A Monitoring Plan to Assess the Ecological Benefits of Kinnickinnic River Dam Removal and River Restoration in River Falls, Wisconsin

Section 4: Riparian Biology Monitoring

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Executive Summary

Dams are known to have a myriad of negative impacts on rivers, including their riparian habitat, aquatic ecosystems, and water quality. River Falls, Wisconsin is home to the Kinnickinnic River (Kinni), a 22-mile, Class 1 trout stream. This river is constrained by two hydropower dams that provide a small percentage of the city's energy. In 2018, River Falls decided that both dams will be removed. The Powell Falls Dam is scheduled for removal by 2026, while the Junction Falls Dam is projected to be removed during the 2035-2040 period. In 2021, the Kiap-TU-Wish Chapter of Trout Unlimited and Inter-Fluve prepared "A Monitoring Plan to Assess the Ecological Benefits of Kinnickinnic River Dam Removal and River Restoration in River Falls, WI". This Kinni Monitoring Plan is intended to provide guidance to public and private partners interested in successful dam removal and ecological restoration of the Kinnickinnic River in River Falls. Implementation of the plan will involve non-profit groups, governmental organizations, scientists, and public individuals working together for data collection, analysis, and reporting.

The Kinni Corridor Collaborative (KinniCC) is a non-profit organization that has been involved in efforts to remove the Kinni dams and restore the river. Its mission is to work collaboratively with the city, public and private organizations, and individuals to assemble the technical and financial resources needed to implement the current Kinnickinnic River Corridor Plan, while preserving the ecology and beauty of the Kinni. Highlights of KinniCC's work include raising funds toward long-term ecological restoration of the river, supporting the Kinni Monitoring Plan and conducting some of the monitoring work, and having a strong presence in the River Falls community through outreach events, to spread awareness on conserving the river and corresponding resources.

This Riparian Biology Monitoring Section of the Kinni Monitoring Plan has been prepared with funding and support provided by KinniCC. The overall goal of the Riparian Biology Monitoring Section is to quantify the riparian community that inhabits and traverses the Kinnickinnic River corridor and assess how that community changes in response to dam removal and river restoration. This monitoring work will also help measure the overall health of the river over time. The Riparian Biology Monitoring Section provides many exciting opportunities for the River Falls community and Kinni lovers to engage as citizen scientists, creating a better understanding of the river and a passion for protection and improvement.

4. Riparian Biology

Kinnickinnic River health is influenced by features that occur outside of the river channel. These include the riparian area, floodplain, and upland areas that influence run-off and bank stability, and provide habitat and a travel corridor for a diverse array of organisms. For the purpose of this monitoring plan, Riparian Biology is subdivided into two monitoring types: Riparian Vegetation and Nongame Wildlife.

The overall goal of this monitoring component is to quantify the riparian community that inhabits and traverses the Kinnickinnic River corridor and assess how that community changes in response to dam removal and river restoration.

4.1 RIPARIAN VEGETATION

Objective – Assess changes in riparian vegetation within the former impoundments (Lakes George and Louise) post-drawdown, to determine the effectiveness of establishing native vegetation and the need for invasive species control.

Kinnickinnic River riparian zone through Lake Louise

A riparian zone is defined as ”the transition zone between fully terrestrial and fully aquatic systems.” These zones include streambanks, floodplains, wetlands, and other systems that neighbor bodies of water (Green 2023). Riparian ecosystems support up to one-third of plant species and 60% of vertebrate species in the United States alone (Green 2023). Riparian vegetation provides habitat and aquatic cover, filters surface and groundwater, and can stabilize riverbanks. However, establishment of native riparian species is often hindered by the expansion of invasive species, such as reed canary grass (*Phalaris arudinacea*), even when seeding with native species occurs (Orr and Koenig 2006). Pre- and post-drawdown vegetation monitoring in the former Kinnickinnic River impoundments is critical to provide the data necessary for vegetation management decisions. Riparian vegetation monitoring is ideal for experienced volunteer groups such as The Prairie Enthusiasts. Lewis et al. (2009) provides guidance on developing a vegetation monitoring plan for river restoration projects. Monitoring is recommended for both impoundments, beginning immediately post-drawdown.

