# Habitat Management Guidance for Reptiles and Amphibians

**Bruce Kingsbury**

Indiana – Purdue University Fort Wayne


CENTER OF EXCELLENCE
ENVIRONMENTAL RESOURCES CENTER
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE

*Conservation through research and education*

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## About me:

Greetings! I am Professor of Biology, Associate Dean of Arts and Sciences, and Director of the IPFW Environmental Resources Center (ERC). My students and I are engaged in research on a variety of animals, notably snakes and turtles. Principal areas of focus are the ecological requirements of imperiled species, and the improvement of landscape management approaches to meet project objectives while maximally benefitting wildlife.




## Fort Wayne will start intensive study of local rivers

by Michael Ravesi | Leave a Comment

An assessment of Fort Wayne's rivers will include flood risk, hydrology, environmental influences, and recreational use. The project, initiated by Mayor Tom Henry, has a budget of $500,000. Future riverside development is the ultimate goal of the project.

Continue Reading →

## ACRES passes the 5000 acres mark!

by Bruce Kingsbury

ACRES passes the 5000 acres mark! ACRES, the largest regional landtrust in the Fort Wayne area, has officially acquired its 5000th acre of protected land. http://www.journalgazette.net/article/20130112/LOCAL/301129985/1002/local

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## Seafood Watch? There's an app for that.

by Bruce Kingsbury | on March 2, 2013

Monterey Bay Aquarium, host of Seafood Watch, has information on the environmental consequences of the seafood you eat. Not only can you find this at their website, but you can even put a regionally (and globally) relevant application

RECENT POSTS

Seafood Watch? There's an app for that.
New tigers arrive at Fort Wayne Children's Zoo
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Science Building
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# HABITAT MANAGEMENT GUIDELINES FOR AMPHIBIANS AND REPTILES OF THE MIDWESTERN UNITED STATES

Technical Publication HMG-1 2nd Edition

PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION

# Agenda

- Highlight wetlands as key
- Show importance of wetland ***complexes***
  - And thus consider connectivity
  - Investigate roads as barriers
- Look for some tangible general guidelines for management along the way
- Introduce the HMGs

# What are we looking at?

- Prairie-Forest Border Ecoregion
- Sensitive species
  - Wetland factor?
    - Spotted Salamander
    - Pickerel Frog
    - Wood Frog
    - Blanding's Turtle (complexes)
    - Blanchard's Cricket Frog (extirpated)
    - Queensnake (ext)
    - Eastern Massasauga (ext)
  - Open grassland or woodland?
    - Eastern Hog-nosed Snake
    - Smooth Greensnake
    - Butler's Gartersnake (& wetlands)
    - Plains Gartersnake (yup)
    - Western Ribbonsnake (ext?)


Ephemeral Wetlands
Throughout the Year

# FOR MANY AMPHIBIANS, NO WETLAND IS TOO SMALL

Keep the fish out, and don't worry if it dries out sometimes…

# Winter

# Spring

# Summer

# Fall

# Winter

# Amphibian Reproductive Cycles and Ephemeral Wetlands

Wood Frogs, *Rana sylvatica*

# Spring

Wood Frogs breed early in the spring

Females can lay Thousands of eggs

# Summer

Tadpoles hatch in late Spring. They develop very quickly into adults

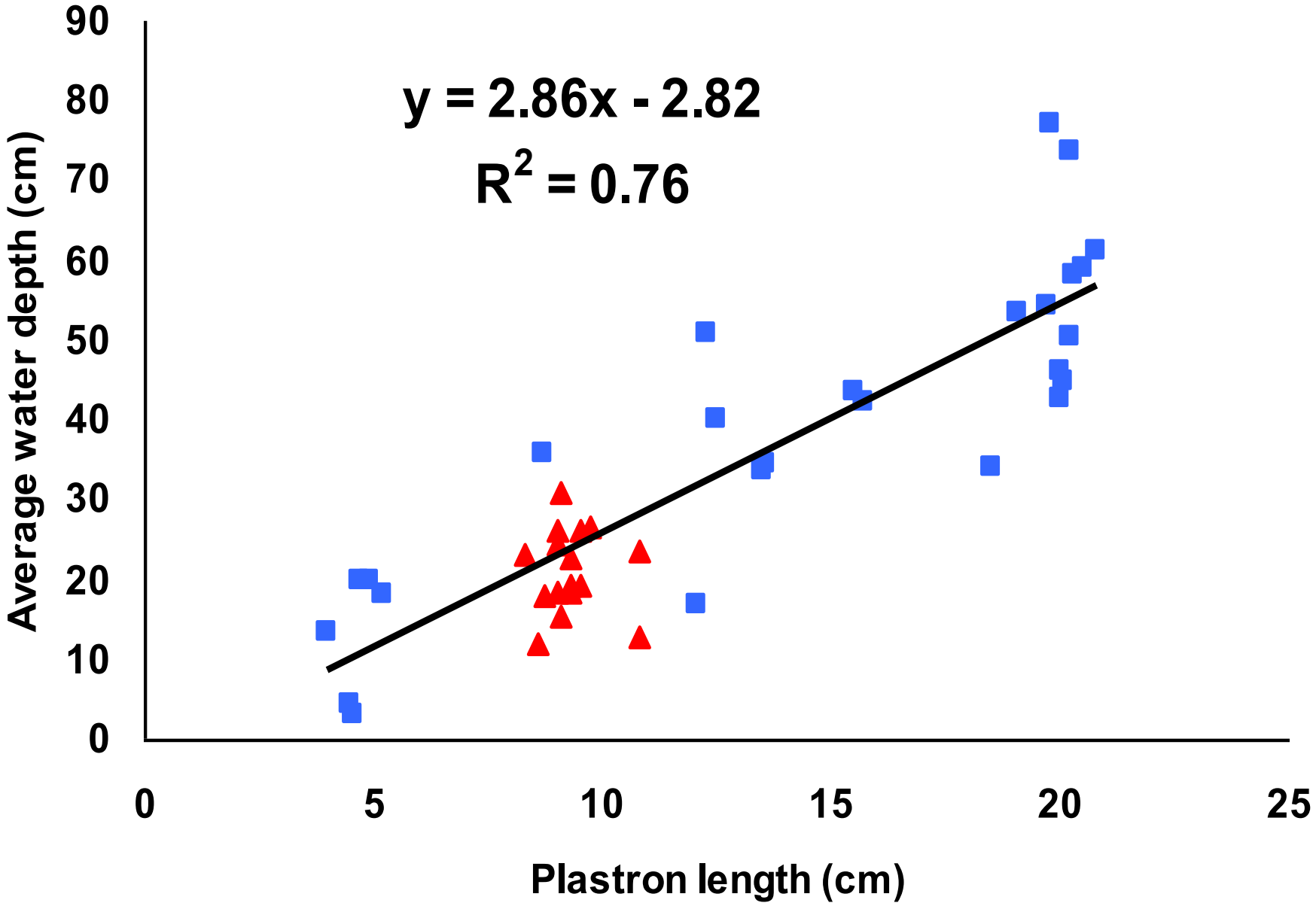
Adult frogs move into surrounding upland habitats

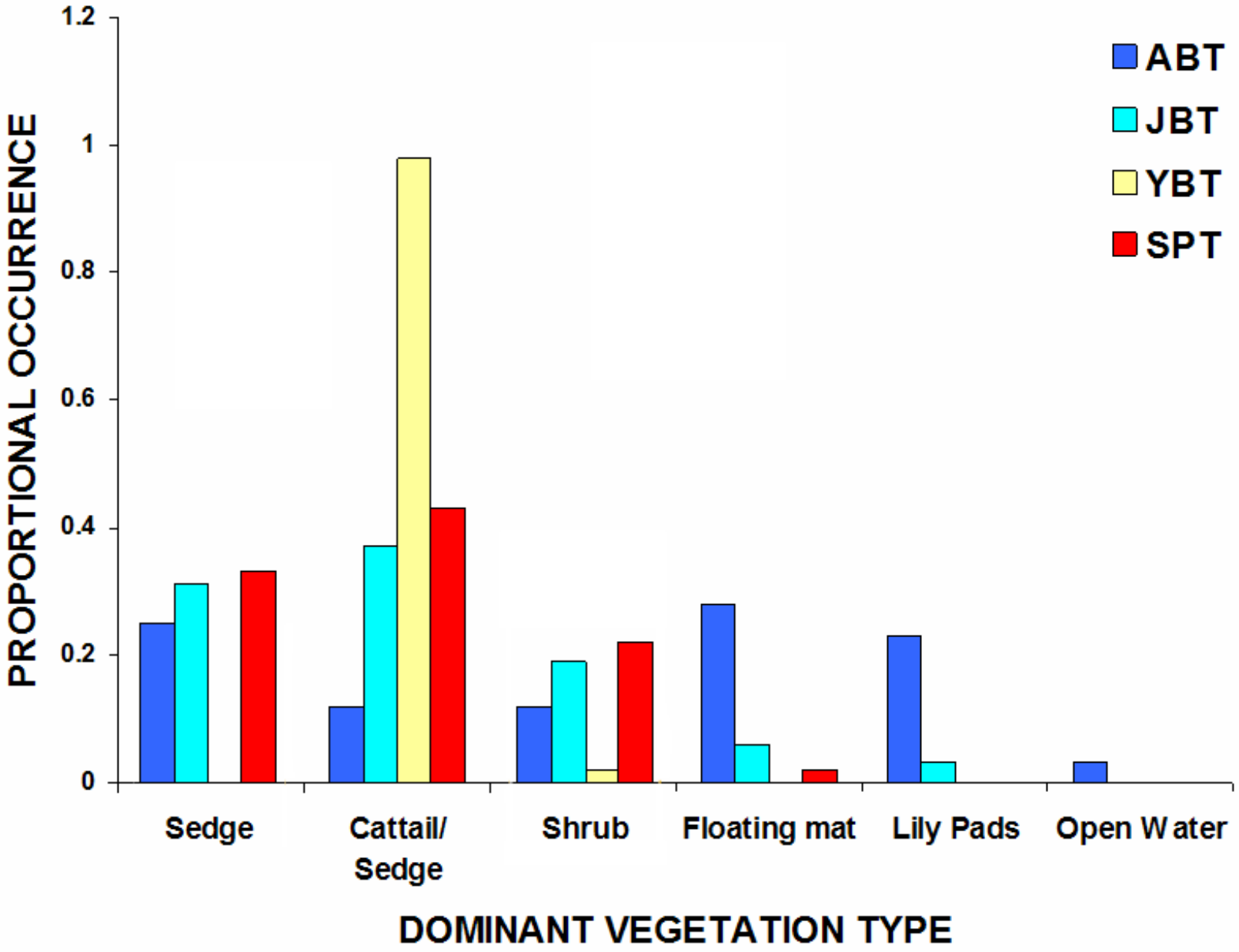
# Fall

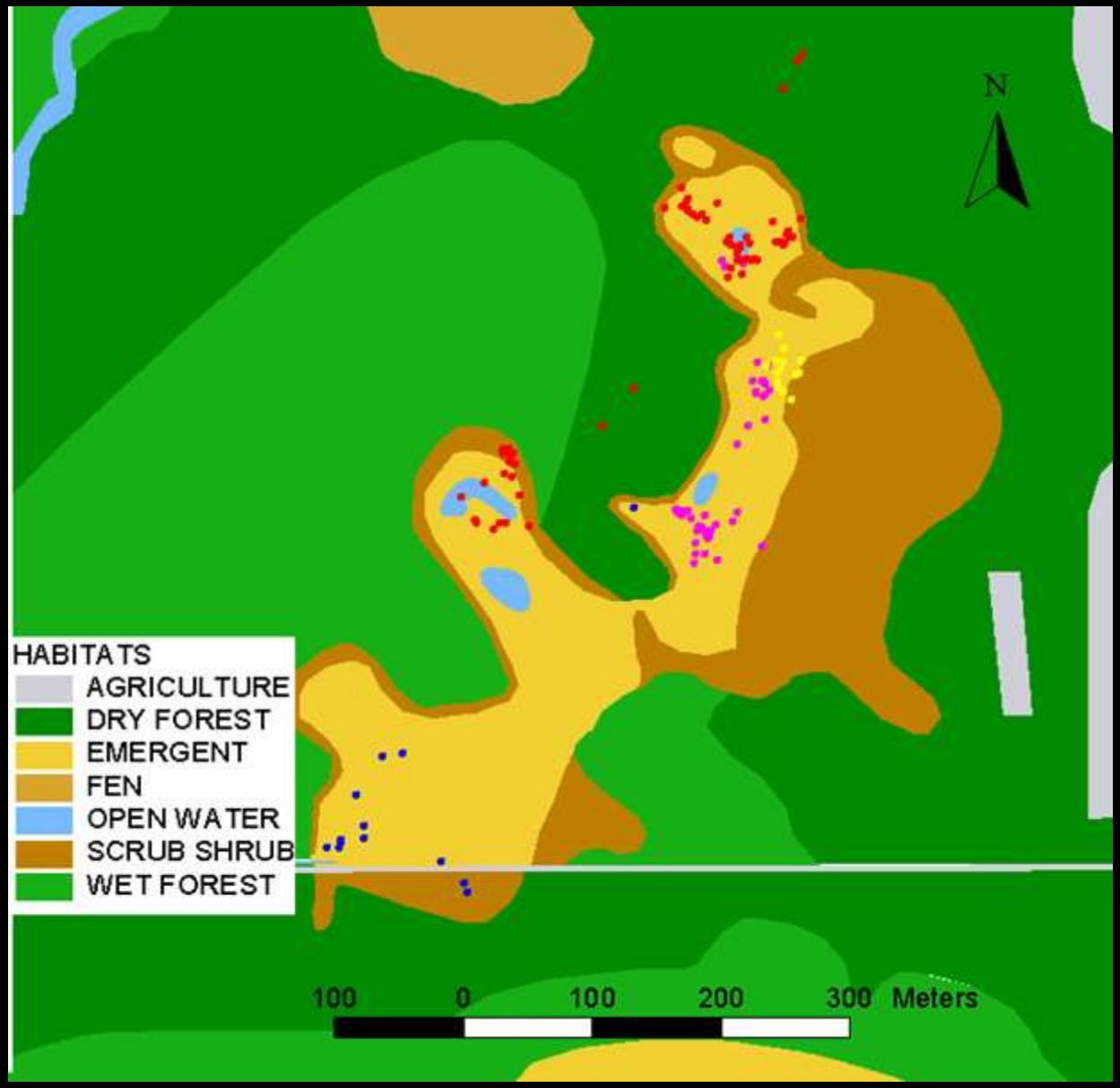
Adult frogs will spend the rest of the year foraging or hiding under debris in the uplands

