Inventory survey area. Many riffles in the lower gorge have not been surveyed.
		<b>2</b>	Compile a herptile record database developed from available records and initiate citizen volunteer Amphibian and Reptile Survey.
<b>B</b>	Achieve a healthy and diverse community of native plants and animals (City of Stillwater Lake Management Plans, Wenck Associates INC, 2007)	<b>1</b>	Implement native plant community preservation and restoration projects utilizing the District's land protection priorities.
		<b>2</b>	Enhance the management of the BCWD's ecosystem services by implementing pollinator conservation strategies (e.g. recognize and support exemplar projects which restore and enhance habitat for pollinator species, work with road authorities to control invasives and promote establishment of pollinator species, work with county and municipalities to develop mowing plan and schedule that is more conducive to stormwater management and pollinator species)
		<b>3</b>	Work with the City of Stillwater and area residents to conduct on-going monitoring of the oak forest found on the west side of Long Lake (identified as a Rare Feature) to evaluate its quality, and if any management activities are needed to ensure its sustainability.
<b>SUB-ISSUE: Invasive Species</b>			
<b>POLICY: The District takes an active role in preventing the spread of invasive species through education, partnerships, monitoring, and invasive species management projects.</b>			
<b>GOALS</b>		<b>IMPLEMENTATION ITEM</b>	
<b>A</b>	Initiate and support aquatic invasive species (AIS) management projects on private and public lands where connected to water quality management	<b>1</b>	Continue to monitor aquatic invasive species and implement controls when it's determined to be a water quality issue.
		<b>2</b>	Record the location of terrestrial exotic and invasive species and implement control measures if it's determined to have water quality impacts.
		<b>3</b>	Address aquatic invasive species management by providing education and outreach to residents and individuals recreating in the watershed.
		<b>4</b>	Utilize the cost-share program to assist with invasive species management where there is a water quality benefit.
<b>B</b>	Initiate and support terrestrial invasive species management projects on private and public lands where connected to water quality management	<b>1</b>	Conduct on-going vegetation surveys (every five years) to evaluate community quality and invasive species to provide a more robust dataset that can be used to evaluate trends in plant community composition. A minimum of 5 wetland and 5 upland plots should be established for long-term monitoring.

**Table 31. Projected Expenditures (in 1,000's) for Ecological Health**

Implementation Activities	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	10-Yr. Total
Conduct additional sampling on Brown's Creek to determine the population status and distribution of the Rainbow darter in the gorge.	2	--	--	--	2	--	--	--	2	--	6
Continue surveys for mussels in the lower gorge, particularly upstream of the 2015 unique Species Inventory survey area. Many riffles in the lower gorge have not been surveyed.	--	--	2.5	--	--	--	--	--	--	2.5	5
Compile a herptile record database developed from available records and initiate citizen volunteer Amphibian and Reptile Survey.	--	--	--	3.5	--	--	--	--	--	--	3.5
Implement native plant community preservation and restoration projects utilizing District's land protection priorities.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5
Enhance management of BCWD's ecosystem services by implementing pollinator conservation strategies.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5
Continue to monitor aquatic invasive species & implement controls when it's determined to be a water quality issue.	--	--	1	1	1	1	1	1	1	1	8
Record the location of terrestrial exotic and invasive species and implement control measures if it's determined to have water quality impacts.	--	--	1	1	1	1	1	1	1	1	8
Conduct on-going vegetation surveys (every five years) to evaluate community quality and invasive species to provide a more robust dataset that can be used to evaluate trends in plant community composition: min. of 5 wetland and 5 upland plots should be established for long-term monitoring.	--	--	10	--	--	--	--	5	--	--	15
<b>Total for Ecological Health</b>	<b>3</b>	<b>1</b>	<b>15.5</b>	<b>6.5</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>8</b>	<b>3</b>	<b>7.5</b>	<b>55.5</b>

**Table 32. Ecological Health Implementation Activities from Table 30 addressed by East Metro Water Resource Education Program**

Address AIS management by providing education and outreach to individuals recreating in the watershed.
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**Table 33. Ecological Health Implementation Activities from Table 30 where implementation costs covered under another Issue Category**

Implementation Activity	Issue Category where implementation cost is identified (Table #)
Utilize the District’s cost-share program to assist in the implementation of Lake Management Plans through best management practice installation by citizens - Cost identified in Implementation Activity X under Stormwater Management.	Stormwater Management (Table 5)
Re-assess water quality data collected in contributing drainage area to Diversion Structure to evaluate pollutant loading and identify sources.	Stormwater Management (Table 5)
Promote stormwater reuse by working with local businesses, local units of government and Washington County to incorporate BMPs into new development or redevelopment projects.	Stormwater Management (Table 5)
Conduct fish barrier assessment to determine potential for fish passage through 95 / 96 box culverts in 2016, then determine fish passage through remaining road crossings to Manning avenue if no barrier present in the gorge.	Stream Management (Table 13)
Annually analyze progress toward the TSS reduction goal based on evaluation of the collected monitoring data (conducted as part of the baseline monitoring program).	Stream Management (Table 13)
Utilize the cost-share program to assist with invasive species management where there is a water quality benefit.	Stormwater Management (Table 5)



*Thermal Measuring of Brown’s Creek*

### 3.14. Land Conservation

#### 3.14.1. General Issue Statement

Changes in land use threaten to degrade the quality of water resources and limit wildlife habitat. Land use practices can reduce the area of land covered with native vegetation, increase erosion and stormwater runoff, and break wildlife habitat into small, disconnected areas unable to support high quality, diverse populations. The development of a land conservation program allows entities to set aside critical parts of the landscape for the protection and restoration of downstream waterbodies.