For evaluating plant communities within the riparian zone, a meander survey will be conducted, as described by the Wisconsin Department of Natural Resources (WDNR) protocol (Timed-Meander Sampling Protocol for Wetland Floristic Quality Assessment). This survey will be conducted at stations 478, 504, 515, 529, 544, and 574. It is best to conduct this survey in late August when plant biomass is the greatest. To begin, fill out the top of the data sheet, including the site’s GPS coordinates (Table 1). Set a timer for ten minutes to walk around a 30-meter diameter circle at each site, while noting each plant species observed and recording the information in Table 1. After the ten-minute time period is up, while still in the assessment area, estimate the abundance score and absolute percent cover for each species, using Table 2 and Figure 1, respectively. If a plant is unknown, use INaturalist and Wisconsin DNR plant identification guides.

Table 1. Adapted WDNR Timed-Meander Survey data sheet for riparian plant monitoring.

Observers_____
Date_____ Site Name_____
Start Point (Dec Deg)_____
End Point (Dec Deg)_____
Start Meander Time _____ End Meander Time _____

Species	%	Abundance Score	Notes	Species	%	Abundance Score	Notes
1				29			
2				30			
3				31			
4				32			
5				33			
6				34			
7				35			
8				36			
9				37			
10				38			
11				39			
12				40			
13				41			
14				42			
15				43			
16				44			
17				45			
18				46			
19				47			
20				48			
21				49			
22				50			
23				51			
24				52			
25				53			
26				54			
27				55			
28				56			

Table 2. Abundance score chart to provide frequency status of plants.

Abundance Score	Description
1	The dominant plants throughout the site
2	Locally abundant or frequently encountered
3	Occasionally encountered, or locally common but absent or infrequent across much of site
4	Infrequently encountered
5	Very few plants seen