# Winter

- Wood Frogs hibernate in the uplands around ephemeral wetlands.
- They are freeze tolerant and can survive extended periods of being frozen solid


y = 2.86x - 2.82
R2 = 0.76
Average water depth (cm)
0
10
20
30
40
50
60
70
80
90
0
5
10
15
20
25
Plastron length (cm)


1.2
1
0.8
0.6
0.4
0.2
0
PROPORTIONAL OCCURRENCE
ABT
JBT
YBT
SPT
Sedge
Cattail/ Sedge
Shrub
Floating mat
Lily Pads
Open Water
DOMINANT VEGETATION TYPE




Blue • = Adult Blanding's turtles

Red • = Spotted turtles

Yellow • = Juvenile Blanding's turtles

Pink • = Yearling Blanding's turtles


Site 3
Site 1
Site 2
Site 4
Site 5
HABITATS
AGRICULTURE
EMERGENT
FORESTED WETLAND
OLDFIELD
OPEN WATER
SCRUB SHRUB
UPLAND FOREST
500
0
500


200
0
200 Meters


What about nesting sites?
200
0
200 Meters

# Aquatic Turtles

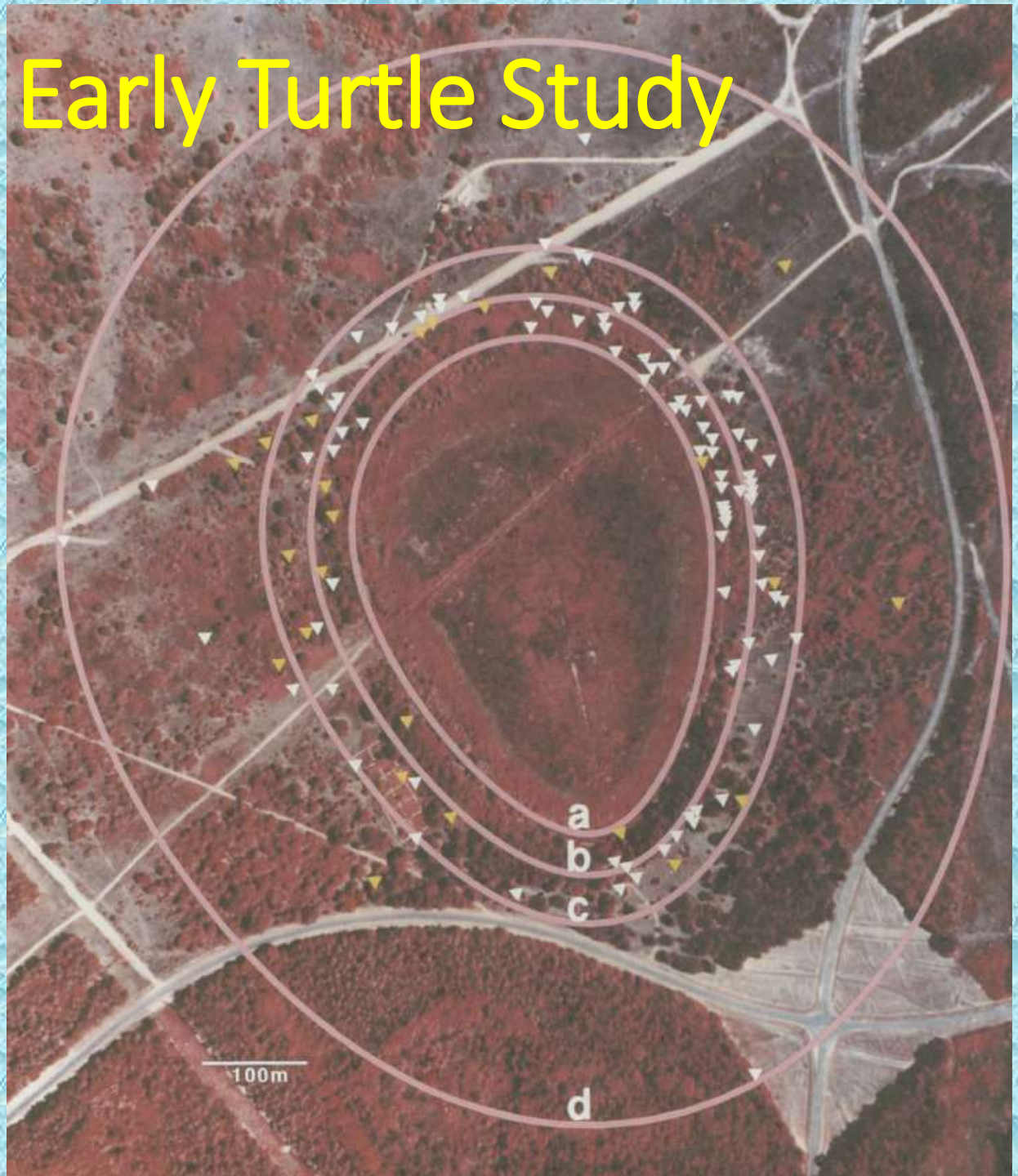
- All of our aquatic turtles lay eggs on land
  - Do they have what they need?
- Some turtles overwinter in uplands
- Many estivate on land
- Some need safe passage to the next wetland

# Nesting Habitat

- Varies between species
- Friable soils suitable for digging nest
- Open canopy to promote warm nest environment
- Safe passage to and from

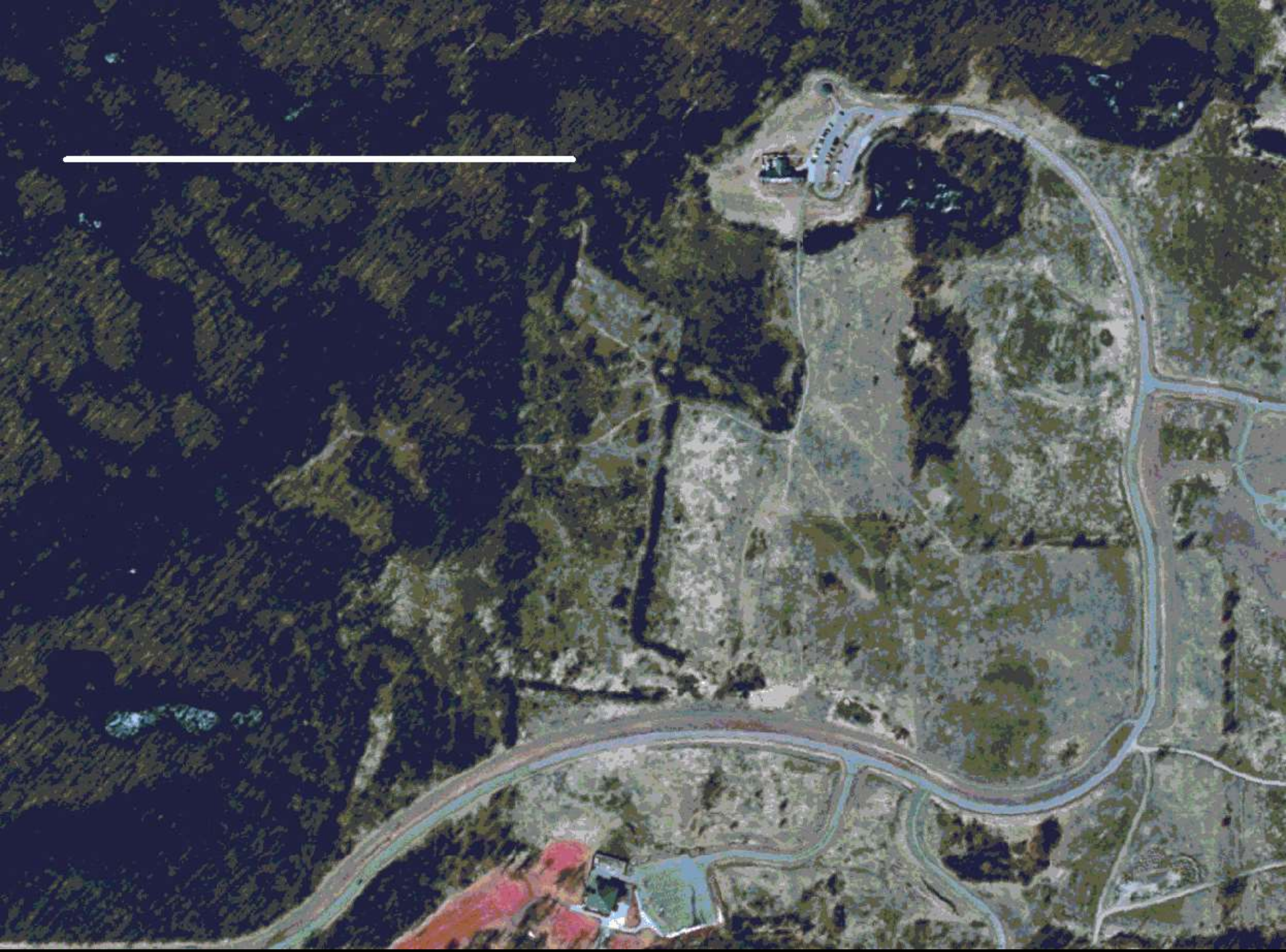
- Those needs may not be met within a wetland buffer

