

# **Wetland Invasive Species (WIS) Monitoring strategy & Field Protocol**

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## **Introduction:**

The purpose of this document is to provide clear guidance on the design of wetland invasive species (WIS) monitoring projects, and a standardized field protocol for searching for and reporting these invasives. The purpose of WIS monitoring efforts is to understand species population sizes and distributions in order to allow tracking patterns of WIS spread, identifying control opportunities, and evaluating the success of any control efforts.

This document is in three parts. First is project design and planning; second is field monitoring to collect the species data; third is communicating findings. For smaller projects, monitors can design and implement their own monitoring plans. For larger regional projects, duties may be split between two or more field monitors, project coordinators, or organizations.

## **Phase 1: Project Design and Planning**

### **Define the monitoring goals:**

Addressing the scope of efforts is the first issue when designing a WIS project, and it must be realistically tailored to available resources. Monitoring goals can include searching for all WIS or limiting efforts to just one or several specific, high priority species. Work can also simply confirm previously reported sites, or include searching all or select wetlands likely to be infested, or both. Given the level of resources available, including both funds and personnel, there will be trade-offs between project type and scope, and the number of target species.

All monitoring should include obtaining accurate species identifications and estimates of infestation sizes, perhaps as well as evaluations of any previous management efforts. Data collected should be readily shared with any partners interested in the same species or areas.

### **Defining the geographical scope of a project:**

Wisconsin has over 5.3 million acres of wetlands, over five times the acreage of all inland lakes, so choosing a realistic area to monitor is important. The state's wetlands vary in size, frequency, and community diversity based upon location in the state's [ecological landscape](#) and area land use patterns. Selected project areas can range from individual wetlands to townships to several counties, watersheds, or even be statewide. Single species projects in fewer wetland community types can often cover larger areas, whereas projects with multiple species may need to focus on more varied wetland community types and cover smaller areas. Appendix 1 provides an overview of wetland communities and commonly associated species.

### **Choosing which invasive species to monitor:**

A list of WIS can be found on the Chapter NR40 Invasive Species Identification, Classification, and Control Rule [website](#). NR 40 prohibited species are usually the highest priority for monitoring that can lead to early detection and rapid response/control actions. Restricted species are already widely established, either statewide or regionally, and complete eradication seems unlikely. Control of these

species is at a landowner's discretion. Restricted species may sometimes also be priority as monitoring targets where they are adjacent to Prohibited counties, wherever small infestations threaten high value local wetlands, or are part of regional invasive species control projects. Priorities can be further refined by considering distribution and landscape vulnerability.

#### Understanding the identification and biology of WIS:

Become familiar with the target species by reviewing the [Early Detection Target Species list](#) and [AIS Identification Guide](#).

The following resources should be reviewed to become familiar with target plant species:

- [Flora of North America](#)
- [Michigan Flora](#) are resources for Wisconsin wetland plants.
- [A Field Guide to Invasive Plants of Aquatic and Wetland Habitats for Michigan](#)
- Additionally WIS vary in their [wetland indicator status](#), and can be found in non-wetland habitats. This may lead to monitoring WIS in habitats not formally designated as wetlands.

The following resources should be reviewed to become familiar with target animal species:

- [Nutria](#)
- [Red swamp crayfish](#)
- [Rusty crayfish](#)

#### Understanding invasive species distributions from databases:

WDNR staff and partners submit reports to the [Surface Water Integrated Monitoring System](#) (SWIMS) which provides data on the Department's website including AIS presence, abundance, and management actions. SWIMS is necessary for permit writing and documenting any species control action the WDNR funds. The [WISCLAND](#) land cover mapping system also maps large populations of invasive species such as reed canarygrass, cattails, buckthorn, and honeysuckle.