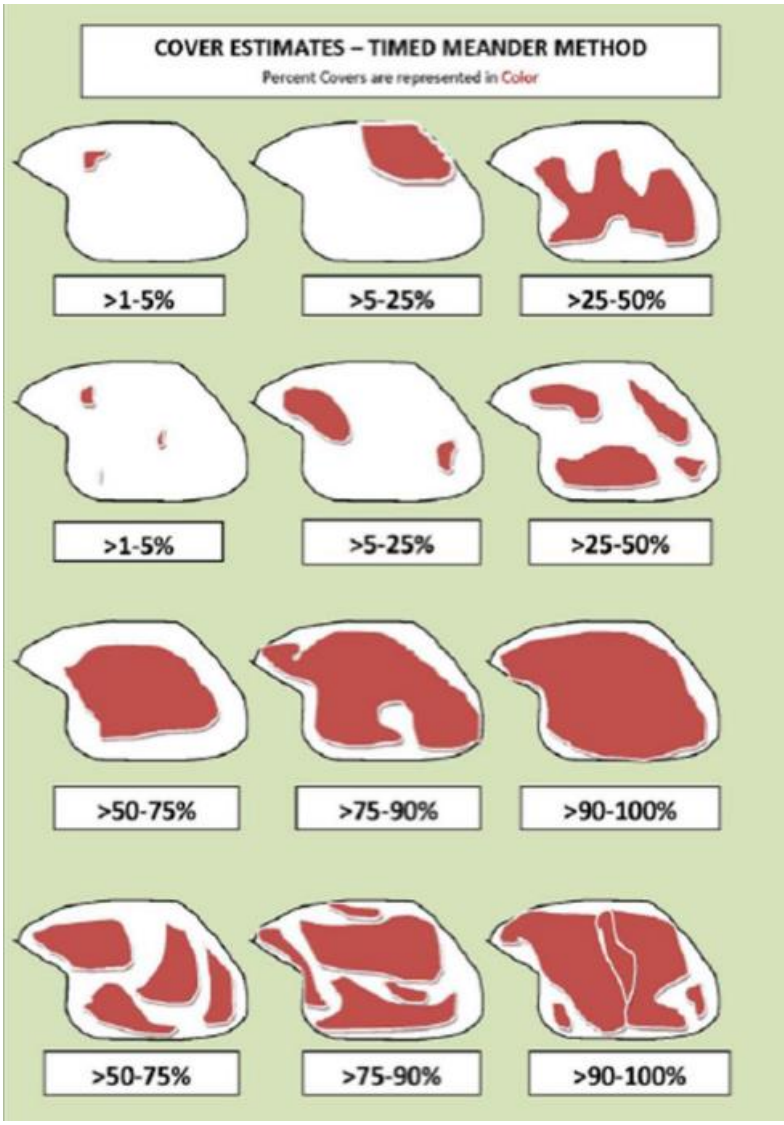


Figure 1. Plant cover estimates to show percentage of each plant species present.

4.2 NONGAME WILDLIFE

Objective- Determine the response of nongame wildlife in the Kinnickinnic River riparian area, following dam removal and river restoration.

River riparian areas within the Driftless Area provide many unique habitats for a rich biological community of nongame wildlife, including some of the area's rare and endangered species. Nongame species of interest could include amphibians, reptiles, birds, invertebrates, and mammals. Methods for monitoring each group are described below. A variety of cellular phone applications and websites (such as iNaturalist and EDDMapS) are available to facilitate data collection by volunteers and citizen scientists. These sources provide easy data entry and a data repository for volunteer observations. Data collection is suggested to be ongoing and species specific. A portion of data relevant to this monitoring plan is already being collected by the St. Croix Valley Bird Club, as part of the River Falls designation as a Bird City. Recommended nongame wildlife monitoring locations, frequency, and duration vary, depending on the species of interest. Additional information on nongame wildlife and associated monitoring protocols can be found in Trout Unlimited's *Nongame Wildlife Habitat Guide* (Hastings 2009).

Salamander Monitoring:

Salamander monitoring should be performed in spring or late fall, since that is when they are most likely to be found. The monitoring technique of cover board transects will be used. Cover boards are defined as "pieces of untreated plywood and/or tin that are laid down to provide artificial habitat for any creatures that choose to move in or visit or come to the surface" (Matthews et al. 2023). According to Fernandez (2002), untreated, green, fresh-cut wood should be used. All boards should be the same 12 x 12-inch size. When placing the cover boards (Figure 2), leaves should be removed, the soil should be leveled, and the boards should lie flat and completely level on the ground, to provide the best moist conditions for salamander habitat (Fernandez 2002). Each transect should have 10 boards, with the boards in the transect being 18 feet from each other. Cover boards should be placed in shady, forested areas on moist ground, as that is the preferred habitat. Cover boards should be checked at least 24 hours after being placed. When monitoring, flip over each cover board and make note of how many and what species are spotted. Prior to monitoring, refer to Table 3 (Salamanders of Wisconsin) to study the different salamander species most commonly found in

Wisconsin. Table 4 should be filled out to note all salamanders observed, along with any other species occupying the cover boards.

For simplicity purposes, ten cover boards will be placed at each of the three chosen sites, including monitoring stations 478 (Glen Park, Lime Kiln), 515 (Lake Louise), and 529 (Below Junction Falls Dam). In order to have an upstream control or reference site with which to compare the three impact/restored sites downstream, station 547 (Division Street) should also be monitored.

https://ontarionature.org/sleuthing-for-salamanders/

Figure 2. Example photo of a cover board and how it should be placed on the soil.

Table 3. Common salamanders found in Wisconsin (Herps of Wisconsin).

Common Name	Scientific Name	WI Status
Blue-spotted Salamander	*Ambystoma laterale*	Common
Eastern Newt	*Notophthalmus viridescens*	Common
Eastern Red-backed Salamander	*Plethodon cinereus*	Common
Eastern Tiger Salamander	*Ambystoma tigrinum*	Common
Four-toed Salamander	*Hemidactylium scutatum*	Special Concern
Mudpuppy	*Necturus maculosus*	Common
Spotted Salamander	*Ambystoma maculatum*	Common

Table 4. Field sheet used to record salamander monitoring results.