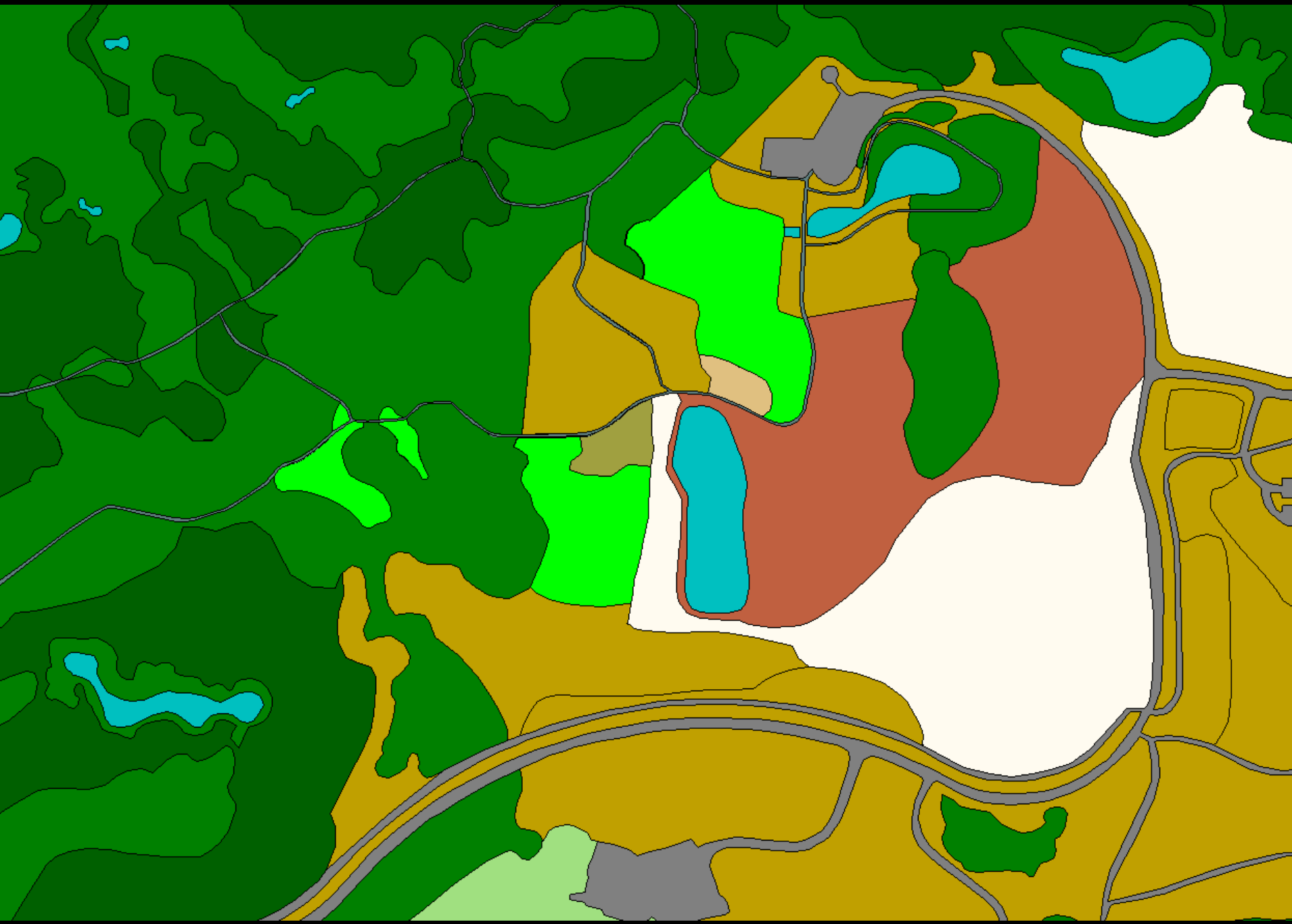
# Early Turtle Study

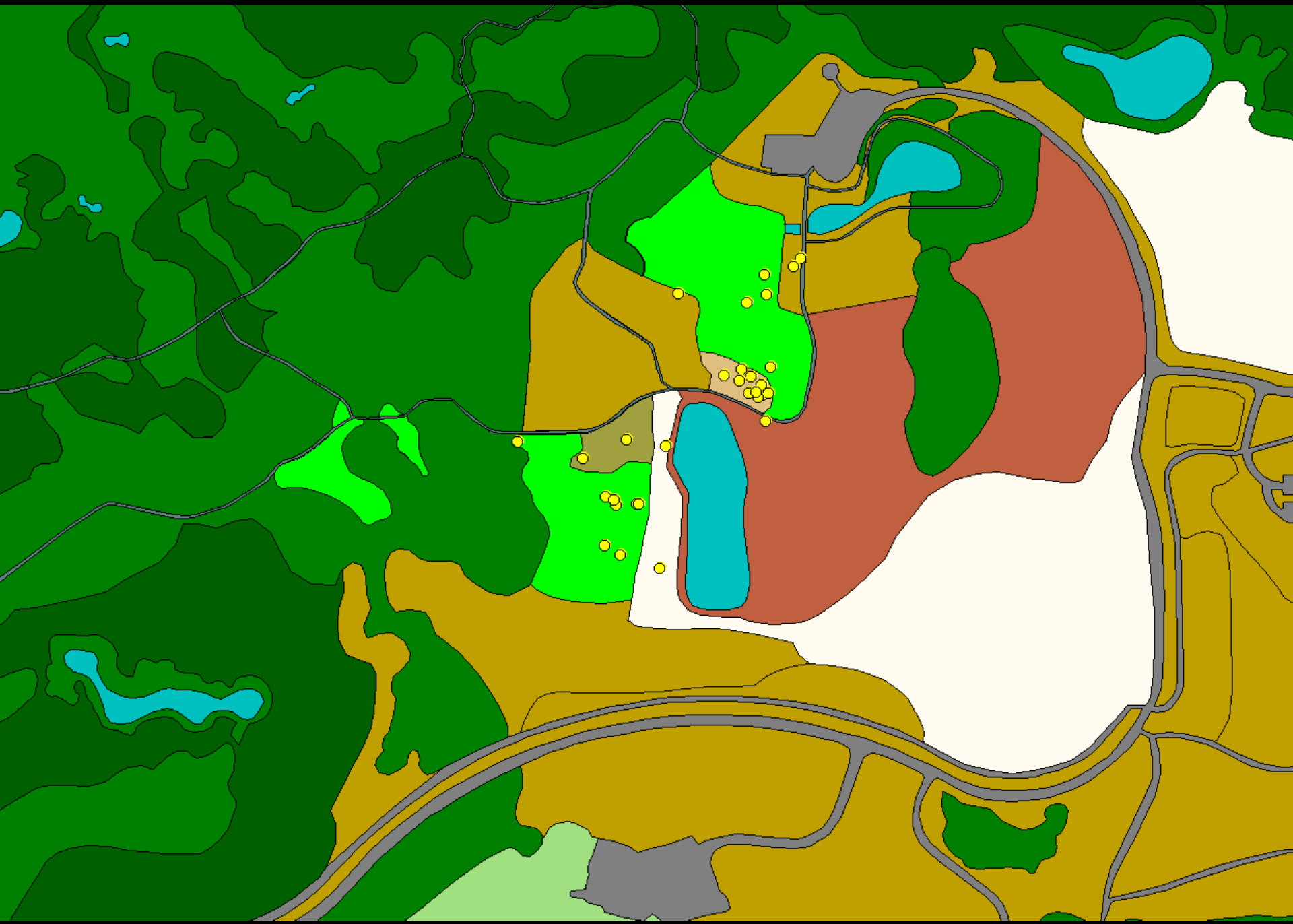


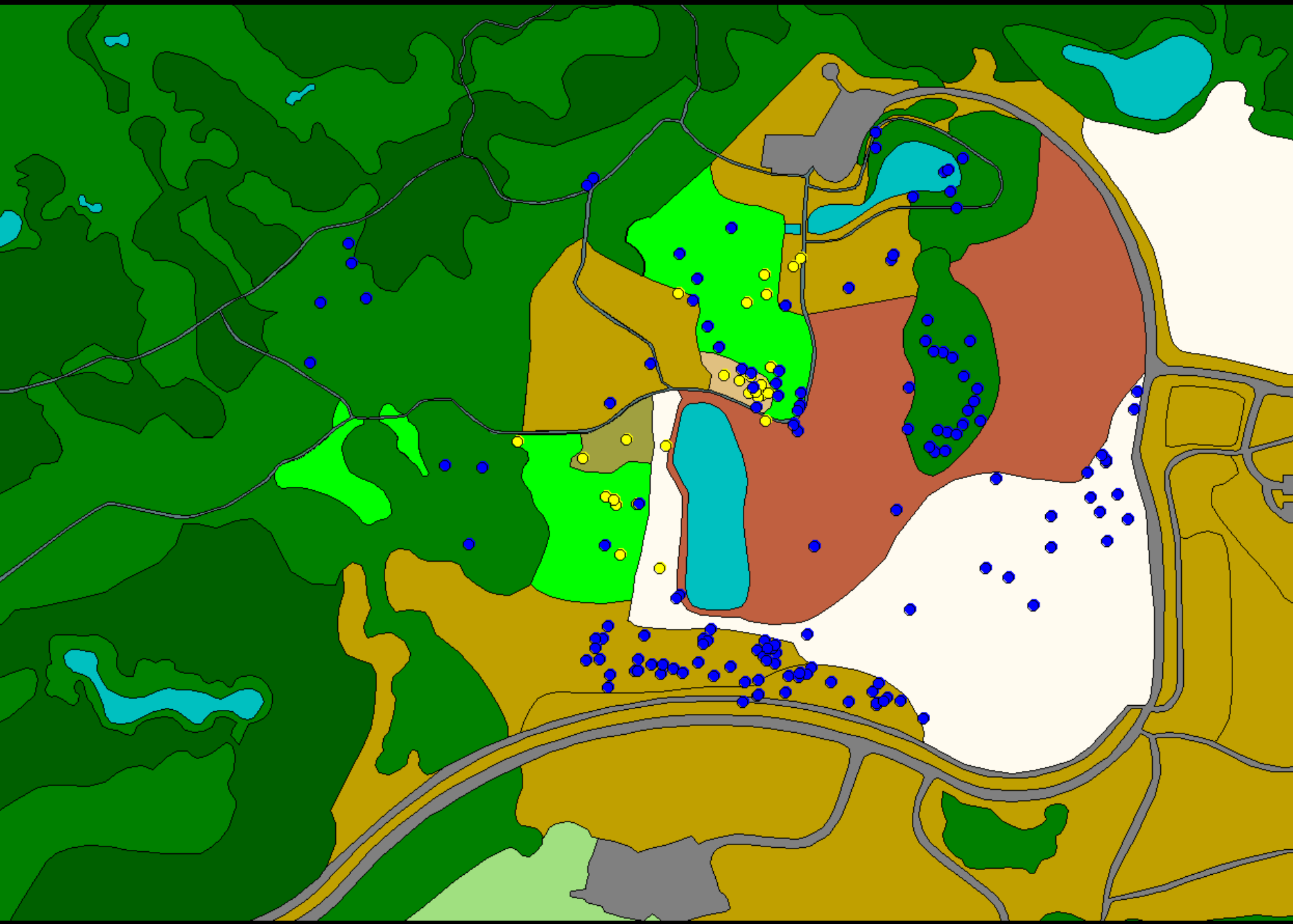

Burke and Gibbons ’95

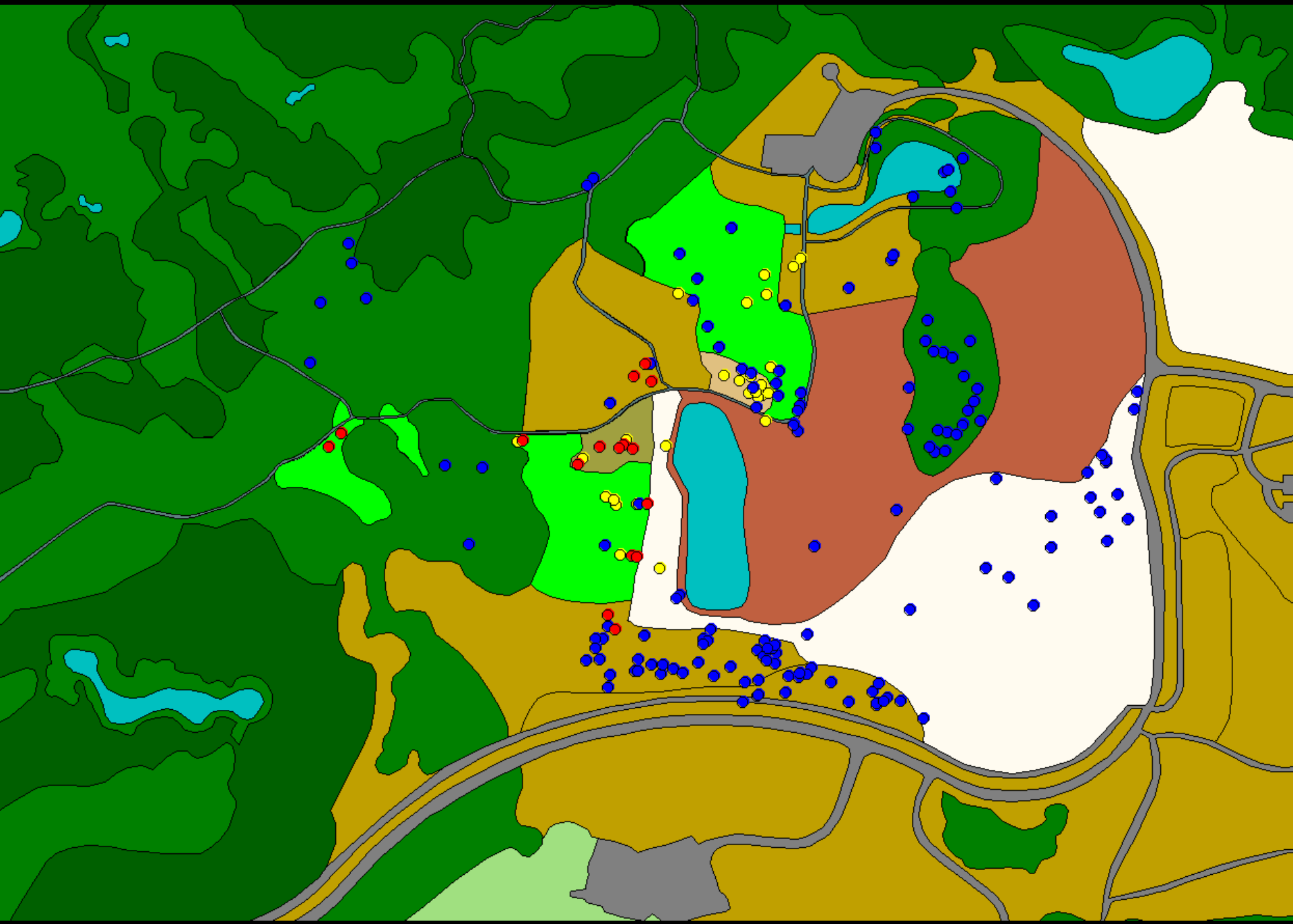
- Federal and state buffers don’t capture nesting and hibernation sites