Users should be aware that not all invasive species records are available in SWIMS. Independent invasive species surveys are sometimes uploaded to public databases such as the Global Invasive Species Information Network ([GISIN](#)), Midwest Invasive Species Information Network ([MISIN](#)), Early Detection & Distribution Mapping Systems ([EDDMaps](#)), [iNaturalist](#), or others. The Great Lakes Indian Fish and Wildlife Commission ([GLIFWC](#)) has an [invasive species database](#) and the University of Wisconsin herbaria shares invasives data using [Symbiota](#).

WDNR has compiled various records from the listed databases in its Invasive Species Archive to streamline record consolidation, and this Archive is available from the Wetland Team at WDNR. Serving as a scoping tool, the Archive displays the geographic distribution of records, tracks the data source, and helps suggest which sites need further investigation and verification. It can be a great first site source for new projects.

#### Most likely additional sites to search for WIS:

Start with dispersal pathways as they are both accessible and vulnerable to WIS. Dispersal pathways include natural pathways such as flowing water or dispersal along game trails, and human-made pathways such as transportation and utility corridors; canals, ditches, and culverts; wetlands

impacted by channelization; impoundments; quarries and mines; or the outer margins of agriculture and urban areas. Both pathways co-occur in parks, public hunting, trapping and fishing areas, hiking trails, boat launches, and other areas where people recreate with nature (Higman et al 2010).

Wetlands that are adjacent or hydrologically connected to areas already infested with WIS are also potential monitoring areas. Searching these areas are useful when establishing the extent of prohibited or under-reported WIS.

Some WIS have a facultative life history and can be found outside of wetlands. Monitors should scan the landscape for WIS along roadways between wetland sites, likely habitats, and disturbed areas. If the species occurs infrequently or is prohibited, then such instances should be reported. Spending too much time documenting roadside WIS may not be productive, unless the project specifically focuses on those species or areas.

#### If you need to access private land:

There may be instances where privately owned wetlands need to be monitored and securing landowner permission will be necessary. WDNR identifies land ownership by comparing the SWIMS monitoring station against parcel data from the Surface Water Data Viewer, against [county plat books](#), county [GIS web applications](#), or contacting the county [Land Information Office](#). The latter applications are publicly available on the Internet or in print.

Initial contact will likely be by a postal letter, and should include a description of the project in detail; when the expected survey will occur, and parcel identification codes of the properties where access and search is requested. The following link below is a suggested landowner permission letter.

<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=153281025>

Landowners should be asked for a contact phone number and email address. Monitors should call and receive verbal confirmation prior to entering a property. A business reply envelope with pre-paid postage should be included with any informational packet, along with the monitor's email and telephone number in case the landowner has any questions.

If access permission needs to be expedited due to the suspected presence of an NR40 prohibited species, or other circumstances, a monitor may travel to the address and make personal contact with the landowner.

#### Managing the data:

For projects administered or funded by the WDNR, all aquatic and wetland invasive species data need to be submitted to [SWIMS](#). Comprehensive instructions for access to SWIMS and workflow can be found on its [Help Tips for SWIMS Users page](#). Once potential WIS sites have been identified, monitoring stations need to be created or tied to the project in SWIMS. The list of monitoring stations will form the core of the survey itinerary and pairing coordinates to stations will help later data entry.

Non-DNR are strongly encouraged to following reporting guidance on the DNR [website](#).

## **Phase 2: Site Visits**

Some sites may be located in road ditches, and visits may be as simple as safely pulling to the side of the road and reconitering in the legal right-of-way with [proper permits](#). Visiting other wetlands that can be anything from a tiny wet depression in a farm field to wild areas many acres in size will be more complex. Before accessing wetlands understand the landscape by reviewing maps to identify entry points, disturbed areas, and potential barriers to your movement. Review safety guidelines. When collecting data for WDNR projects using the WIS monitoring form.

A step-by-step guide to site visits, documentation, and later reporting is found in Appendix 2: Wetland Invasive Species Monitoring Project Protocol.