#### 3.14.2. Relevance to the District

Land use changes in the District are often made adjacent to and encroaching on water resources and natural areas. Proper management of stormwater runoff and erosion will limit the water quality and quantity impacts to these resources, but will not fully maintain the ecological quality or function and value of the resources if adjacent lands are managed in a way that does not maintain native vegetative communities and wildlife habitat. In some cases, properties adjacent to water resources are challenging to develop due to encroachment and/or access issues. In 2017, the BCWD acquired such a property so that it may be protected by a conservation easement. This acquisition adds a new role for the BCWD Board of Managers as they consider the management needs and potential uses for this property.

#### 3.14.3. Sub-Issue Areas

##### Preservation of Natural Areas, Connections between Natural Areas, and Groundwater Recharge Zones

While the impacts of development can be managed, key natural resources can be lost in the process. Conservation of groundwater recharge zones, surface water resources, and natural resources can be effectively accomplished through preservation of key natural areas. Land conservation can preserve and restore resource quality, provide stormwater benefits, protect groundwater recharge, and ensure the sustainability of wildlife habitat connections.

#### 3.14.4. Policies, Goals, and Implementation

The policies, goals, and implementation items related to these sub-issue areas are summarized in the following tables. The sub-issue area is identified in a heading, followed by a related policy. The goals addressing that policy are lettered and stated, followed by the implementation items for that goal. This format is intended to clearly display how each policy and goal will be addressed.





**Table 52. Land Conservation Policies, Goals, and Implementation Activities**

<b>SUB-ISSUE:</b>		Protection of natural areas, connections between natural areas, and groundwater recharge zones	
<b>POLICY:</b>		The BCWD will work with communities, agencies and non-profits, as appropriate, to protect land throughout the District in order to preserve and restore the resource quality, stormwater benefits, groundwater recharge, and wildlife habitat connections provided by key upland and lowland areas.	
<b>GOALS</b>		<b>IMPLEMENTATION ITEM</b>	
A	Identify and pursue opportunities to preserve and restore land within the watershed based on the District's identified conservation priorities.	<b>1</b>	Review and revise land protection corridors and priorities to reflect current resource protection needs (e.g. recharge areas and land adjacent to District's resources).
		<b>2</b>	Work with member communities to set standards for development near and within the identified land protection corridors and to determine allowed uses within corridors that will provide necessary flexibility while preserving the water and habitat benefits of the corridor.
		<b>3</b>	<u>Restore the Brown's Creek Conservation Area by implementing the activities identified in the Management Plan which includes Natural Areas Management and Usage Implementation costs for a 10-year period.</u>

**Table 53. Projected Expenditures (in 1,000's) for Land Conservation**

Implementation Activities	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	10-Yr Total
Review and revise land protection corridors and priorities to reflect current resource protection needs (e.g. recharge areas)	--	--	--	--	--	20	--	--	--	--	20
Work with member communities to set standards for development near and within the identified land protection corridors and to determine allowed uses within corridors that will provide necessary flexibility while preserving the water and habitat benefits of the corridor.	--	--	--	--	--	--	5	--	--	--	5
<u>Restore the Brown's Creek Conservation Area by implementing the activities identified in the Management Plan which includes Natural Areas Management and Usage Implementation costs for a 10-year period.</u>	<u>54</u>	<u>73</u>	<u>36</u>	<u>19</u>	<u>23</u>	<u>16</u>	<u>16</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>266</u>

Develop landowner interest in land protection, promote stewardship and acquire conservation easements and/or lands in coordination with the Department of Natural Resources, Washington County, the Natural Resource Conservation Service, the Minnesota Land Trust, and the Trust for Public Land as appropriate.	25	25	25	25	25	50	50	50	50	50	375
<b>Total for Land Conservation</b>	<u>79</u>	<u>98</u>	<u>61</u>	<u>44</u>	<u>48</u>	<u>86</u>	<u>71</u>	<u>60</u>	<u>60</u>	<u>60</u>	<u>666</u>



## 1.4 Biological Environment

In 2015 the Brown's Creek Watershed District conducted a unique species inventory to assess the quantity and quality of natural habitat in the watershed. The goal of the unique species inventory was to better characterize the flora and fauna found in the Brown's Creek corridor so that watershed management decisions could be made taking the ecological health of the entire system into consideration. Given that the Brown's Creek watershed can be broken into unique landforms (areas that have very different qualities due to geologic and topographic features), the unique species inventory was performed to characterize the flora and fauna found in the Brown's Creek corridor within these distinct areas.

The Brown's Creek watershed has four distinct landforms: Brown's Creek Headwaters, Central or Middle Brown's Creek, Lower Brown's Creek Ravine (Gorge) and the Long Lake Tributary areas. The Unique Species Inventory placed emphasis on the three landform regions directly connected to the creek, with limited resources placed on the Long Lake Tributary area which periodically contributes to Brown's Creek following the installation of the Diversion Structure. The boundary of these four landforms can generally be described as follows:

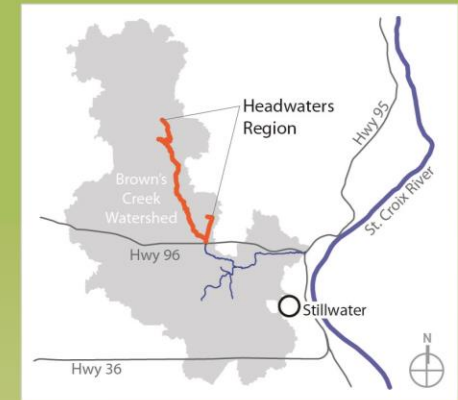
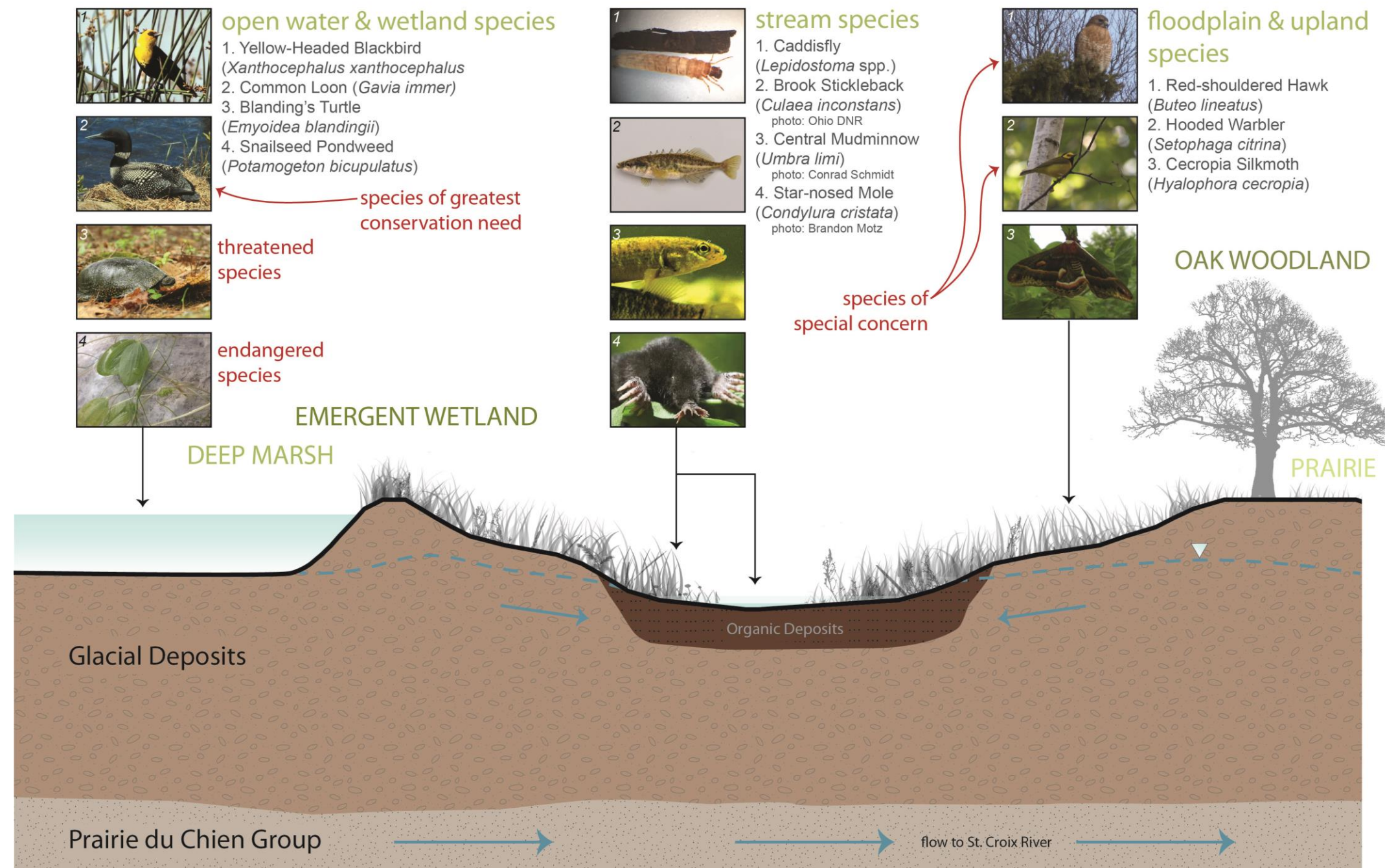
- **Headwaters Region of Brown's Creek**  
This area includes the northern portion of the watershed from Minnesota State Highway 96 to the Goggins-School Section Chain-of-Lakes (Figure A-5).
- **Brown's Creek Middle Reach**  
This area includes the Brown's Creek corridor in the central portion of the watershed south of Minnesota State Highway 96 to County Road 5 (Figure A-6).
- **Long Lake Tributary Area**  
This area includes the drainage area to the four tributaries described in Section 1.3.1.1 including Long Lake tributary, two reaches of the South Central Tributary and the Zephyr Tributary.
- **Brown's Creek Gorge**  
This area includes the Brown's Creek corridor and its drainage area downstream of County Road 5 to the St. Croix River (Figure A-7).

The following is a discussion of each of the four landform areas as it relates to the biological environment. For those landforms directly connected to the creek and part of the Unique Species Inventory, cross sections have been developed to display the unique attributes of these regions. Additional sources of information describing the Brown's Creek watershed's natural environment include: Brown's Creek Unique Species Inventory (2015); BCWD Natural Resource Inventory (2001); MLCCS mapping and continued data collection by MPCA and MNDNR.

January 2018

Figure A-5. Brown's Creek Headwaters

# Brown's Creek HEADWATERS: natural & cultural resources



Brown's Creek Headwaters Wetland



Brown's Creek Headwaters Deep Marsh







### **1.4.1 Brown's Creek Headwaters**

The Headwaters Area includes the northern-most portion of the Brown's Creek Watershed District with its many lakes and the peripheral landlocked and semi landlocked areas. The topography in the Headwaters Area is characterized by a mostly level to gently rolling landscape with numerous depressions. Soils are highly variable, ranging from well-drained sand to deep, poorly drained peat within wetlands and drainage swales.

#### ***Native Plant Community Description***

The Headwaters Area contains numerous, large forested communities with the most prevalent being oak-dominated forests and woodlands. Other wooded communities include conifer plantations, maple-basswood and aspen dominated forests. The natural communities are typically adjacent to lakes and large wetlands. These natural communities and large lakes provide significant habitat and form a wildlife corridor. The natural communities benefit the lakes by providing recharge of groundwater, preventing erosion of steep slopes, and providing water quality treatment. The many depressional lakes and wetlands provide for significant recharge to the water table, which, in turn, supports flows in Brown's Creek.