Station	**Date**	**Time**	**# of Salamanders**	**Species Found**	**Other Observations**
478					
515					
529					
547					

Bird Monitoring:

River Falls is a known Bird City. This means that the city has a "highly visible public recognition to municipalities that understand that healthy communities are the sum of many parts, including birds (Benefits & Rationale of Conserving Birds)".

Bird monitoring will be performed by surveying breeding bird calls in the spring. A list of riparian and wetland birds commonly found in Wisconsin is presented in Table 5 (Hastings 2009). Prior to monitoring day, volunteers from the St. Croix Valley Bird Club should be scheduled to provide support for call and sight identification. At each of the three chosen sites, a timer should be set for five minutes, during which volunteers will listen to and record every bird call heard. Through the expertise of the bird club members, along with the Merlin app (sound ID) and eBird app (sight ID), Table 6 should be filled out to note all calls heard, along with physical observations seen in the five-minute period. The three sites selected for bird monitoring include stations 120 (County Road F/Kinnickinnic State Park), 478 (Glen Park), and 529 (Below Junction Falls Dam). Monitoring should occur early in the morning when birds are most active.

Table 5. Riparian/wetland birds common to Wisconsin (Hastings 2009).

American Redstart	Great Blue Heron	Red-winged Blackbird
Bank Swallow	Green Heron	Sanderling
Belted Kingfisher	Hooded Merganser	Sandhill Crane
Common Yellowthroat	Killdeer	Spotted Sandpiper
Eastern Kingbird	Mallard	Tree Swallow
Eastern Phoebe	Northern Rough-winged Swallow	Wood Duck

Table 6. Field sheet used to record bird monitoring results.

Station	Date/Time	Weather Conditions	Time (Minutes)	Bird Calls Heard	Tallies	Bird Species Observed	Tallies
Station 120			5				
Station 478			5				
Station 529			5				

Turtle Monitoring:

Dams are known to limit the ability of wildlife (like turtles) to effectively move around an area, leading to a lack of genetic diversity in the population. Removing the Kinnickinnic River dams and restoring the river to a natural state will result in more fish and wildlife dispersal in the area (Boardman River Dam Removal Amphibian and Reptile Inventory Report 2017). This is why it is important to monitor turtle populations before and after dam removal.

Turtle monitoring can be conducted in a few different ways. The first option is to place hoop traps in the river overnight at the chosen sites in the spring and document the quantity and species of turtles captured (Mali et al. 2014). A list of turtles commonly found in Wisconsin is presented in Table 7 (Wisconsin Turtles).

A simpler option is to canoe, kayak, or walk the shoreline for 180 feet at each monitoring site on sunny days, hoping to make a visual observation of basking turtles. For simplistic reasons, this option is more realistic for this project. Table 8 can be used to record the data collected at each monitoring station (120, 264, 478, 504, 515, 529, 544, 574, 652).

Table 7. Turtles commonly found in Wisconsin (Wisconsin Turtles).

Blanding's Turtle	Common Snapping Turtle	Midland Smooth Softshell Turtle	Painted Turtle
Common Map Turtle	Eastern Spiny Softshell Turtle	Ornate Box Turtle	Wood Turtle
Common Musk Turtle	False Map Turtle	Ouachita Map Turtle	

Table 8. Field sheet used to record turtle monitoring results.

Station	Distance	Date/Time	Weather Conditions	Number of Turtles Observed (Tallies)	Turtle Species Observed
120	180 ft				
264	180 ft				
478	180 ft				
504	180 ft				
515	180 ft				
529	180 ft				
544	180 ft				
574	180 ft				
652	180 ft				

Frog Monitoring:

Dam removal and river restoration also provide an opportunity to improve habitat for frogs (Postel 2020). Similar to the bird monitoring methodology, frogs will be monitored using their mating calls. This should be done at night and will require repeating once a month from April to July, to account for all the different species and their unique mating timeframes, as shown in Figure 3 (Wisconsin Wetlands Association 2017). The five sites selected for frog monitoring include stations 264 (KRLT Drewiske Family Preserve), 478 (Glen Park), 515 (Lake Louise), 544 (Lake George), and 574 (Division Street). At each of the five chosen monitoring stations, a timer should be set for five minutes, during which volunteers will record and listen to every frog call heard. The FrogID app can be used to record and identify frogs as well. Table 9 should be completed to note all calls heard, along with any physical observations made in the five-minute period. For each of the species in Table 10, the Wisconsin Frog and Toad Survey website can be used for identification assistance, including links to videos that describe how to identify each species by both sight and sound (Wisconsin Wetlands Association 2017).

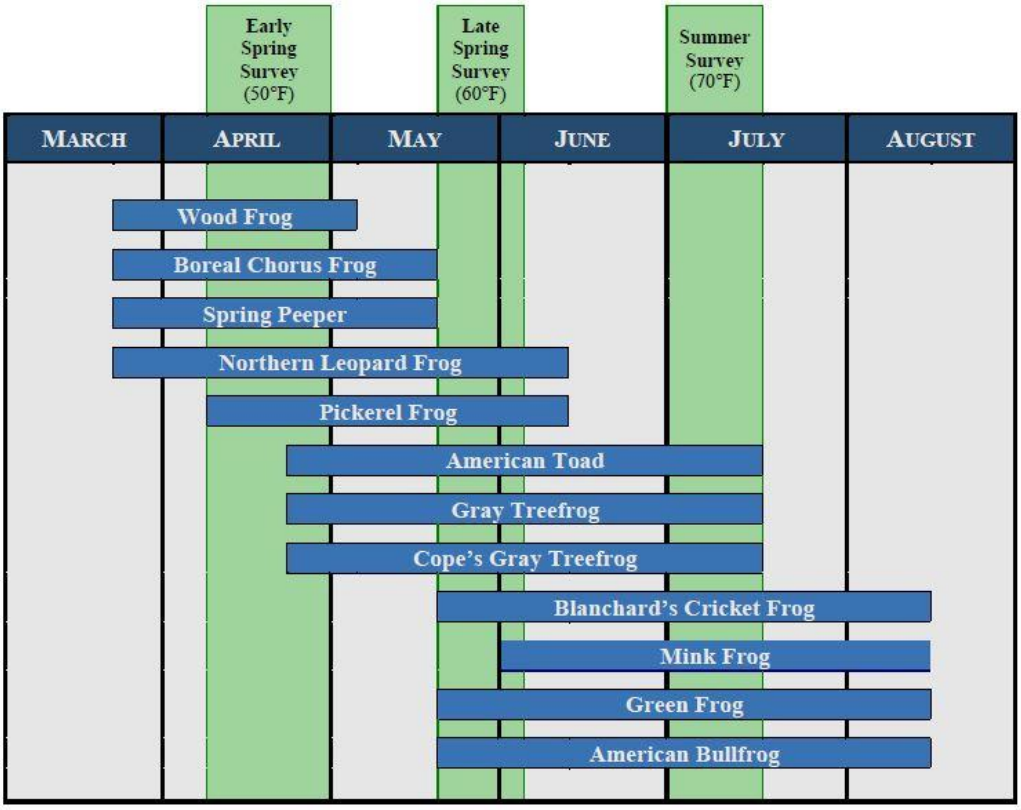


Figure 3. Wisconsin frog species and their mating timeframes (Wisconsin Wetlands Association 2017).

Table 9. Field sheet used to record frog monitoring results.

Station	Time (Minutes)	Date/Time	Weather conditions	Frog Calls Heard	Frog Species Observed
264	5				
478	5				
515	5				
544	5				
574	5				

Table 10: Common frog species in Wisconsin (Herps of Wisconsin).