#### Review maps:

Before conducting surveys at a specific wetland, monitors should review aerial, topographic, and vegetative community maps from the [Wisconsin Wetland Inventory](#). Many features are available within the Department’s data viewers. The [Surface Water Data Viewer](#) will help depict the locations of SWIMS monitoring stations and (**Map 1**) while [Lakes and Aquatic Invasive Species \(AIS\) Mapping Tool](#) shows some invasive species records.

Reviewing site maps will show potential access points and potential pathways to monitors prior to entering the wetland. It may help the monitor to find potential disturbances, address any issues that might complicate movement through the wetland such as streams and open waters. Monitors should review the wetland communities associated with their target species.



**Map 1:** An example of the Wisconsin Wetland Inventory, water features, and aerial imagery projected using the Surface Water Data Viewer. Codes within the wetland polygons correspond to wetland communities found in the [Wisconsin Wetland Inventory Classification Guide](#).

#### Review safety guidelines:

To ensure the safety of all WIS monitors, be aware of the “General Safety Guidelines,” which are requirements for DNR staff and contractors, and recommended for all non-DNR staff and volunteers. The following guidelines list field work planning, protective equipment and training, vehicle use, and other Standard Operating Procedures listed by the Department. For more information, click the document icon below.

<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=151798568>

#### Data collection using the Wetland Invasive Species Monitoring form:

WDNR field monitors will collect data using the Wetland Invasive Species Monitoring (WIS) form (below). This form records information about the monitor, survey locations, site characteristics and brief descriptions of what AIS were discovered.

<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=133901217>

### Search paths at the target site:

Targeted search paths are the most efficient method when searching for specific plants in larger areas, and have been used when attempting to find invasive species (Huebner 2007). They allow the monitor to wander or meander through the wetland and target the likely habitats used by specific species. This method is a “plotless” approach, and does not require the placement of plots, transects, or other reference points which may miss locating target species (Goff et al 1982).

When using a targeted search approach, monitors should have both planned and adaptive components to their search paths. When moving through the wetland, monitors follow a random line and direction that transits through the wetland community, enabling the monitor to see a broad area. Monitors should search the area until sufficiently surveyed or until 20 minutes have elapsed since any new invasive species have been detected (Pat Trochlell 2016, personal communication). Figure 1 of Appendix 2 depicts a general guide for search paths at entry points and along roads.

### Incidental occurrences, when WIS found outside of target site:

If reporting in SWIMS and occurrences are observed incidentally between monitoring stations, an incident report should be completed.

Plants: <http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf>

Animals: <http://dnr.wi.gov/lakes/forms/3200-126-animalincident.pdf>

### Specimen verification:

Collect 3 specimens of all NR40 Prohibited occurrences, high profile species for your area (i.e. Eurasian water milfoil or zebra mussel), unusual specimens (i.e. suspected hybrid milfoil, unusual leaf count, unusual size, etc.), first occurrence in a county, or unknown specimens. Be sure that specimens contain all the identifying characteristics that are highlighted in the AIS Identification Guide (i.e. the root system, leaves, flowers, and seeds if a plant and the entire animal). Place aquatic plants in a bag with damp paper towel. Preserve animal specimens by either freezing or refrigerating in water or by using ethanol. Include internal and external labels. Check with the verifier on their preferred preservation method.

Photograph all new occurrences according to the [guidance](#) for verification and record purposes, though as stated above all new prohibited, high profile restricted species, and unknown specimens do also need a physical specimen. In each photograph include the landscape, population, and identifying characteristics that are highlighted in the AIS Identification Guide. Include the field data sheet in the photographs so that the location is visible.

### Decontamination when leaving a site:

Accidental dispersal of invasive organisms can occur during monitoring work via seeds, eggs, disease organisms, etc. on footwear, clothing and other gear. Monitors must decontaminate (and possibly disinfect) their clothing and equipment to prevent spreading invasives. Decontamination is a requirement for DNR staff, agents, contractors, and some permittees as stated within the [DNR Manual](#)

[Code #9183.1](#). Non DNR staff, agents, and permittees should at a minimum follow the [wetland invasive species best management practices](#).