The broad lowland corridor contains a variety of high-quality wetland communities, including hardwood swamp, emergent marsh, hardwood seepage swamp, and tamarack swamp. Associated with these wetlands are a number of wooded upland communities, especially oak forest and oak woodland. Several of these are in good condition, and do not display the heavy levels of buckthorn that frequently characterize oak communities within the region. In general, these communities tend to be in better condition in the areas adjacent to the wetlands and to show more evidence of disturbance away from the wetlands.

Many communities within this Area are mapped on the Washington County Map of Natural Communities and Rare Features that was produced by the MN MNDNR, and there are records for Blanding's turtle, a state-listed threatened species, within the Area. In addition, because of the quality and size of the wetland communities, the potential for additional rare species is high.

In 2015 three sites in the headwaters area were surveyed. Table A-18 summarizes the findings of these surveys.



**Table A-18. Headwaters Natural Communities Surveyed in 2015**

Site ID (as identified in the 2001 NRI)	2015 Site Description	Results/ 2001 to 2015 Comparative Analysis*
1H		Site determined to be low quality in 2001 and of similar quality in 2015 due to presence of buckthorn. Ongoing buckthorn management is helping to improve community quality and species diversity.
3B	Near site 3B on an esker west of Brown's Creek	Site was free of buckthorn but did contain two other invasive species; smooth brome and reed canary grass. Since the 2015 plot was not within the boundary of site 3B surveyed in 2001, no comparative analysis can be made.
4I		Site described in 2001 to have buckthorn but also to be exhibiting a significant amount of oak regeneration and a diverse vegetative community. 2015 survey confirms a robust assemblage of native species persist at this site along with continued presence of buckthorn. Garlic mustard, an invasive species was found in the 2015 survey.

\* Three MNDNR releve data sheets including natural community descriptions and plant species lists document findings of the 2015 survey. These data sheets can be found in the Unique Species Inventory (2016).

***Bird Habitat Description***

The mosaic of wetland, forest, and grassland communities within the Headwaters region provides important breeding and foraging habitats for many resident and migratory species of birds. Bird surveys conducted along the Gateway Trail have identified 88 species of birds in 2015, including Red-shouldered hawk (*Buteo lineatus*) which is listed as a species of special concern by the MNDNR. Mature forested areas around lakes provide suitable nesting habitat for Red-shouldered hawks and this species likely nests in the headwaters region of the watershed. A male Hooded warbler (*Setophaga citrina*) was photographed along the Gateway Trail approximately ¼ mile north of Highway 96. Hooded warblers are classified as a “Rare Regular” species by the Minnesota Ornithologists Union (MOU). In 2013, Yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) were observed nesting in one of the wetlands in the Trout Habitat Preservation Project (THPP) located near the town of Withrow. This is the first known breeding record for this species in Washington County.

***Macroinvertebrate Habitat Description***

Macroinvertebrates were sampled from several habitat types downstream of 110<sup>th</sup> Street. Of the three sites sampled for the Unique Species Inventory (Headwaters, Central, and Gorge), the Headwaters site contained the highest taxon richness (39 taxa represented). The Headwaters site contained one Lepidostoma caddisfly, Glossosomatid caddisflies, and a large number of Limnephilidae caddisflies. These taxa have a low pollution tolerance and are indicative of good water quality and sufficient dissolved oxygen. The single Lepostomatidae caddisfly was the only specimen collected from all three sites and had the lowest pollution tolerance of all the specimens collected during this study.

***Fish and Fresh Water Mussel Habitat Description***

Fish surveys conducted by MNDNR for the Headwaters Area of Brown's Creek are limited to a short reach just north of 110th Street. Within this reach, the Brook stickleback (*Culaea inconstans*), a species associated with clear, cool streams is found.

Another fish species documented in this reach and often found in cool bog streams is the Central mudminnow (*Umbra limi*); two other fish species, Fathead minnow (*Pimephales promelas*) and Creek chub (*Semotilus atromaculatus*), are also documented in the upper reach. No trout species have been documented from the upper reach by MNDNR Fisheries. Although water temperature in the upper reach is generally cool enough to support trout, the low gradient, peaty substrate characteristic to most of this reach provides for poor trout habitat.

***Amphibian and Reptile Habitat Description***

Blanding's turtles have been found in numerous locations within the Brown's Creek watershed with the most sightings in the headwaters area. The large wetlands and shallow lakes provide excellent habitat for Blanding's turtles. These aquatic habitats also support healthy populations of painted and snapping turtles, and several species of frogs and toads.