American Bullfrog	Cope's Gray Treefrog	Northern Leopard Frog
America Toad	Gray Treefrog	Pickerel Frog
Blanchard's Cricket Frog	Green Frog	Spring Peeper
Boreal Chorus Frog	Mink Frog	Wood Frog

Snake Monitoring:

Snakes are an important indicator species of the health of an aquatic ecosystem and riparian zone. They are sensitive to pollution and aquatic habitat loss (Dickerson 2001). Since dams are known to alter habitats and cause sediment buildup that degrades water quality, snakes could benefit from dam removal and river restoration. A list of snakes typically found in Wisconsin is presented in Table 11 (Herps of Wisconsin).

Table 11. Snake species found in Wisconsin (Herps of Wisconsin).

Common Name	Scientific Name	WI Status
Butler's Gartersnake	*Thamnophis butleri*	Special Concern
Common Gartersnake	*Thamnophis sirtalis*	Common
Common Watersnake	*Nerodia sipedon*	Common
DeKay's Brownsnake	*Storeria dekayi*	Common
Eastern Foxsnake	*Pantherophis vulpinus*	Common
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Common
Eastern Massasauga	*Sistrurus catenatus*	Endangered
Eastern Milksnake	*Lampropeltis triangulum*	Common
Eastern Ribbonsnake	*Thamnophis saurita*	Endangered
Gophersnake	*Pituophis catenifer*	Special Concern
Gray Ratsnake	*Pantherophis spiloides*	Special Concern
Lined Snake	*Tropidoclonion lineatum*	Special Concern
North American Racer	*Coluber constrictor*	Special concern
Northern Ring-necked Snake	*Diadophis punctatus edwardsii*	Common
Plains Gartersnake	*Thamnophis radix*	Special Concern
Prairie Ring-necked Snake	*Diadophis punctatus arnyi*	Special Concern
Queensnake	*Regina septemvittata*	Endangered
Red-bellied Snake	*Storeria occipitomaculata*	Common
Smooth Greensnake	*Opheodrys vernalis*	Common
Timber Rattlesnake	*Crotalus horridus*	Special Concern
Western Ribbonsnake	*Thamnophis proximus*	Endangered
Western Wormsnake	*Carphophis vermis*	Special Concern

Like turtle monitoring, snake monitoring is an observational study. Snakes will be monitored by conducting a walking transect at each station (120, 264, 478, 504, 515, 529, 544, 574, and 652) and hopefully making a physical observation. At each station, walk a 100-meter transect along the shorelines looking for snakes and record the data in Table 12. Snakes should also be noted if they are observed under coverboards during salamander monitoring.

Table 12. Field sheet used to record snake monitoring results.

Station	Date/Time	Snakes Found (# and species)
120		
264		
478		
504		
515		
529		
544		
574		
652		

Riparian Mammal Monitoring:

Small mammal monitoring is typically conducted using Sherman traps (Machtinger and Williams 2020), which are usually placed along a transect that includes 20 traps located ten meters apart. These transects are best situated along the shoreline at the chosen monitoring sites. The preferred trapping window is in August-September. The traps could be laid out on a Monday, then checked twice a day (once in the morning and again in the evening) on Tuesday and Wednesday, then checked again on Thursday morning and removed.

However, for the simplification of this plan, mammal monitoring will be conducted as an observational study. At each of the monitoring stations (120, 264, 478, 504, 515, 529, 544, 574, and 652), a 180-foot transect should be walked along the shorelines, looking for any of the riparian mammals listed in Table 13 (Hastings 2009). Mammal observations should be documented using Table 14.

Table 13. Common riparian mammals, as noted in the *Nongame Wildlife Habitat Guide* (Hastings 2009).