Boat Gear and Equipment Decontamination and Disinfection Manual Code 9183.1:  
<http://dnr.wi.gov/topic/Invasives/disinfection.html>.

Best Management Practices for Preventing the Spread of Invasive Species in Wetlands:  
<http://dnr.wi.gov/topic/Wetlands/documents/WetlandInvasiveBMP.pdf>

### **Phase 3: Reports & Communication**

#### Enter data:

Enter data from the Aquatic Invasive Species Monitoring Wetland Data Form into SWIMS.

#### Submit specimens and photos:

Include a copy of the field datasheet with the specimens. Submit specimens and datasheet to the [Regional DNR AIS Coordinator](#). Photos may be emailed to [DNRIvasivePhotos@wisconsin.gov](mailto:DNRIvasivePhotos@wisconsin.gov). Specimens and photos of prohibited or newsworthy populations, or populations requesting a WI Administrative Code NR 107 Aquatic Plant Management permit must be submitted within 4 days. Populations that will seek Early Detection and Response grants must submit reports within 3 days.

#### Share findings:

The Regional DNR AIS Coordinator to notify partners such as [county conservationists](#), [tribal government contacts](#), other organizations found at the [DNR contact page](#). Contact information for CISMAs can be found through the [Invasive Plants Association of Wisconsin](#). After discovering prohibited roadside invasive species, share results with the Wisconsin Department of Transportation, [Bureau of Highway Maintenance](#). WDOT has initiatives to control prohibited invasive species as they occur along federal and state Rights-of-Ways.

### **References**

Campbell, S., P. Higman, B. Slaughter, and E. Schools. 2010. A Field Guide to Invasive Plants of Aquatic and Wetland Habitats for Michigan, Michigan State University Extension, 90p. (<http://mnfi.anr.msu.edu/invasive-species/aquaticsfieldguide.pdf>)

Goff, F., G. A. Dawson, and J. J. Rochow. 1982. Site examination for threatened and endangered plant species. Environmental Management 6:307-316.

Higman, P. J., B. Slaughter, S. Campbell, and E. Schools. Early Detection of Emerging Aquatic and Wetland Invasive Plants in Michigan. Michigan Natural Features Inventory, Lansing, MI. Report Number 2010-08. April 30, 2010.

## **APPENDIX 1: Summary of wetland habitat types:**

Wetland communities in Wisconsin are [varied and diverse](#). For this protocol and data collection, the following categories have been simplified. Further information on wetland communities may be found in "[Wetland Plants and Plant Communities of Minnesota and Wisconsin](#)".

**Aquatic bed/open water:** This wetland type is characterized by submergent or floating-leaved aquatic plants growing in standing water. Examples include duckweed (*Lemna* spp.), water lilies (*Nymphaea* spp.), spatterdock (*Nuphar* spp.) and pondweeds (*Potamogeton* spp.).

**Marsh:** These wetlands occur in areas where surface water occurs throughout all or a portion of the growing season. Typical species include cattails (*Typha* spp.), bulrushes (*Schoenoplectus* spp.), arrowheads (*Sagittaria* spp.), and pickerel weed (*Pontederia cordata*).

**Meadow:** These wetlands may occur on saturated soils without standing water. Dominant vegetation is comprised of sedges, grasses and flowering plants. Example plant species include tussock sedge (*Carex stricta*), Canada bluejoint grass (*Calamagrostis canadensis*), marsh aster (*Symphotrichum lanceolatum*), joe-pye weed (*Eutrochium maculatum*), and giant goldenrod (*Solidago gigantea*).

**Scrub/shrub:** This wetland type is dominated by woody shrubs or small trees. Common shrub species include willows (*Salix* spp.), red osier dogwood (*Cornus alba*), and tag alder (*Alnus incana*). Small trees may include ash trees (*Fraxinus* spp.) or box elder (*Acer negundo*).

**Open bog:** Bogs are plant communities which develop on peat soils with a Sphagnum moss understory. Common species include ericaceous shrubs like leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda polifolia*), and cranberry (*Vaccinium* spp.). Stunted trees may be present.