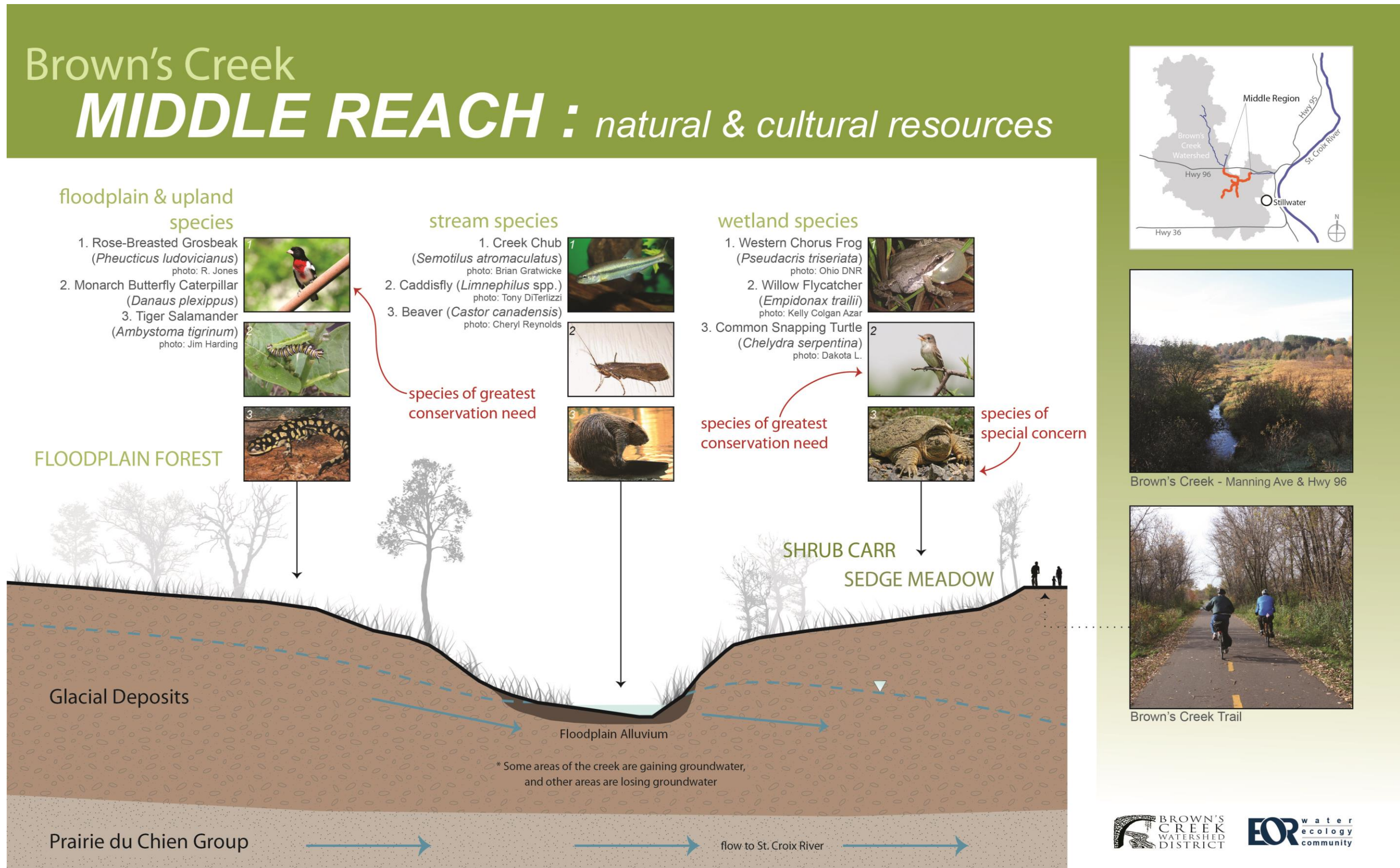




*Brown's Creek Trail*



Figure A-6. Brown's Creek Middle Reach







### 1.4.2 Central or Middle Brown's Creek

The topography in the Central Area is characterized by a gently rolling to level landscape with numerous depressions with the near wetland margins and Brown's Creek topography being somewhat steeper. Much of the area is currently residential development with some wetlands bordering Brown's Creek. Oak Glen golf course occurs in this reach downstream of Neal Avenue. The geographic scope for the Central Area is defined by the Brown's Creek Reach spanning from Manning Avenue to Norrell Avenue.

#### ***Native Plant Community Description***

Similar to the Headwaters Area the Central Area contains scattered forested communities with the most prevalent being oak-dominated. Other wooded communities include conifer plantations, maple-basswood and aspen dominated forests. No native plant communities along this reach were identified for surveys in 2015. The recent creek restoration project through Oak Glen golf course does provide an excellent example of how natural resource restoration projects can be incorporated into a developed landscape.

#### ***Bird Habitat Description***

The wetland and shrub-carr communities within the Central region provide important breeding and foraging habitats for many resident and migratory species of birds. Open water habitat is also an important component utilized by waterfowl and shorebirds. Although no specific bird surveys were conducted in this area, Ring-necked duck (*Aythya collaris*), Mallard (*Anas platyrhynchos*), Broad-winged hawk (*Buteo platypterus*), Killdeer (*Charadrius vociferous*), Pileated woodpecker (*Hylatomus pileatus*), Chimney swift (*Chaetura pelagica*), Alder flycatcher (*Empidonax alnorum*), Great-crested flycatcher (*Myiarchus crinitus*), and Barn swallow (*Hirundo rustica*) have been observed in this area.

#### ***Macroinvertebrate Habitat Description***

Macroinvertebrates were sampled from several habitat types downstream of Highway 96. Of the three sites sampled for the Unique Species Inventory (Headwaters, Central, and Gorge), the Central site contained the second highest taxon richness (33 taxa represented). The Central site contained Glossosomatid caddisflies and a large number of Limnephilidae caddisflies. These taxa have a low pollution tolerance and are indicative of good water quality and sufficient dissolved oxygen.

#### ***Fish and Fresh Water Mussel Habitat Description***

No fish or mussel assessment was completed for this area in 2015. The Natural Resource Inventory (NRI) from 2001 identified Brook stickleback, Central mudminnow, Fathead minnow, Creek chub, and several warm water species including Black bullhead (*Ictalurus melas*), Pumpkinseed (*Lepomis gibbosus*) and hybrid sunfish (*Lepomis sp.*). The presence of warm water species reflects the sluggish characteristics of Brown's Creek within this reach. Fingernail clams have been observed in riffle habitat downstream of Highway 96 and within the Oak Glen golf course.