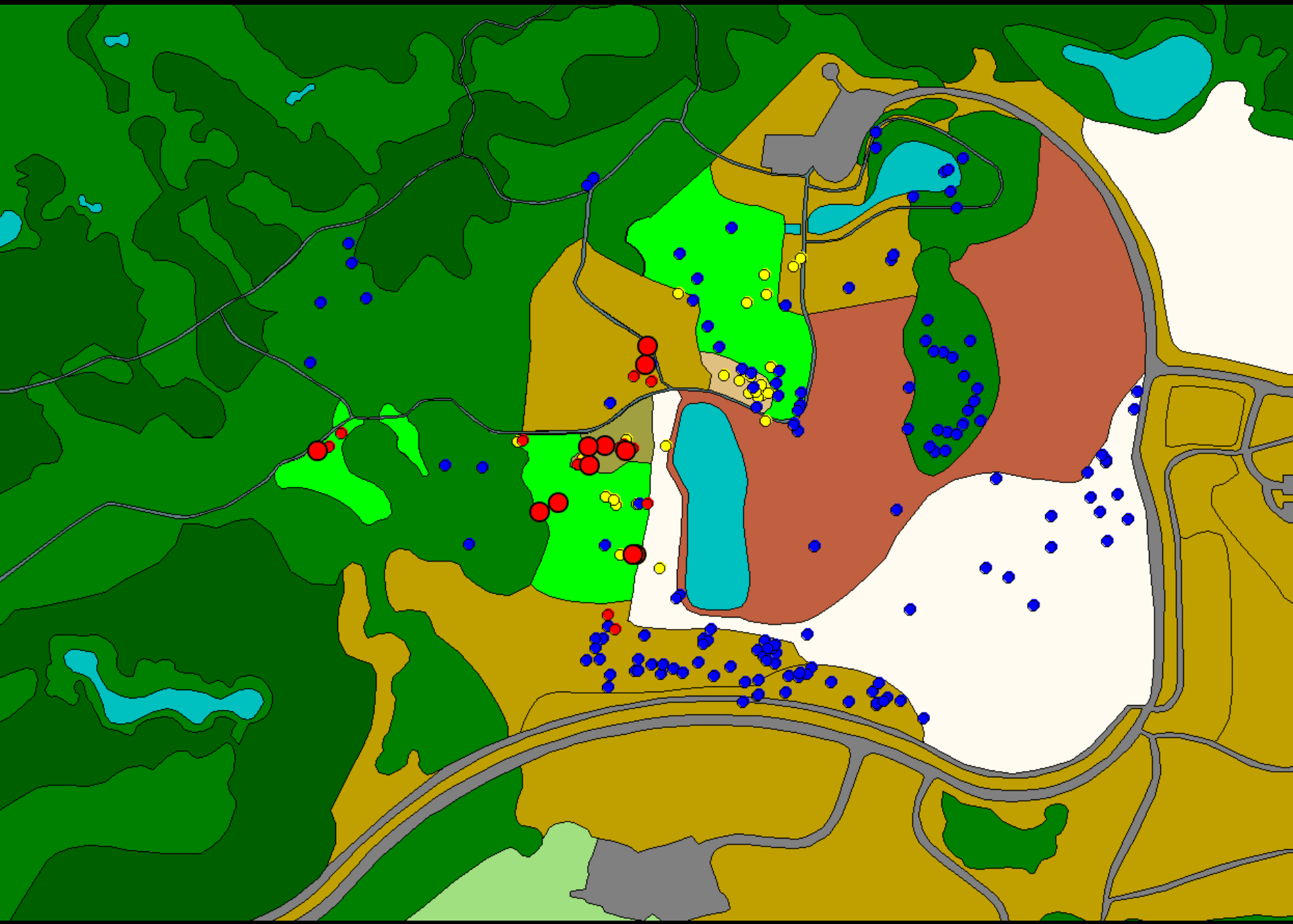


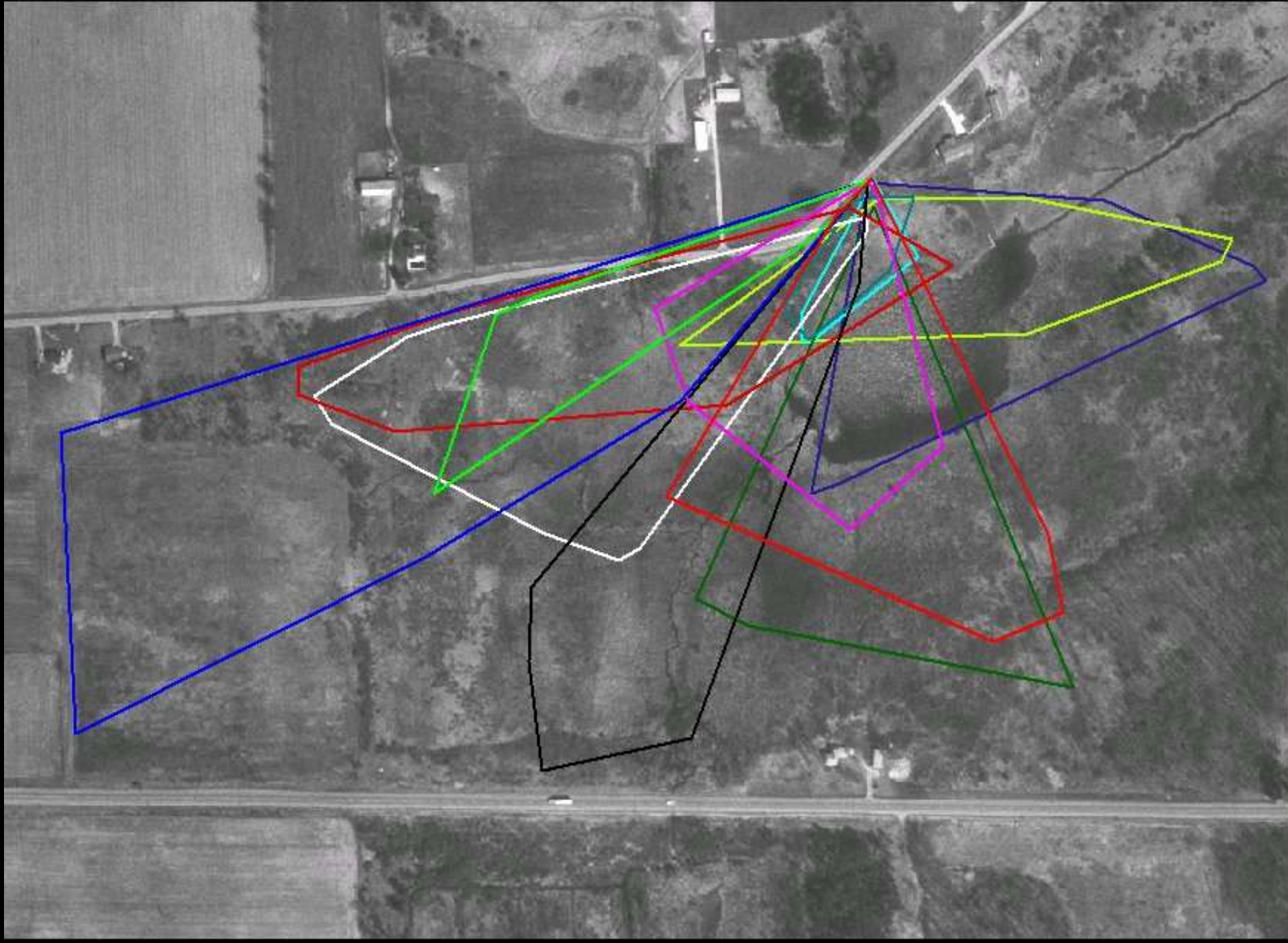




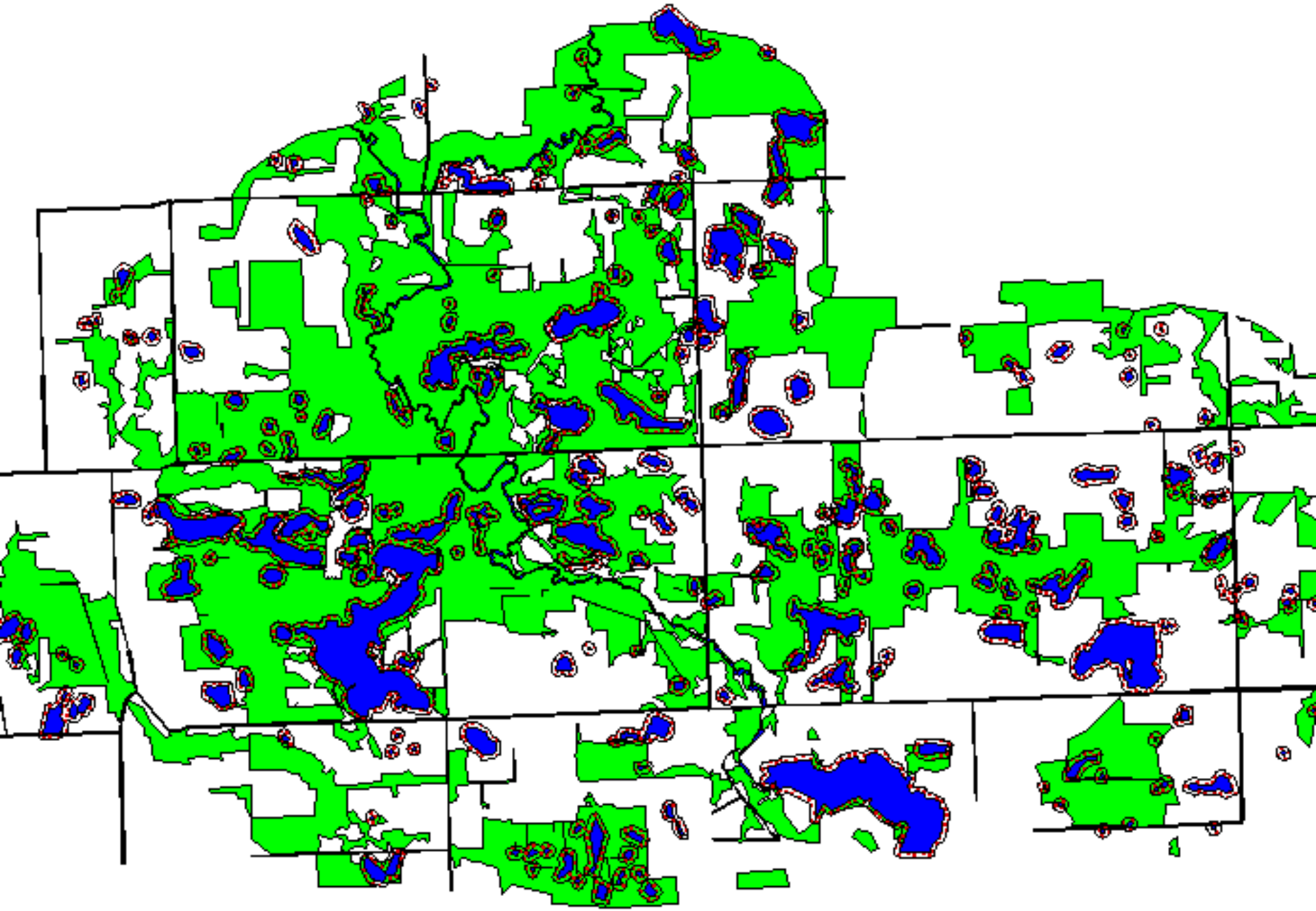




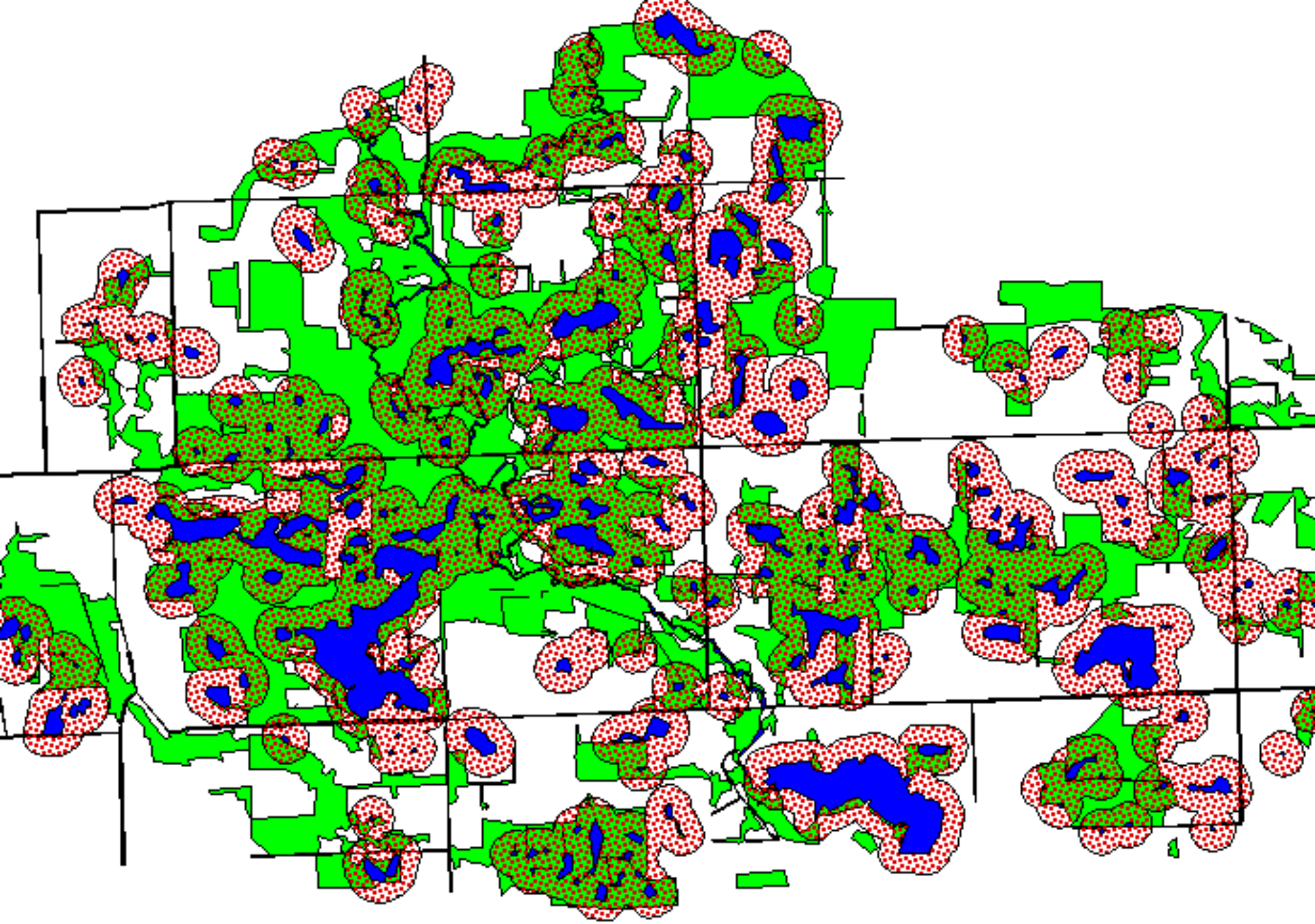




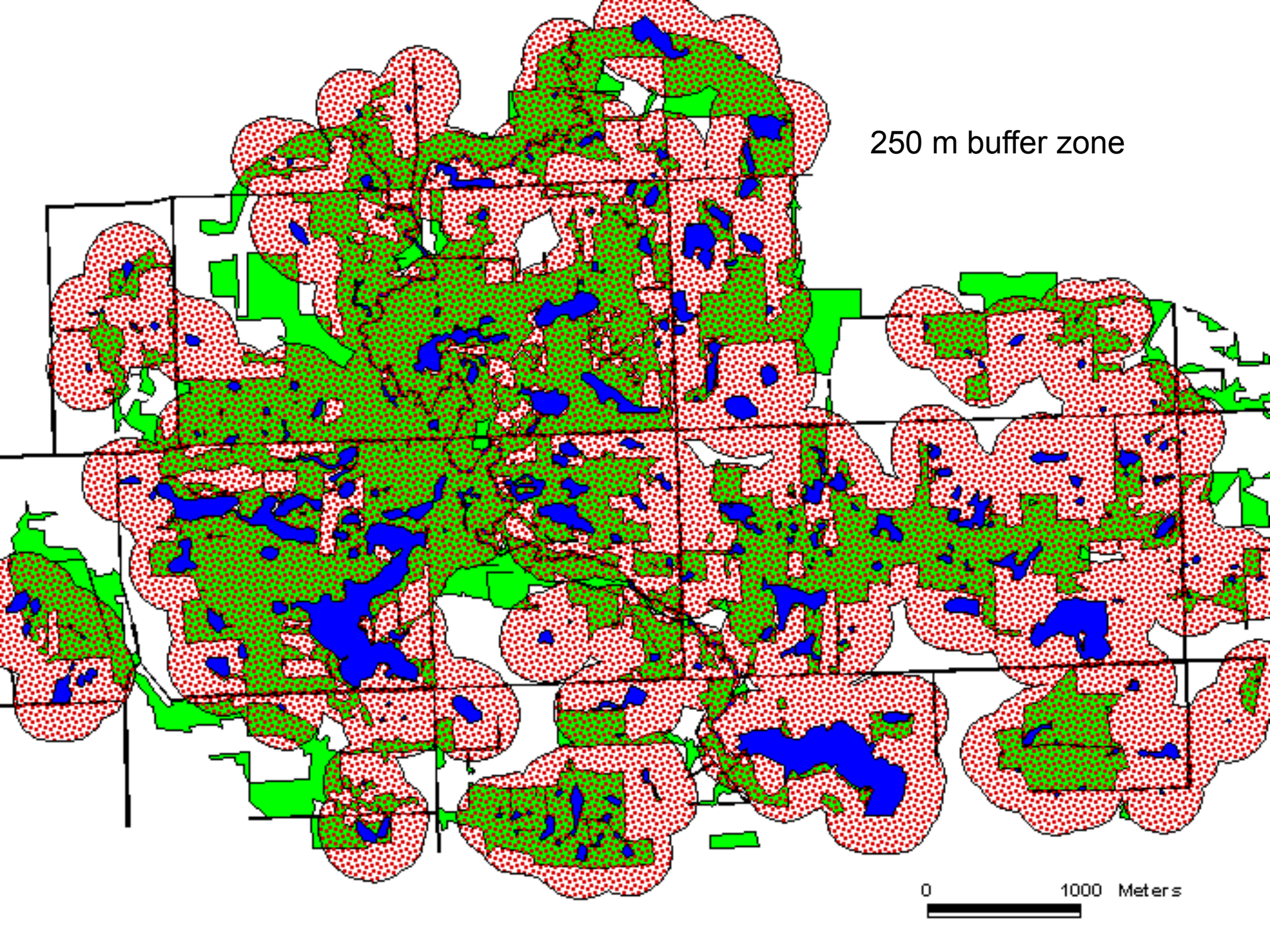
# Identifying and Mitigating the Impacts of Roads