**Spruce/tamarack forest:** These wetland communities are typically found in the northern Wisconsin. They occur on soils that are acidic to neutral with various hydrologic regimes. Species that are commonly present include black spruce (*Picea mariana*), tamarack (*Larix laricina*), and ericaceous shrubs like leatherleaf (*Chamaedaphne calyculata*), and Labrador tea (*Rhododendron groenlandicum*), with an understory of sedges.

**Cedar swamp:** Cedar swamps are wetlands occurring on groundwater-dominated sites with basic soils. White cedar (*Thuja occidentalis*) dominates the forest canopy with a diverse herbaceous community.

**Deciduous forest:** Deciduous forest wetlands include lowland hardwood swamps and floodplain forests. Typical lowland hardwood tree species include black ash (*Fraxinus nigra*) and red maple (*Acer rubrum*). Tree species typically found in floodplain forests include silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), cottonwood (*Populus deltoides*) and American elm (*Ulmus americana*).

**Upland habitats:** Not wetland but have WIS. Typically found in wet ditches, transportation and utility corridors, agricultural fields, and streambanks or shorelines.

## **APPENDIX 2: Wetland Invasive Species Monitoring Project Protocol:**

1. **Review** Department General Safety [Guidelines](#).
2. **Review** [Department Safety SOPs 1, 2, 3 \(4 and 6 are only necessary for boat use\)](#).
3. **If sites to be field checked are locations previously reported** to WDNR, species and location information simply need to be confirmed, along with estimating site size. The WDNR/UWEX Wetland Invasive Species (WIS) Program can often supply data for such sites. **Always obtain access permissions** from landowners before entering private land sites. Local stakeholders may help acquire permissions to conduct such monitoring, but the WIS Program can often supply landowner contact info (or even acquired permissions) once accurate location, species and site size info is reported to the Program. Road right-of-way permissions are also generally necessary (see below).
4. **Become familiar with [target species in aquatic and wetland sites \(also see the Guide to Invasive Plants in Wisconsin at <http://dnr.wi.gov/files/pdf/pubs/fr/fr0436a.pdf>\)](#)**. Develop accurate search images for target species based on time of year and appropriate physical characteristics.
5. **Check what records** are known in the work area to know whether there are any previous records that need verification, and if [disinfection methods are needed](#) to prevent further dispersal of exotic species during field work.
6. **Review local area maps** to identify vulnerable habitats and areas to search that are likely to have target species, such as roadsides, developments, other transportation corridors, possible source locations, etc.
  - a. WIS Program may provide small scale site maps for reported target populations.
  - b. Township maps will show infested road sites and other known area AIS locations.
  - c. These will provide clues to where other roads/areas might harbor additional sites that should be checked.
  - d. Roads travelled should be marked on maps for area work records. Maps that have been marked on should be scanned and saved to the project in SWIMS.
  - e. Wis. Atlas/Gazetteer may be used to orient township map locations & help devise efficient travel routes.
7. **Equipment** that may be necessary to conduct the survey (not necessarily inclusive).
  - a. Roadsides: Retroreflective vest, red flashing light(s) for car, orange safety cones.
  - b. GPS unit to record coordinates, and tracks if doing a moving survey.
  - c. Camera to collect photos of specimens. Geo-coded camera or smart phone preferred.
  - d. Ziploc bags with label pens for preserving prohibited specimens. Ideally save in plant press later for vouchering specimens. Labels are used to properly identify the collection site.
  - e. Binoculars/scope to scan distant sites & Range finder, if available, to estimate distance.
  - f. [Wetland Invasive Plant Monitoring form](#) (on waterproof paper) for each site.
  - g. Portable Jiffy steam, car inverter and long handled stiff bristled brush for disinfection.
  - h. Multiple pairs of boots or waders for sampling multiple sites where decontamination is necessary. Walking sticks may be useful.
8. **Surveys:**
  - a. **Take photographs** for each species observed following the [Photographing Guidance](#) found in the [verification process](#) guidance document. Photographs of each physically distinct population will be needed for verification for any species, especially difficult to distinguish from look-a-like species (e.g. Phragmites subspecies). For other species, only one photo is necessary for all the same species recorded in a wetland. Send photos to the regional DNR AIS Coordinator.