***Amphibian and Reptile Habitat Description***

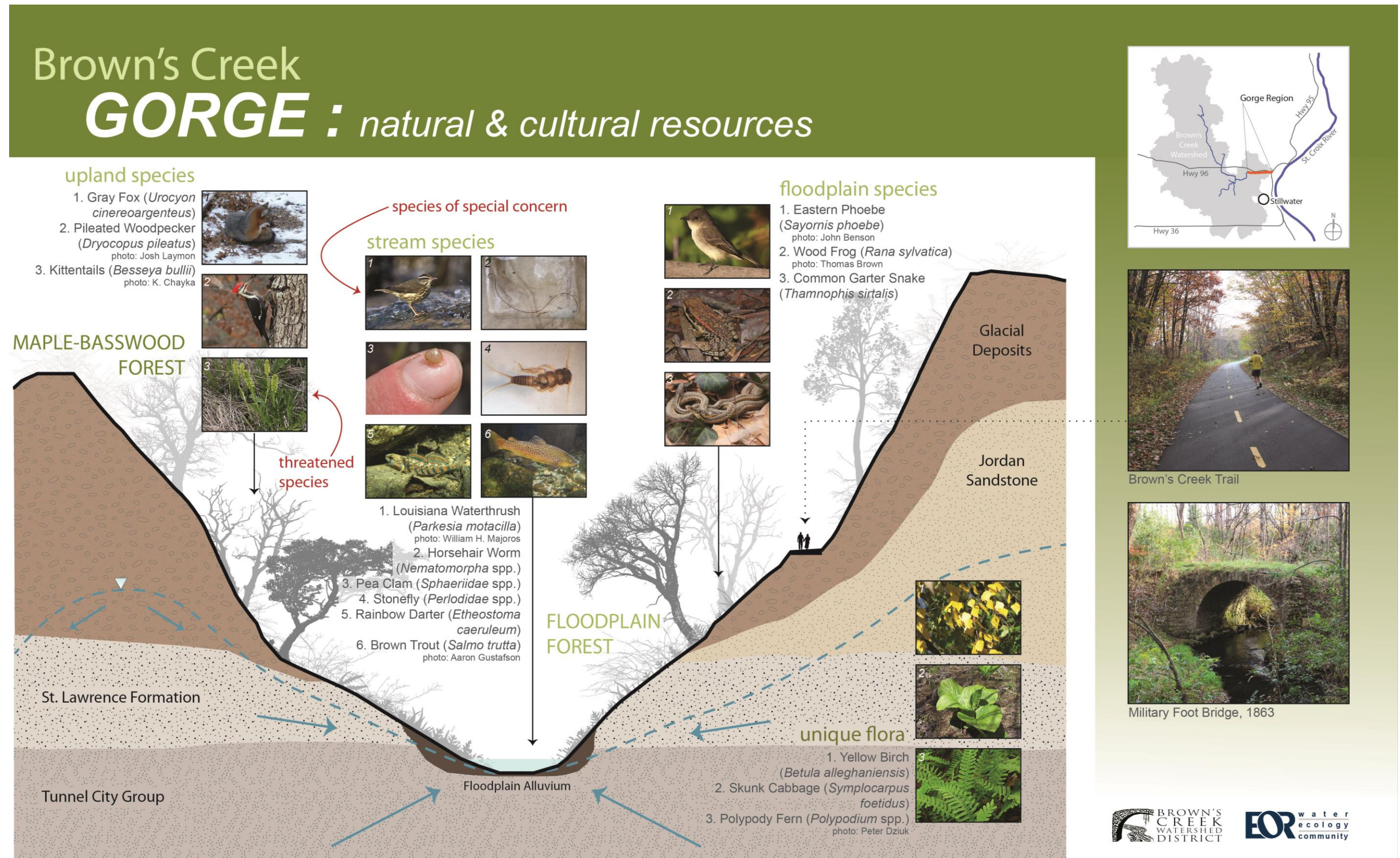
Common herpetile species such as Common garter snakes, Green frogs, Western chorus frogs, and Northern leopard frogs are most likely to be prevalent within this somewhat developed reach of Brown’s Creek.



*Northern Leopard Frog – Washington County*



Figure A-7. Brown's Creek Lower Reach/Ravine







### 1.4.3 Lower Brown’s Creek Ravine (Gorge)

The gradient of Brown's Creek changes dramatically as it descends into the St. Croix River valley downstream of the historic Stone Arch Bridge. Within this reach, Brown’s Creek flows through a deep valley where the creek channel has cut into the Tunnel City Group bedrock formation, hence the name Lower Gorge. It is within this reach that cold groundwater provides a major component of the base flow to Brown’s Creek, thus providing one of the key elements necessary to support a coldwater fishery. The direct drainage area within this subwatershed is limited to a relatively small drainage area adjacent to Brown's Creek. Most of this drainage area is forested with scattered large-lot residential development. The Lower Gorge generally consist of two types of vegetative communities: maple-basswood forest, and mixed hardwood seepage swamp.

#### *Native Plant Community Description*

The natural communities within this area are located within the ravine. There are good quality mesic oak forests and maple-basswood forests within the ravine. There is also a dry oak forest along the top of the ravine to the north. These natural communities help protect Brown’s Creek by preventing erosion of the steep slopes and by shading the water.

The Rare Features Value for this site section of the creek is high. Several communities within the ravine are mapped on the Natural Communities and Rare Species Map for Washington County, including Kittentails, a state-listed Threatened plant. In 2015 surveys were conducted in high quality vegetation communities identified in the MLCCS mapping and as site 6D in the 2001 NRI.

In 2015 one site in the headwaters area was surveyed. Table A-19 summarizes the findings of this survey.

**Table A-19. Lower Ravine Natural Communities Surveyed in 2015**

Site ID (as identified in the 2001 NRI)	2015 Site Description	Results/2001 to 2015 Comparative Analysis*
6D		In 2015 two sample sites were selected based on landscape position and ease of access. Two MNDNR releve data sheets including natural community descriptions and plant species lists document findings of the 2015 survey. Vegetation data from 2015 confirm a diverse plant community exists although both buckthorn and Tartarian honeysuckle were found in 2015 and not documented in the 2001 survey.

\* Two MNDNR releve data sheets including natural community descriptions and plant species lists document findings of the 2015 survey. These data sheets can be found in the Unique Species Inventory (2016).