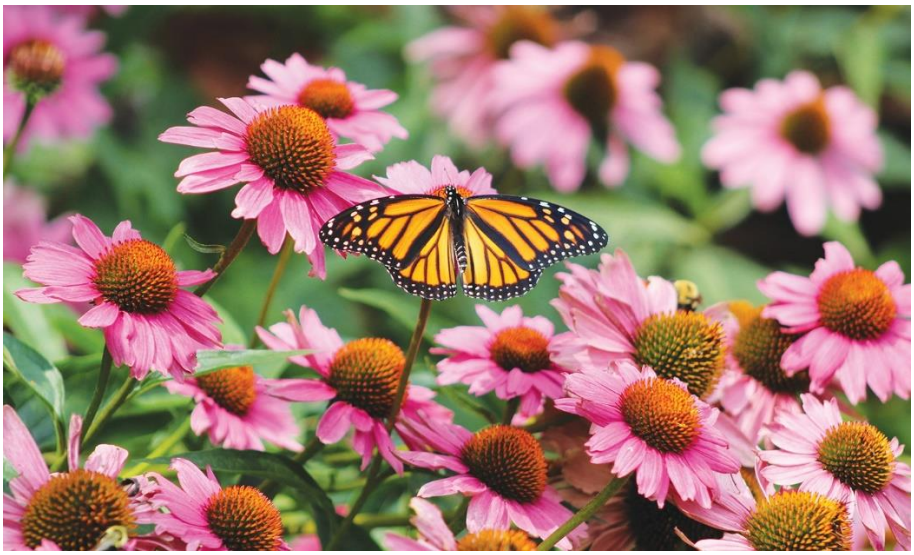
Beaver	Masked Shrew	Prairie Vole	Thirteen-Lined Ground Squirrel
Coyote	Meadow Jumping Mouse	Raccoon	Woodchuck
Deer Mouse	Mink	Red Fox	
Eastern Chipmunk	Muskrat	Short-Tailed Weasel	
Gray Fox	Otter	Striped Skunk	

Table 14. Field sheet used to record mammal monitoring results.

Station	Date/Time	Mammals Found (# and Species)	Observations (Scat, Tracks, etc.)
120			
264			
478			
504			
515			
529			
544			
574			
652			

Pollinator Monitoring:

Wisconsin pollinator populations play a crucial role in the conservation of native plants, wildflowers, crops, and other natural ecosystems (Saving Wisconsin's Native Pollinators). As such, pollinator monitoring is critical to determine the health and well-being of these populations. Pollinator monitoring typically occurs when blooming flowers are at their peak, usually in early fall. According to Stewart (2012), common fall-blooming plants in Wisconsin that attract pollinators include "pussy willow, plum, cherry, blueberry, New Jersey tea, American basswood, wild lupine, anise hyssop, purple prairie clover, pale purple coneflower, wild bergamot, Culver's root, butterfly milkweed, woodland and prairie sunflowers, prairie blazing star, and great blue lobelia."



The University of Wisconsin-River Falls is recognized as an affiliate of Bee Campus USA, thanks to their student-organized Bee Club. Dr. Kevyn Juneau, Associate Professor of Conservation and Environmental Science at UW-River Falls, is a resident expert on pollinator monitoring and will serve as a helpful resource with this survey. Dr. Juneau can suggest the best time to monitor, as well as provide all the necessary nets and survey equipment to trap moths, butterflies, and bees. One pollinator monitoring method, to be used at station 478, consists of a trap net baited with fermented apples and bananas, to attract butterflies and moths. Dr. Juneau's pollinator identification guides and iNaturalist should be used to identify the species trapped, with the data recorded in Table 15.

Table 15. Field sheet used to record butterfly and moth species captured in baited trap net.

Site	Date/Time	Temperature (°C)	Species	Tallies
478				

The other pollinator monitoring method will be the Wisconsin Bumble Bee Brigade's small area survey. This group records long-term data on Wisconsin's native bee populations, which is ideal for tracking trends and population health over time. Data collected must be uploaded to the Wisconsin Bumble Bee Brigade's website, which stores the data for future reference. The website also includes a detailed list of Wisconsin bee species, along with photographs. Bee surveying can be conducted anytime between April and October by walking a 30-meter circle transect at each monitoring station (120, 264, 478, 504, 515, 529, 544, 574, and 652) and taking photographs of the bees observed. These photos can be subsequently uploaded to the organization's website. The organization's YouTube channel has detailed step- by-step instructions on how to use this method, along with tips and additional resources ("Bumble Bee Brigade Training Part 3- Survey Methods"). Not every bee will need to be photographed, but the number of bees observed in each morph must be counted and tallied, using the Small Area Survey Datasheet in Table 16. Since this is strictly a photography-based method and bees will not be handled, a permit is not required.