- b. **Collect specimens** for prohibited species or for difficult to identify species. Collect plant parts critical for effective ID and label carefully. Send specimens to the regional DNR AIS Coordinator.
- c. Record the **start coordinates (access point)** and AIS presence/absence on the [Wetland Invasive Plant Monitoring form](#).
- d. **If monitoring a roadside population:**
  - i. **WDOT permits** are required for roadside surveys on state and federal ROWs, and county or town permission is wise for their roads. Only check plants that are within the legal right-of-way unless private land permissions have been acquired. The ROW is typically 66' (out to 33 feet each side from the road center line) on most 2 lane county, state, federal and 20'+ wide town roads (49.5' ROW on 16'-18' town roads). Contacting landowners adjacent to roads before entering ROWs, if possible and safe, is useful since neighbors often care for these areas and may want to know your purpose, but their permissions are not required for entry into ROWs.
  - ii. **All legally invasive wetland plants in ROWs** or within eyesight of road should be reported, but right-of-way field site checks will be most common for some species. Make a note in the comments if a population is outside the ROW.
  - iii. **For previously reported sites**, prepare routes, maps or any other aids based on site locations to check sites as efficiently as possible.
  - iv. **Drive & work carefully** while scanning for any species, especially if also monitoring GPS coordinates to find a previously reported site. Keep all WDOT work safety requirements in mind when deciding to stop, including having your retroreflective vest on constantly. Have the vehicle flashers on whenever driving slower than other traffic. The vehicle should be driven entirely off pavement and onto the road shoulder, if possible. Consider parking either side of a site if necessary for this. Leave the vehicle from its left side, if possible.
  - v. **Collect GPS** point where monitoring is initiated and record on the datasheet as "access" and indicate whether AIS were observed or not. If AIS were observed, estimate the area and density. If it is a small population (e.g. one plant), collect the coordinates from the population center. If it is a larger population (e.g. a living room, 12 ft x 16 ft), collect coordinates from each edge of the population to create a polygon. Provide GPS accuracy in the comments of the data sheet. Use the [WDNR Coordinate Reference System](#).
  - vi. **Turn GPS tracking 'on'** during the search to keep track of the search route.
  - vii. **Search (meander)** along the road. Each time an AIS is observed, record the coordinates as "meander" and estimate the area and density. Populations ~20 feet apart can be recorded as a new population.
  - viii. At the **end of the search track**, record the end point as an "access", collect coordinates and records whether AIS were observed or not. If AIS were observed, estimate the area and density.
  - ix. **Confirm the species and collect** the latitude/longitude coordinates at the population center point for each monitoring location (with shape if a polygon),

as well as infestation size. If a population is visible from the road, but not accessible, estimate the distance, direction (with range finder if possible) and size. Use binoculars. Before reporting distant sites, confirm population center point and size later from recognition of the infestation on Google Earth or using other mapping software so that accurate land ownership can be determined for getting access permission.