### ***Bird Habitat Description***

Three bird species that have a preference for mature forests associated with streams include the Louisiana waterthrush (*Parkesia motacilla*), Acadian flycatcher (*Empidonax vireescens*), and Cerulean warbler (*Setophaga cerulea*). These three species are listed by the MNDNR as “species of special concern” and also listed as Species of Greatest Conservation Need (SGCN). In 1988, the Minnesota County Biological Survey (MCBS) documented a pair of Louisiana waterthrushes along the Brown’s Creek gorge. Although no nest was found during the survey, the surveyors concluded there was good evidence of breeding occurring in the area. There has been no documented evidence of Acadian flycatcher and Cerulean warbler within the lower gorge, but it is possible sufficient habitat exists to support these species during the breeding season. It should be noted that all three of these species have been observed at Falls Creek SNA in northern Washington County. Falls Creek SNA is similar to the Brown’s Creek gorge since both areas contain steep wooded ravines with swift flowing creeks. The relative proximity of these two areas increases the likelihood of these species utilizing the Brown’s Creek corridor during the breeding season and migration.

### ***Macroinvertebrate Habitat Description***

Macroinvertebrates were sampled from several habitat types within the Brown’s Creek Gorge. Of the three sites sampled for the Unique Species Inventory (Headwaters, Central, and Gorge), the Gorge site contained the lowest taxon richness (26 taxa represented). The Gorge site contained one Perlodid stonefly, and large numbers of Uenoidae and Limnephilidae caddisflies. These taxa have a low pollution tolerance and are indicative of good water quality and sufficient dissolved oxygen. The single Perlodidae stonefly was the only specimen collected from all three sites.

The Met Council has collected macroinvertebrate samples in the Brown’s Creek Gorge near the Highway 96 crossing dating back to 2001. The following is an excerpt from the Met Council Report: Comprehensive Water Quality Assessment of Select Metropolitan Area Streams Brown’s Creek- December 2014: *The results from the biological monitoring suggest that Browns Creek has a diverse, healthy macroinvertebrate community and good water quality. While the FBI (Family Biotic Index) scores indicated the presence of some organic pollution during most years of monitoring, there were pollution intolerant taxa present in every sample except 2002. All of the M-IBI scores were above the upper confidence level and the threshold of impairment, with the most recent score (2011) the highest calculated over the period of study. Overall, the monitored stream reach habitat and water quality were able to sustain the needs of aquatic life.*

### ***Fish and Fresh Water Mussel Habitat Description***

The following is from an excerpt from the 2001 Natural Resource Inventory: The lower reaches of Brown’s Creek are designated as Trout Waters by the MNDNR (MN Rules 7050.0420). The lower reach is stocked annually with 800 yearling Brown trout (*Salmo trutta*) by MNDNR Fisheries. Based on MNDNR surveys, little natural regeneration of trout has occurred in recent years. Most likely, poor natural reproduction is due to warm stream temperatures. Other fish species documented during MNDNR surveys include: creek chub (*Semotilus atromaculatus*), fathead

minnow (*Pimephales promelas*), brook stickleback (*Culaea inconstans*), pearl dace (*Semotilus margarita*) and long-nosed dace (*Rhinichthys cataractae*). Interestingly, while conducting the mussel survey in 2015, a Rainbow darter (*Etheostoma caeruleum*) was captured and photographed in the Brown's Creek gorge. This individual represents the 2<sup>nd</sup> record of this species in Brown's Creek. The first known record of a Rainbow darter in Brown's Creek was sampled by the MNDNR in 1976.

The mussel survey was conducted in the Brown's Creek gorge on October 13, 2015. Survey efforts focused on riffles in the lower gorge where the potential for mussel occurrence would be greatest. No live specimens of mussels were found, but numerous fingernail clams in the family Sphaeriidae were observed in the riffles. This is a common species found in many Minnesota streams. Interestingly, an old mussel valve (shell) was found upstream of the Highway 96 box culvert. Regional malacologists from the MNDNR concluded that the identity of this specimen was likely a Plain pocketbook (*Lampsilis cardium*). The origin of this specimen is unknown, but it is possible Brown's Creek once supported at least one species of native mussel in the lower gorge. If host fish from the St. Croix River are able to freely swim upstream into the lower gorge of Brown's Creek, it is possible glochidia from certain mussel species could be dispersed by their fish hosts and colonize the riffles that occur in the lower gorge.

#### ***Amphibian and Reptile Habitat Description***

The steep wooded bluffs, rock outcroppings, riparian and groundwater seepage habitats provide an excellent assemblage of habitats that support a high diversity of herpetiles. In particular some of the less common/rare snake species as well as lizards may utilize the wooded areas and outcrops. The ephemeral wetlands and mesic forests support species such as salamanders and less common frog species. This reach does not provide significant habitat for Blanding's turtles.



*Brown's Creek Gorge*

#### **1.4.4 Long Lake Tributary Area**

Predominant land uses in the Long Lake Tributary Drainage Area include old fields, row crops, forest and low to moderate density residential. South of Long Lake, along the Highway 36 corridor, land use includes a mixture of light industrial and office space, along with retail business. The Highway 36 corridor has experienced the highest amount of urban growth in the Brown's Creek watershed.

##### ***Native Plant Community Description***

The natural communities within the Long Lake Tributary are limited to the areas adjacent to Long Lake and two small areas to the west of Manning Avenue. The natural communities in this area are facing tremendous amounts of pressure from development and are likely to decrease in quality. The largest natural community within this area, a mesic oak forest is currently being developed into residential housing. In addition to this area there are small conifer plantations and oak woodlands of varying quality. These natural communities provide an excellent buffer for Long Lake.

Rare Features value for the oak forest on the west side of Long Lake is high. The 2001 NRI identified this site as 8B. This community is mapped on the Natural Communities and Rare Species Map for Washington County.