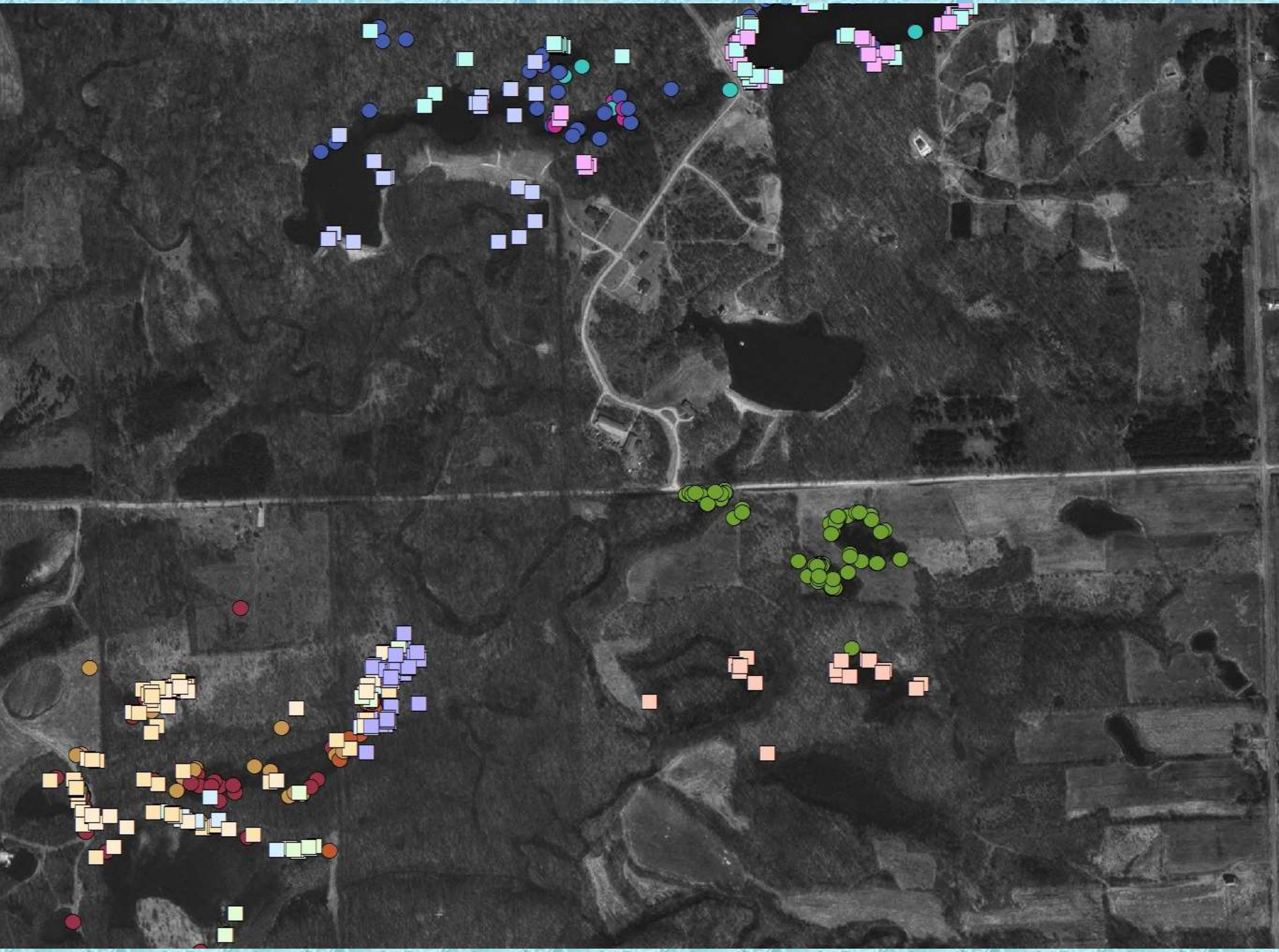


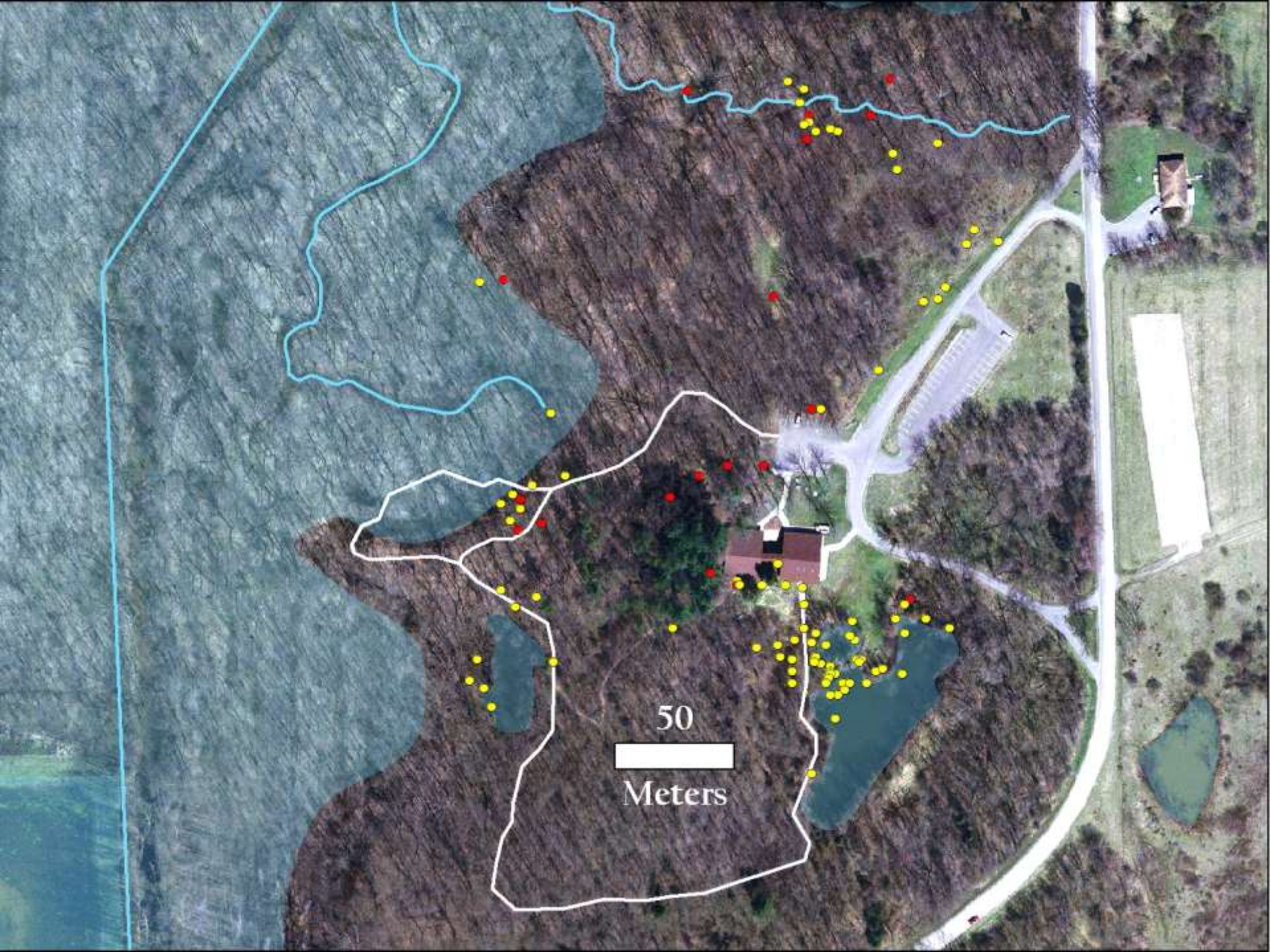

30 m buffer zone




125 m buffer zone

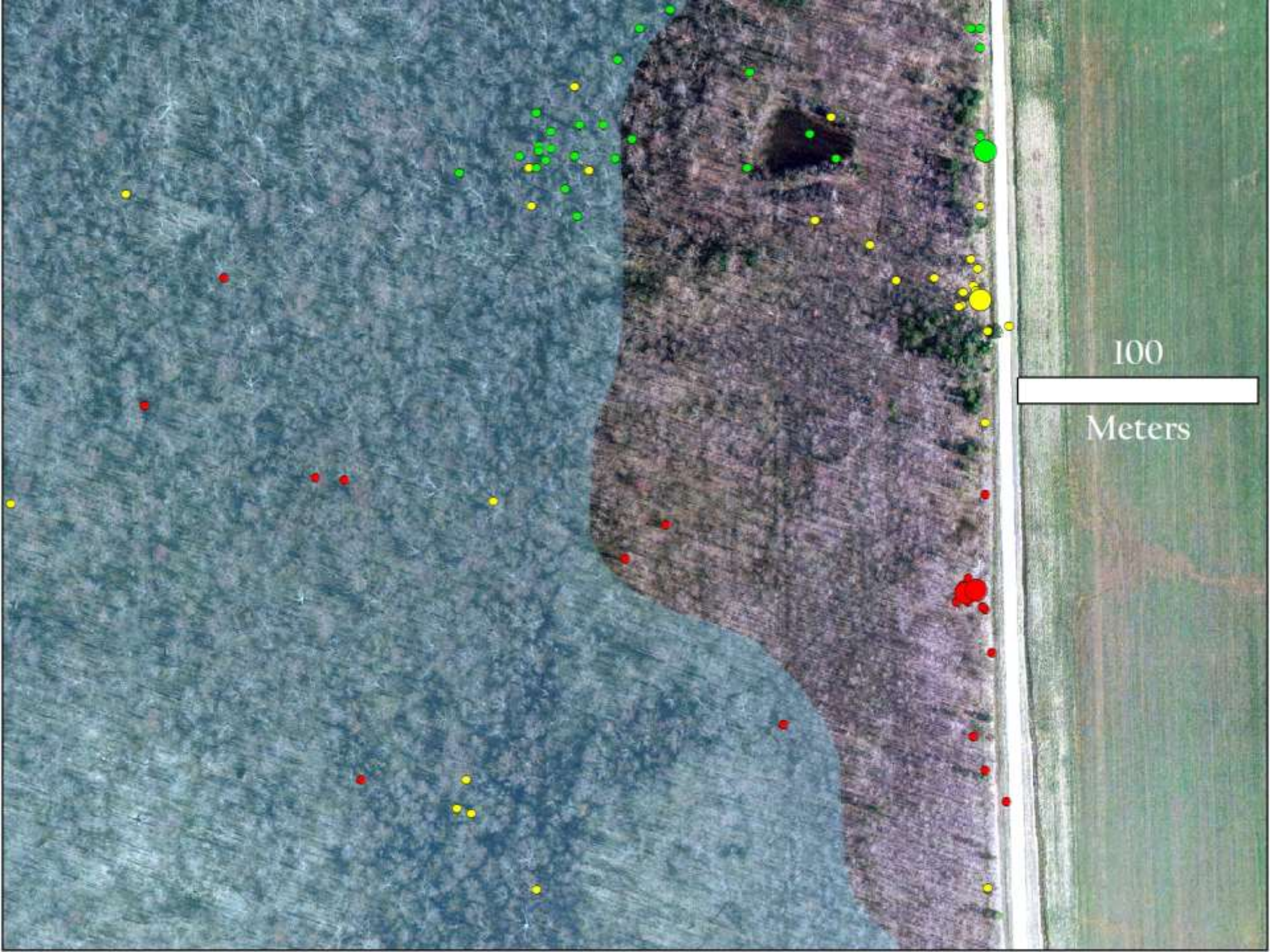

250 m buffer zone
0
1000 Meters

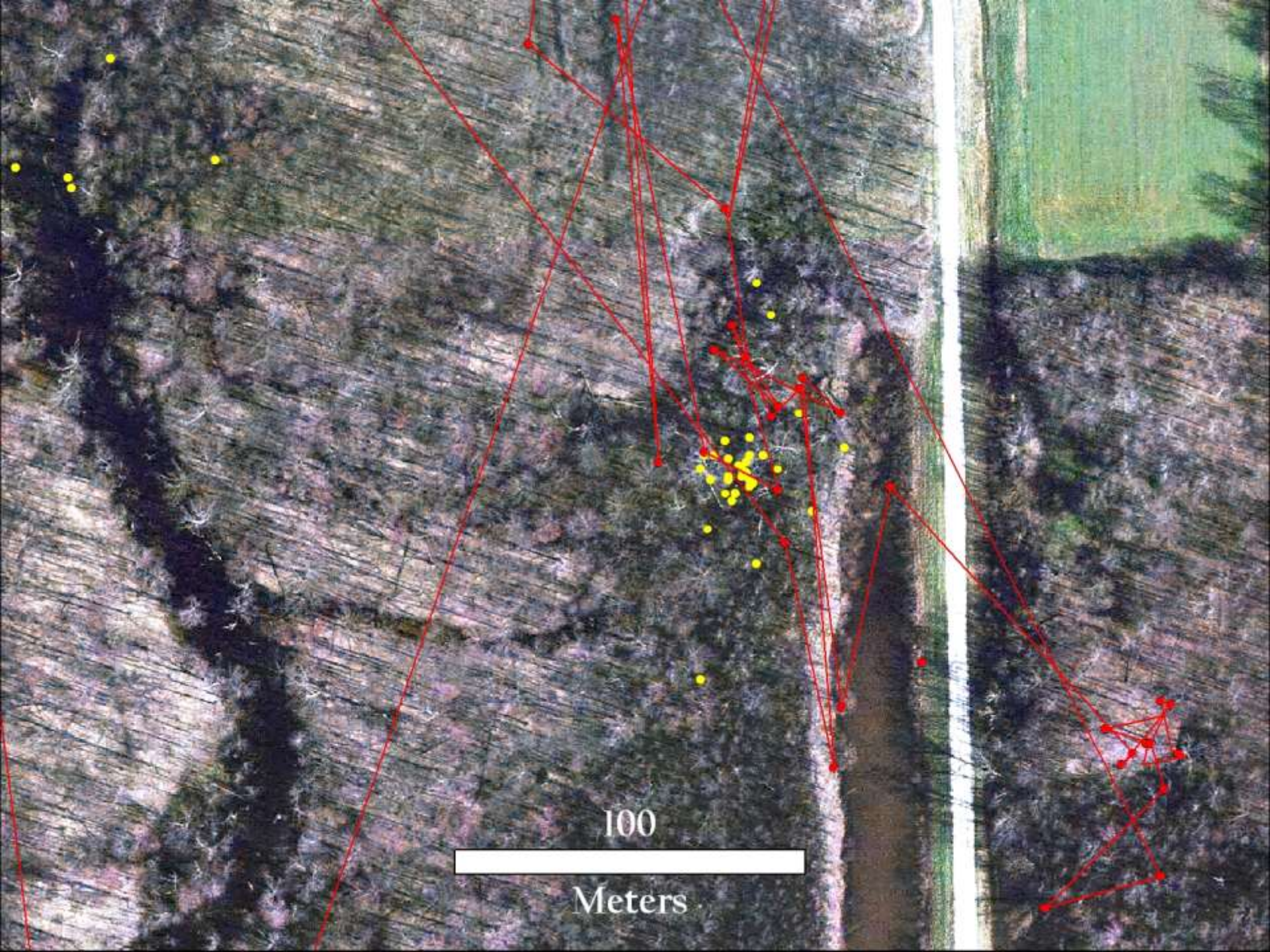



50
Meters


50
Meters


500
Meters


100
Meters

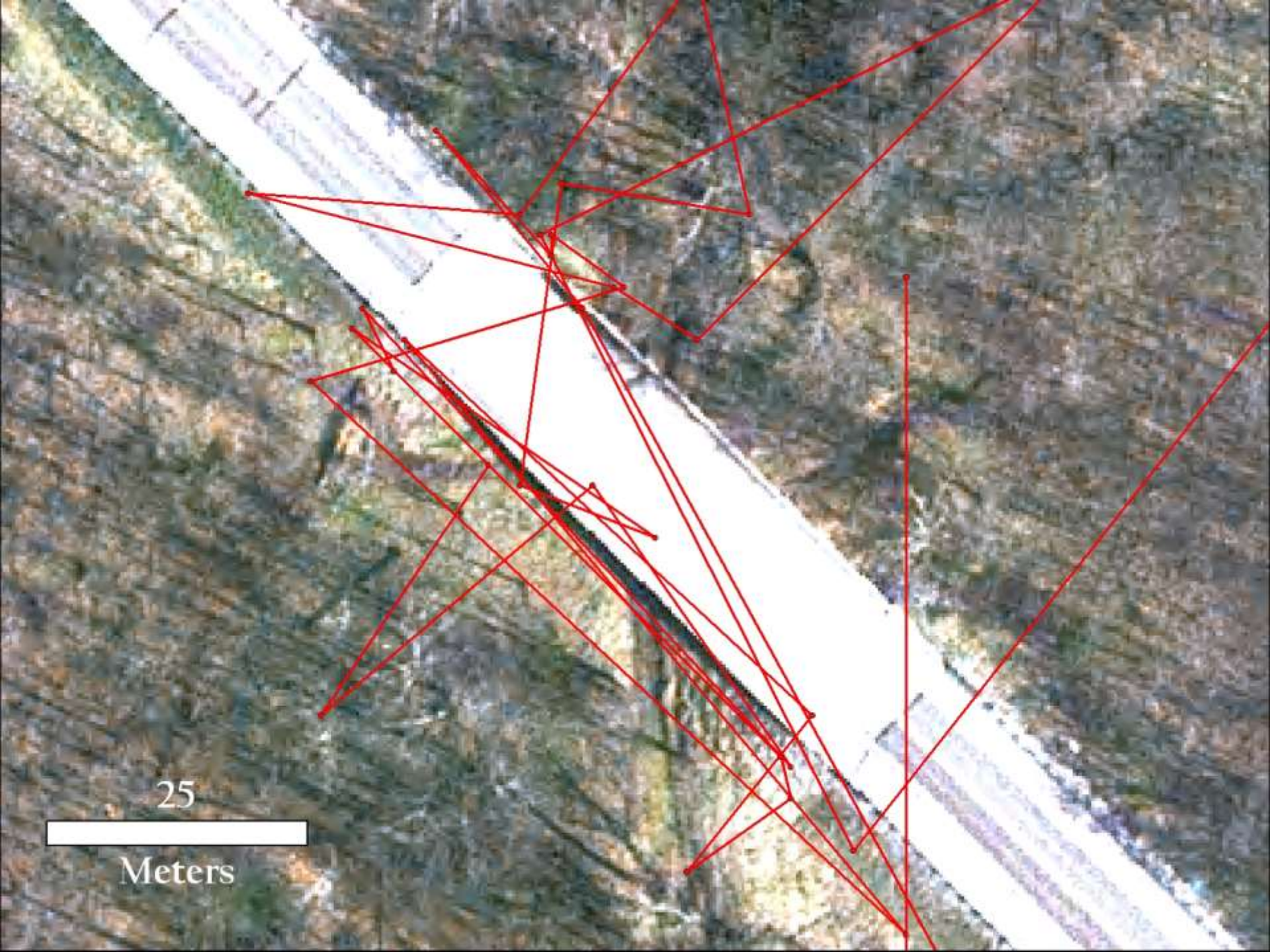

100
Meters


DO NOT
ENTER


DO NOT
ENTER


200
Meters


FLASH
FLOOD
AREA


25
Meters

# Conclusions: Wetlands

- Shallow, particularly ephemeral, wetlands are very important
  - Fishless is good
- Wetland herps have connections to the terrestrial habitats around the wetlands
- Wetland value is dramatically enhanced by connectivity
  - Think of complexes, not individual wetlands
- So - wetlands must not be managed distinct from the uplands
  - Wetlands often need additional upland habitat beyond buffers intended to maintain wetland quality
  - Safe passage must be provided between wetlands
  - Roads are bad