- x. **Complete** the [Wetland Invasive Plant Monitoring form](#). Be sure to estimate the area and density of each population.
- e. If monitoring a whole wetland:**
- i. **Turn GPS tracking 'on'** during the search to keep track of the search route.
  - ii. **Examine predetermined vulnerable target areas** identified as vulnerable during desktop reconnaissance. Additional target sites may be added upon visual inspection of the wetland (blowdown, construction, etc.). Target sites will be recorded as 'target' and AIS presence/absence will be recorded. Species found that were not at pre-determine target locations will be recorded as 'incidental' sites.
  - iii. **Complete the Wetland Invasive Plant Monitoring form.**
- f. **Describe** each search site and the overall wetland on the form.
  - g. **Record the stop location** and presence/absence of AIS on the form.
  - h. **Turn tracks 'off'** and save them by the station name and date. They will be saved to the SWIMS project and attached to the ROI later.
9. Decontaminate and disinfect equipment when leaving a site where you have entered a wetland (actual entry is not always necessary), [decontaminate](#) any clothing or equipment that was used per the Boat, Gear, and Equipment Decontamination and Disinfection [Manual Code 9183.1](#).
10. **Enter the data** from the Wetland Invasive Plant Monitoring form into SWIMS.
- a. The excel spreadsheet will identify if a station already exists or whether a station needs to be created.
  - b. The collector will create any stations that need to be creating and all surveyed stations to the project and enter the data.
  - c. Be sure to save scans of the data sheet and attach them to the project.
  - d. To obtain treatment results quickly, the collector will also add verification and acreage estimates to the excel spreadsheet.
11. **Submit incident reports** for AIS occurrences observed while in route to monitoring station.
12. Provide **photos/specimens** to the regional verifier.
13. Follow the [communication protocol](#) following new discoveries.

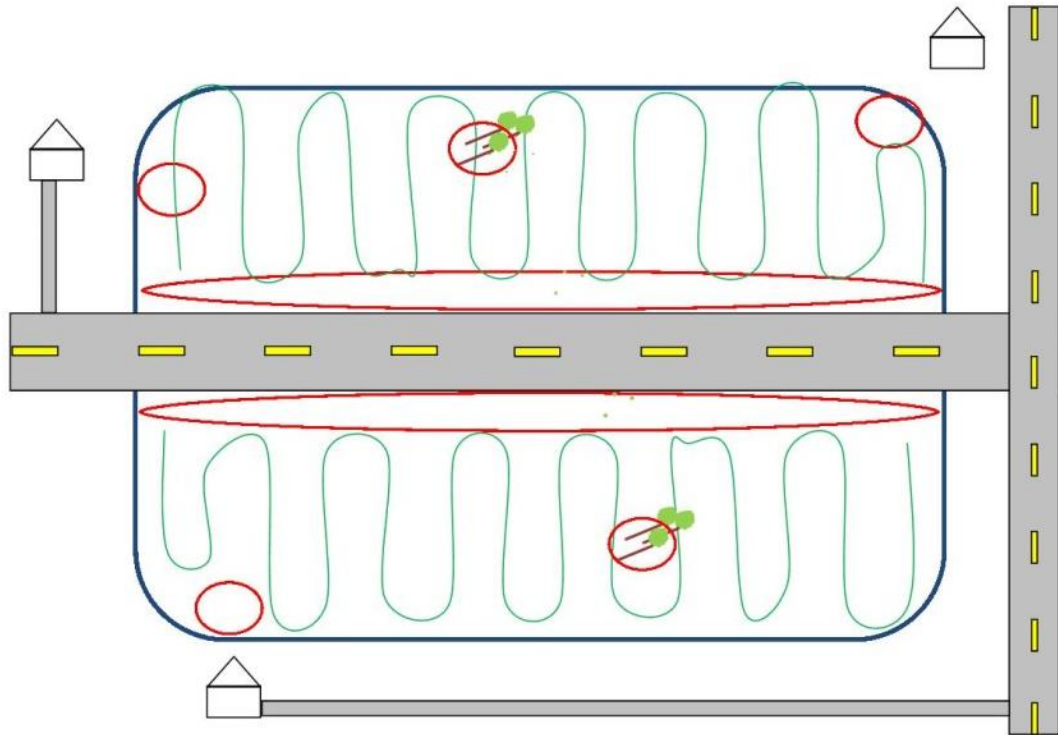


Figure 1. Schematic of Wetland AIS Early Detection Survey Design. Survey along road accesses and 5 target areas (red circles). Target areas include areas of anthropogenic influence like roads or homes and disturbances like blow down. Survey along transects between target sites for broad coverage of the wetland (blue line).