As documented in the 2001 Groundwater Dependent Natural Resource Management Plan a fen is located on a sloping, east facing hillside in the southwestern portion of Section 26 of Township 30, Range 21. This shallow wetland community is dominated by sedges and grasses on a deep (>2 feet) peat substrate. The ground layer is dominated by tussock sedge, lake sedge, wooly sedge, and other sedges and grasses along with swamp saxifrage, water hemlock, and sensitive fern. Although a generally open community, this fen also contains pockets of woody shrubs including willows and dogwoods. As a whole, this fen has retained its status as being high quality and high functioning. However several areas of this fen have been partially degraded where scattered pockets of reed canary grass, an invasive plant species, occur. Iron-rich groundwater discharges at the base of the slope where the fen is located. This is an indication of groundwater discharging into the fen. In total over 50 native plant species have been documented at the site during numerous field visits, making it one of the most diverse wetlands in the Brown's Creek watershed. The majority of the plant species found within the wetland are not encountered in any other wetland in the watershed and many of the species are somewhat unique to rich fens.

##### ***Bird Habitat Description***

No bird surveys were conducted in this area.

##### ***Macroinvertebrate Habitat Description***

No macroinvertebrate work was conducted in this area.

##### ***Fish and Fresh Water Mussel Habitat Description***

No fish or mussel work was conducted in this area.

***Amphibian and Reptile Habitat Description***

Similar to the developed central reach of Brown’s Creek common herptile species such as Common garter snakes and Northern leopard frogs are most likely to be prevalent here. The lakes and wetlands also provide habitat for commons turtle species such as the Painted turtle and Snapping turtle. There are no Blanding’s turtle records in this area of the BCWD.

**1.4.5 Exotic and Invasive Species**

Exotic and invasive species are present and ever increasing within the Brown’s Creek watershed. They affect the quality of our natural resources in many ways by degrading wildlife habitat and water quality, and can negatively affect the quality of our native plant communities.

Table A-20 was developed from the MNDNR terrestrial and aquatic invasive species database. The terrestrial species database is an inventory across MNDNR administered lands of selected invasive terrestrial plants derived from a multi-divisional effort to collect consistent information across all MNDNR administered lands. The aquatic species are derived from a MNDNR effort to record the locations of aquatic invasive species in waterbodies throughout the state. To develop the table below, the GIS database for both terrestrial and aquatic species was first queried for Washington County and then using a GIS the BCWD watershed boundary was used to identify documented species in the BCWD. There are several species documented in Washington County that are likely present in the BCWD for which the MNDNR does not have a record.

**Table A-19. List of exotic and invasive species documented by MNDNR in Washington County and BCWD. Species documented by BCWD inventory efforts are noted with a Y\*.**

Species Common Name	Washington County	BCWD	Terrestrial	Aquatic
Alyssum, Hoary	Y		Y	
Barberry, Japanese	Y	Y	Y	
Bighead Carp	Y			Y
Bittersweet, Asian	Y	Y	Y	
Buckthorn, Common	Y	Y	Y	
Buckthorn, Glossy	Y	Y	Y	
Burdock	Y		Y	
Butter and Eggs	Y	Y	Y	
Creeping Charlie	Y	Y	Y	
Curly-leaf Pondweed	Y			Y
Daisy, Oxeye	Y		Y	
Elm, Siberian	Y	Y	Y	
Eurasian Watermilfoil	Y	Y		Y
Flowering Rush	Y			Y
Foxglove, Grecian	Y		Y	
Grass Carp	Y			Y
Grass, Cheat	Y	Y	Y	
Grass, Reed canary	Y	Y	Y	



Species Common Name	Washington County	BCWD	Terrestrial	Aquatic
Grass, Smooth brome	Y	Y*	Y	
Hawkweed, Orange	Y		Y	
Honeysuckle, Exotic	Y	Y	Y	
Knapweed, Spotted	Y	Y	Y	
Knotweed, Japanese	Y		Y	
Largemouth Bass Virus (LMBV)	Y			Y
Locust, Black	Y		Y	
Loosestrife, Purple	Y	Y	Y	
Maple, Amur	Y	Y	Y	
Maple, Norway	Y	Y	Y	
Mullein, Common	Y	Y	Y	
Mustard, Garlic	Y	Y	Y	
Olive, Russian	Y		Y	
Parsnip, Wild	Y		Y	
Peashrub, Siberian	Y		Y	
Queen Ann's Lace	Y		Y	
Rainbow Smelt	Y			Y
Spurge, Cypress	Y		Y	
Spurge, Leafy	Y	Y	Y	
St. John's-Wort, Common	Y		Y	
Sweetclover, White	Y	Y	Y	
Sweetclover, Yellow	Y		Y	
Tansy	Y	Y	Y	
Thistle, Bull	Y		Y	
Thistle, Canada	Y	Y	Y	
Thistle, Musk/Nodding	Y		Y	
Thistle, Plumeless	Y		Y	
Thistle, Sow	Y		Y	
Trefoil, Birdsfoot	Y	Y	Y	
Vetch, Cow	Y	Y	Y	
Vetch, Crown	Y	Y	Y	
Vetch, Hairy	Y		Y	
Zebra Mussel	Y			Y

Data from the vegetation surveys conducted in the Brown's Creek watershed (for the unique species inventory) were analyzed to develop a baseline assessment of invasive species abundance. In the 696 (mostly wetland) vegetation data points within the BCWD, 65% of them had one or more invasive species identified. Reed canary grass was present in 49% of the plots and the second-most common species was glossy buckthorn at 12%. Common buckthorn was also found in 8% of the plots but it should be noted that most of the plots were within wetland and that common buckthorn is more prevalent in upland sites. Past and ongoing vegetation surveys in the Brown's Creek watershed confirm that smooth and glossy buckthorn are problematic invasive species.