Table 16. Bumble Bee Brigade's Small Area Survey Datasheet, to be filled out in the field and later uploaded to the website.

BUMBLE BEE BRIGADE

Small Area Survey Datasheet- Page 1

Primary Observer:		Additional Observers:
Date:	Start Time:	End Time:
LOCATION		
Site Name:		Details to find survey location:
Latitude (DD):	Longitude (DD):	
Agricultural ☐; Forest ☐; Grassland/Shrubland ☐; Wetland ☐; Shoreline ☐; Urban/Suburban/Rural Development ☐; Right-Of-Way ☐		

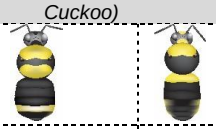
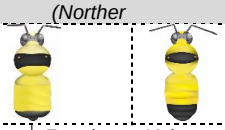
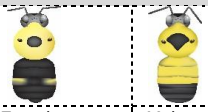
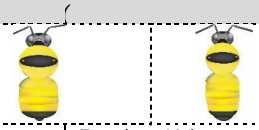
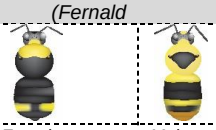
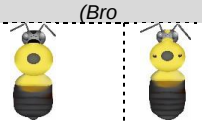
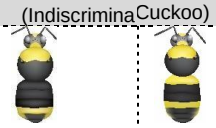
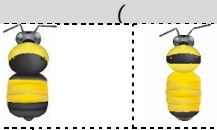
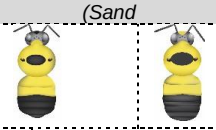
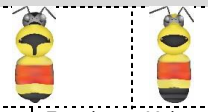
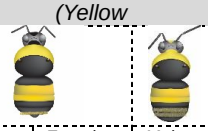
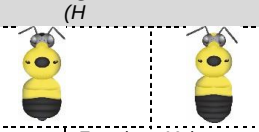
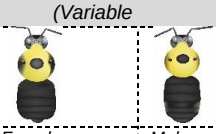
BUMBLE BEE OBSERVATIONS

Species & Caste (if known)	**Morph Description** (color pattern, size, shape)	**Number** (e.g., 3 or III)	**Additional Notes** to help with ID (nectar plants, photo name/numbers)

☐ Bumble bee nest observed	Species:	Description:

Submit survey data to Wisconsin Bumble Bee Brigade – http://wiatri.net/inventory/bbb

Small Area Survey Datasheet- Page 2

B. affinis *(Rusty Patched)*	**B. auricomus** *(Black and Gold)*	**B. bimaculatus** *(Twospotted)*	**B. bohemicus** *(Ashton's Cuckoo)*
			
Queens | Females | Males	Queens | Females | Males	Queens | Females | Males	Females | Males
notes	notes	notes	notes
B. borealis *(Northern Amber)*	**B. citrinus** *(Lemon Cuckoo)*	**B. fervidus** *(Yellow)*	**B. flavidus** *(Fernald Cuckoo)*
			
Queens | Females | Males	Females | Males	Queens | Females | Males	Females | Males
notes	notes	notes	notes
B. frigidus *(Frigid)*	**B. griseocollis** *(Brownbelted)*	**B. impatiens** *(Common Eastern)*	**B. insularis** *(Indiscriminate Cuckoo)*
			
Queens | Females | Males	Queens | Females | Males	Queens | Females | Males	Females | Males
notes	notes	notes	notes
B. pensylvanicus *(American)*	**B. perplexus** *(Confusing)*	**B. rufocinctus** *(Redbelted)*	**B. sandersoni** *(Sanderson's Sand)*
			
Queens | Females | Males	Queens | Females | Males	Queens | Females | Males	Queens | Females | Males
notes	notes	notes	notes
B. ternarius *(Tricolored)*	**B. terricola** *(Yellow-banded)*	**B. vagans** *(Half-black)*	**B. variabilis** *(Variable Cuckoo)*
			
Queens | Females | Males	Queens | Females | Males	Queens | Females | Males	Females | Males

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