# Buffering

- Need to adress all of the habitat needs of your organisms over the seasons and lifetimes
- Restore, or at least cease farming in, areas around and between wetlands and other critical habitats
  - First 100 m likely most important
  - Connect **all** nearby wetlands aggressively
- Dynamic distance buffering likely better than fixed distance buffering

# Roads

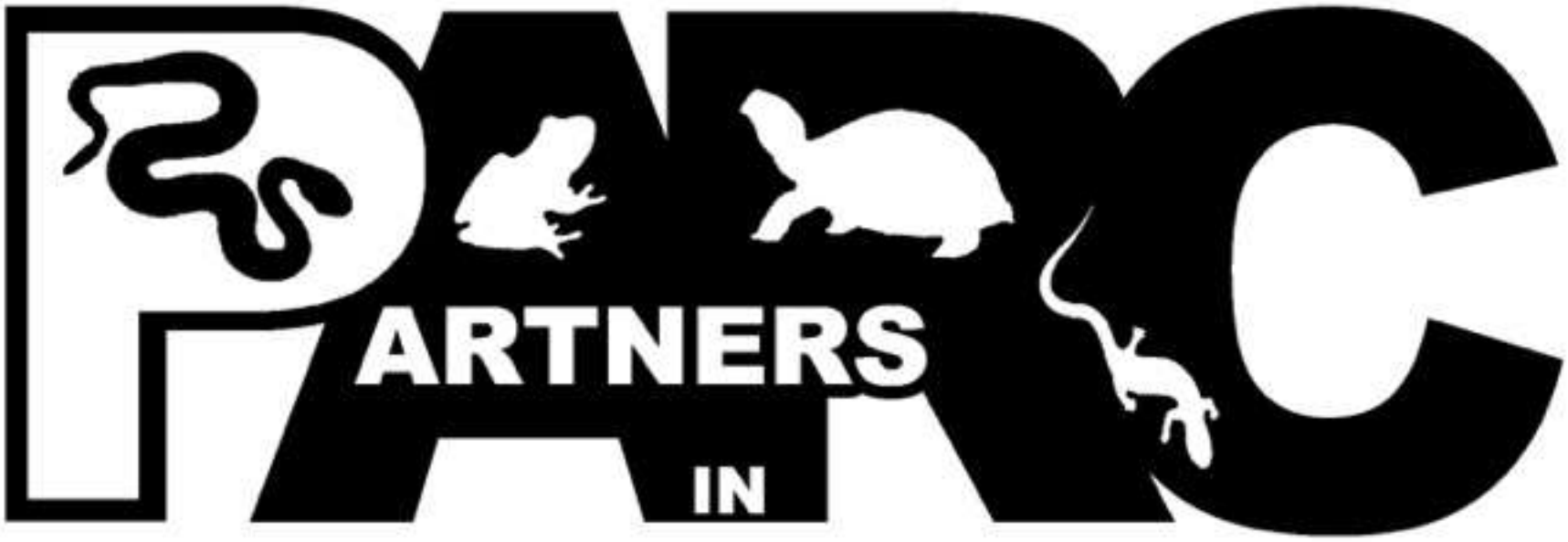
- Extend matrix all the way to roads or other barriers whenever possible
  - Make the best use of uninterrupted blocks
- Mitigate road impacts by reducing threats when possible
  - Maximize quality of blocks within road limitations
  - Avoid road construction whenever possible, particularly between requisite habitats
- Provide usable corridors like large culverts

# HABITAT MANAGEMENT GUIDELINES FOR AMPHIBIANS AND REPTILES OF THE MIDWESTERN UNITED STATES

Technical Publication HMG-1 2nd Edition

PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION

MIDWEST




AMPHIBIAN AND REPTILE CONSERVATION

MIDWEST PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION

# Save the Date!

**We are pleased to announce that the 2014 Midwest Partners in Amphibian and Reptile Conservation (MW PARC) annual meeting will be held in Minnesota August 22nd - 24th.**

More details to follow: www.mwparc.org

**Meeting Topic:** Survey and Monitoring of Amphibians and Reptiles with an Emphasis on Restored Habitats.

**Location:** Camp Iduhapi, Loretto, MN (about 40 minutes west of Mpls-St. Paul Airport).

**Registration Cost:** To be announced, but will include meals and on-site lodging.

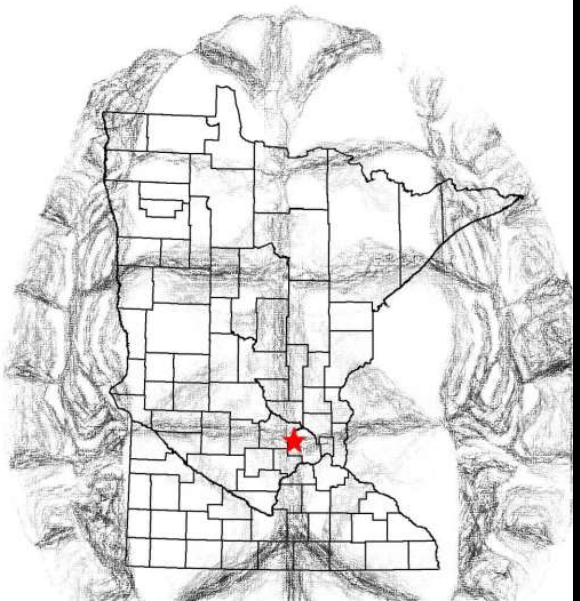
**Optional Field Trips:** Crow Hassan Park Reserve (Friday) and French Regional Park (Sunday).

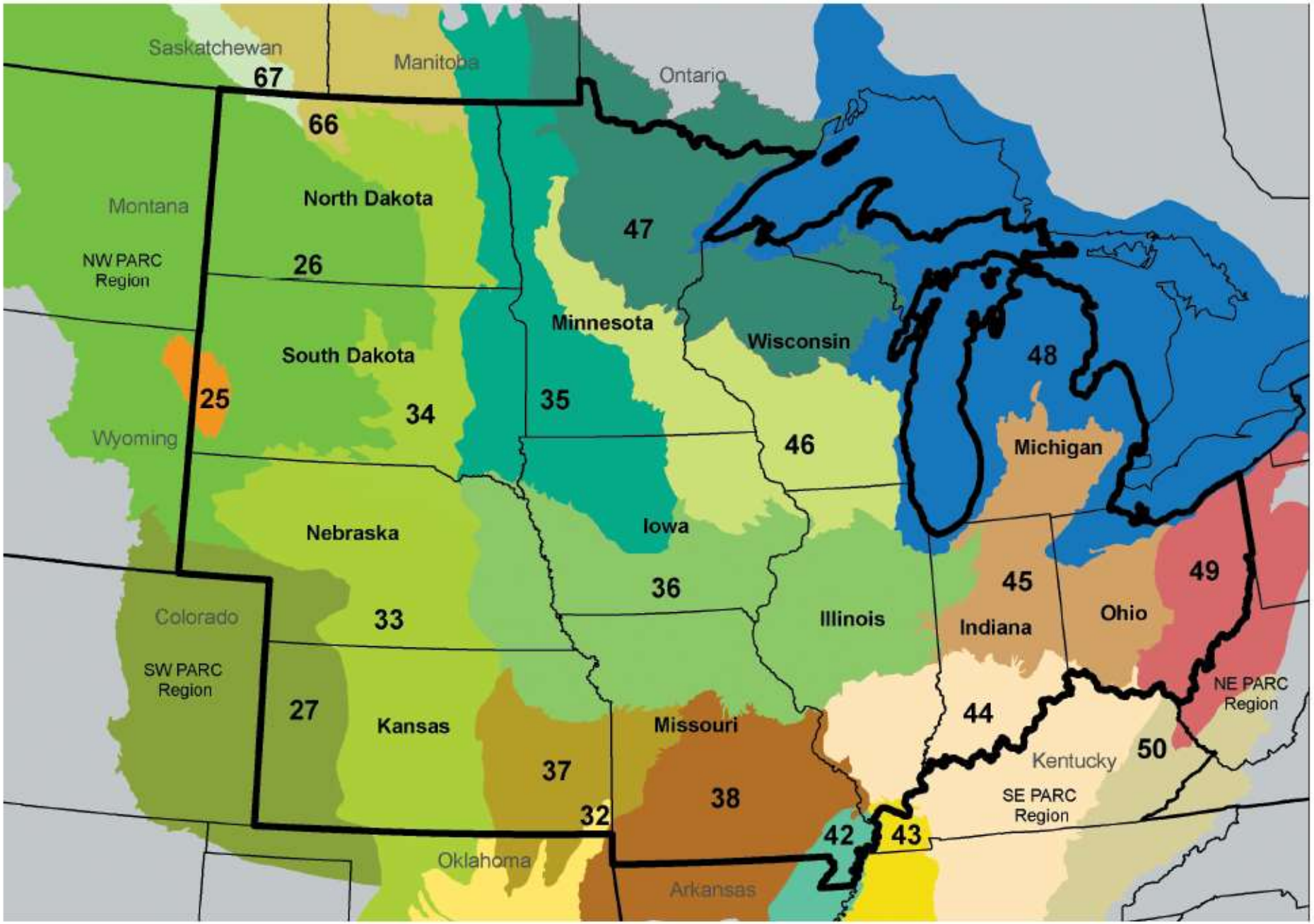
**Partnering Organizations:**

- Three Rivers Park District
- Minnesota Dept. of Natural Resources
- University of St. Thomas

**Other Local Attractions (family friendly):**

- Baker Park Reserve
- Mall of America
- Minnesota & Como zoos
- Reptile and Amphibian Discovery Zoo
- Valley Fair Amusement Park
- World's Largest Ball of Twine






Ecoregions of the Midwest


# MANAGEMENT GUIDELINES FOR SPECIFIC HABITAT TYPES

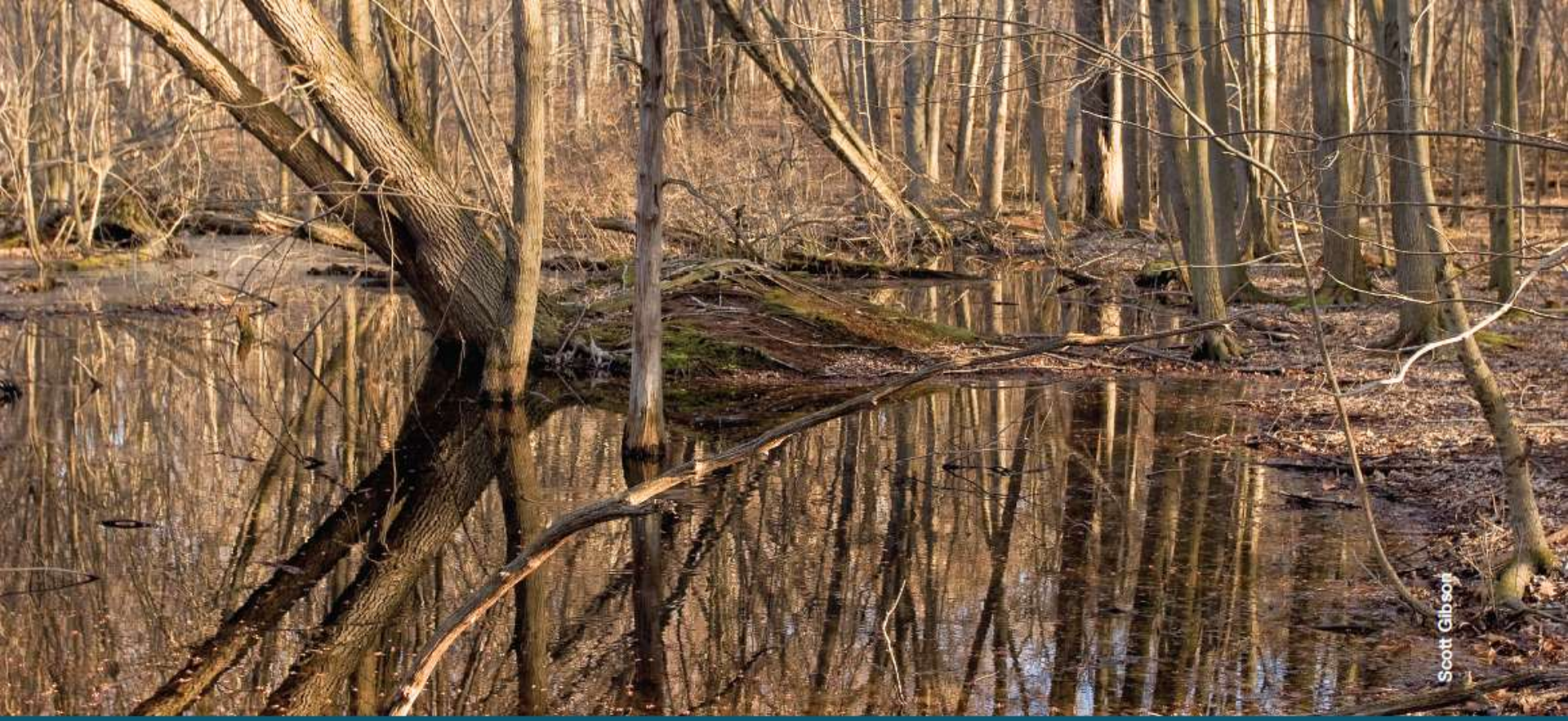
The following 13 habitat modules contain management recommendations pertinent to their respective habitat. Each of the habitat sections contains two sets of guidelines: *Maximizing Compatibility* and *Ideal*.

**"Maximizing Compatibility"** guidelines are for landowners and resource managers who wish to contribute to the conservation and stewardship of these animals while managing their land primarily for other uses, such as timber production, grazing, agriculture, recreation, and residential or industrial development.

**"Ideal"** guidelines are for landowners and land or resource managers who want to make amphibian and reptile conservation a primary objective, such as on nature preserves, wildlife refuges, and private or agency lands where optimizing the diversity and abundance of herpetofauna is desired.

**"Maximizing Compatibility"** guidelines are for landowners and land managers who wish to contribute to the conservation of these animals while primarily managing their land for other uses, such as timber production, hunting, recreation, grazing, development, agriculture, and others.

**"Ideal"** guidelines are for landowners and land managers desiring to make amphibian and reptile conservation a primary objective, as might be desired on nature preserves, wildlife refuges, and private lands whose owners wish to optimize herpetofaunal diversity and abundance.




## SEASONAL (EPHEMERAL) WETLANDS

Seasonal wetlands, also known as ephemeral wetlands, are one of the most important and threatened habitats for amphibians and reptiles of the Midwest. Seasonal wetlands are often quite small and include vernal pools, floodplain pools, prairie potholes (see the Grasslands and Savanna module), limestone sinks, ditches, and other shallow depressions that fill, and then dry, typically on a seasonal basis. Though these systems may have temporary aquatic connections with other wetlands as a result of occasional flooding, they are often isolated from other bodies of water by habitat during the life cycle of many amphibians and reptiles. Herps aside, seasonal wetlands also have an entirely different community structure compared to permanent wetlands. For example, they support a variety of aquatic invertebrate species, such as fairy shrimp, and the juvenile aquatic stages of dragonflies and damselflies. Reptiles and amphibians in seasonal wetlands also use the surrounding upland (terrestrial) habitat. In fact, many salamanders and frogs remain in terrestrial burrows and vegetation for most of the

Scott Gibson

North Dakota Fish and Game

**Seasonal wetlands are embedded within larger habitats such as forests and grasslands. They provide important habitat for many amphibian and reptile species, and their absence in the landscape can limit the distribution of some species of amphibians. For example, Eastern Tiger Salamanders, Blue-spotted Salamanders, and Wood Frogs rely on seasonal wetlands for breeding sites, and will disappear from areas where these wetlands have been lost.**

## CHARACTERISTIC SPECIES

Four-toed Salamander, Blue-spotted Salamander, Jefferson Salamander, Marbled Salamander, Small-mouthed Salamander, Spotted Salamander, Eastern Tiger Salamander, American Toad, Fowler's Toad, Great Plains Toad, Woodhouse's Toad, Eastern Spadefoot, Northern and Southern Leopard Frogs, Wood Frog, Gray Treefrog, Cope's Gray Treefrog, chorus frogs, Spring Peeper, Spotted Turtle, Blanding's Turtle, Yellow Mud Turtle, Plain-bellied Watersnake, Northern Watersnake, Eastern and Western Ribbonsnakes.

## MANAGEMENT GUIDELINES

Toad, Eastern Spadefoot, Northern and Southern Leopard Frogs, Wood Frog, Gray Treefrog, Cope's Gray Treefrog, chorus frogs, Spring Peeper, Spotted Turtle, Blanding's Turtle, Yellow Mud Turtle, Plain-bellied Watersnake, Northern Watersnake, Eastern and Western Ribbonsnakes.

## MANAGEMENT GUIDELINES

**MAXIMIZING COMPATIBILITY: Timberlands, Hunt Clubs, Farmlands, Ranches, Recreation Lands, and other Integrated Land uses**

*When benefiting amphibians and reptiles is secondary to other management objectives:*

- **Develop an awareness of existing seasonal wetlands and the surrounding landscape.** *Identify areas where water pools in the winter and spring. Seasonal wetlands can be difficult to identify when dry, but knowledge of where these habitats are is the first step towards their management.*
- **Consider restoring or creating wetlands or ponds where natural wetlands have been degraded or destroyed.** *A series of wetlands on the landscape can facilitate dispersal and accelerate recolonization of amphibians in reforestation or restoration sites. These wetlands can also improve habitat for waterfowl and other game species. Promote extensive shallow shorelines and gently sloping banks.*

Scott Gibson

**Many different species of snakes, such as this Northern Watersnake, exploit the abundance of food available in seasonal wetlands. This individual arrived in early spring when hundreds of Wood Frogs had gathered to breed.**

- **Limit cases of wetland deepening and stabilization.** *Consider letting seasonal wetlands stay seasonal. Transforming seasonal wetlands into farm ponds will eliminate species that require seasonal wetlands. Create deeper farm ponds elsewhere while retaining natural seasonal wetlands.*
- **Avoid ditching and draining seasonal wetlands.** *Seek alternatives to wetland removal.*

*will use these areas extensively.*

- **Provide natural upland buffer habitat around sensitive aquatic features.** *Buffers in ideal management scenarios should be as wide as possible. Intact upland habitat buffers of 100-150 feet can help protect water quality, reduce organic inputs, and ultimately improve the quality of riparian habitat for stream amphibians and reptiles.*
- **Leave snags, other coarse woody material, and rocks in streams to provide microhabitat.** *All these structures provide refugia for amphibians and reptiles. Juvenile and larval amphibians use these structures extensively.*
- **Retain natural stream channel undulations, backwater areas, and floodplains.** *Do not channelize streams. Such alteration of stream courses removes habitat diversity that is important to amphibians and reptiles and the food web on which they rely.*
- **Avoid storing chemicals, salt, manure, and other possible contaminants near streams.** *Control placement of such chemicals to prevent leakage and inadvertent input into streams.*
- **Do not alter spring flows and do not disturb the associated seep areas.** *These small habitats are critical to several species of salamanders. Alteration of any kind will cause population decline and potentially lead to extirpation (i.e., local extinction). Provide overflow if springs are boxed.*
- **Avoid the use of fertilizers and pesticides in or around streams, springs, and seeps.** *If chemicals must be used, be sure to adequately buffer these sensitive areas, use the correct formulation and follow label directions.*
- **Restrict activities upstream that could introduce contaminants downstream (e.g., water treatment plants, mining).** *Think at the landscape level. Remember that whatever is introduced upstream will likely make its way all the way downstream. Contaminants can affect a large area.*
- **Meet or exceed forestry and agricultural Best Management Practices and Streamside Management Zones standards for stream health.** *Meeting stream BMPs and SMZ standards is a good first step in providing habitat for amphibians and reptiles. For links to each state's BMPs, visit www.forestrybmp.net. In some cases, SMZs are adequate to protect aquatic-related amphibians and reptiles; however, in other cases, these practices may need to be modified, especially for species that migrate or disperse in and out of adjacent upland habitats.*

This is the Small Streams, Springs, and Seeps module of the PARC publication, HMG-1, 2nd Edition. ISBN 0-9667402-8-9. Please visit ***www.parcplace.org*** for further information, copies of the complete document, or a web-based version of these guidelines.

# APPENDIX A: DEVELOPING A MANAGEMENT PLAN

An important first step in managing habitats for amphibians and reptiles, regardless of the designated land-use, is development of a management plan.

**1. Know what you have.** Conduct an inventory of the amphibian and reptile populations on your property. At the same time conduct an inventory of habitat types and map their relative locations and sizes. Once such information is organized, it will be easier to identify features of habitats that need alteration, restoration, or other management actions to benefit amphibians and reptiles. You will also want to identify current habitat conditions, such as the presence of invasive plants, before initiating any changes. If other land uses are your primary focus, then you can identify ways to maximize compatibility between your land use goals and habitat suitability for amphibians and reptiles.

**2. Use maps and aerial photos.** One of the most important first steps for landowners is to obtain maps and imagery of their lands. A good map allows the landowner to visualize the arrangement of certain

# APPENDIX B: AMPHIBIAN AND REPTILE SPECIES OF THE MIDWEST

Depending on how you count them, The Midwest supports at least 163 native species of amphibians and reptiles: 33 frogs, 38 salamanders, 20 turtles, 16 lizards, and 56 snakes. The following table presents species occurrence information for each state and habitat covered in this book. We used the most recent taxonomic information available, but the names used to describe some species is in flux as herpetologists continue to sort out relationships between species, and so they *will* change over time.

One of the goals of PARC is to help keep common species common, as well as to restore species that have declined as a result of human activities. Therefore, providing information about species occurrences and their rarity, as well as current protected status, may be useful to land owners and land managers for evaluating the positive effects of their habitat management actions. These ranks and protected status listings were accurate as of February 2011.

Future actions by the PARC community may affect and which are characteristically most associated with them. "Suitable" habitats are other secondary habitats that may also be used by a species. "Marginal" habitats are other habitats where species might persist, but really are not most appropriate for the species.

**Global and State ranks:** We have used NatureServe's global (G) and state (S) ranks to provide a standardized measure of abundance of each species throughout its global range and by each State within which it occurs. This numeric system is not regulatory, and does not indicate federal or state protected status. Ranks are expected to change over time as new information becomes available. More information about the NatureServe ranking system may be found at: *http://www.natureserve.org/explorer*.

Each species has a single G rank indicating the total number of occurrences throughout its range. An S rank is also assigned for each species' state occurrence. Blank fields in the table below indicate the species does not occur in the state. The definitions provided

Zack Walker

**Green Treefrog**

| AMPHIBIANS: Frogs and Toads | | NATIVE TO REGION | FEDERAL LEGAL STATUS | NatureServe State-level Rank and State Protection: ILLINOIS | INDIANA | IOWA | KANSAS | MICHIGAN | MINNESOTA | MISSOURI | NEBRASKA | NORTH DAKOTA | OHIO | SOUTH DAKOTA | WISCONSIN | SEASONAL (EPHEMERAL) WETLANDS | PERMANENT WETLANDS | WET MEADOWS, BOGS, AND FENS | SMALL STREAMS, SPRINGS, AND SEEPS | RIVERS AND LARGE STREAMS | HARDWOOD FORESTS | CONIFEROUS FORESTS | WOODLANDS AND SAVANNAS | GRASSLANDS AND PRAIRIES | ROCK OUTCROPS, GLADES, AND TALUS | CAVES AND KARST | AGRICULTURAL LANDS | URBAN AND RESIDENTIAL AREAS | An image of this species can be found on the following pages |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acris crepitans* | **Northern Cricket Frog** | S | | 5 | 4 | 3 | 5 | 2 | 1 | 5 | 5 | | NR | 1 | 1 | S | 0 | S | S | M | S | | | M | | | S | | 51 |
| *Anaxyrus (Bufo) americanus* | **American Toad** | S | | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 1 | NR | NR | U | 5 | 0 | 0 | S | M | | 0 | 0 | 0 | S | | | S | S | 83, 88, 107, 111,113 |
| *Anaxyrus (Bufo) cognatus* | **Great Plains Toad** | S | | | | 4 | 5 | | 4 | U | 5 | NR | | 5 | | 0 | M | | | | | | | 0 | | | S | | |
| *Anaxyrus (Bufo) debilis* | **Green Toad** | S | | | | | 2 | | | | | | | | | 0 | | | S | | | | S | 0 | | | S | | |
| *Anaxyrus (Bufo) fowleri* | **Fowler's Toad** | S | | 5 | 4 | 3 | | 4 | | 5 | | | NR | | | 0 | 0 | S | S | | S | S | 0 | S | | | S | S | 85 |
| *Anaxyrus (Bufo) hemiophrys* | **Canadian Toad** | S | | | | | | | 4 | | | NR | | U | | 0 | 0 | 0 | 0 | | 0 | 0 | | | | | | | |
| *Anaxyrus (Bufo) punctatus* | **Red-spotted Toad** | S | | | | | 2 | | | | | | | | | 0 | 0 | | 0 | | | | | 0 | 0 | | S | | |
| *Anaxyrus (Bufo) woodhousii* | **Woodhouse's Toad** | S | | | | 3 | 5 | | | 5 | 5 | NR | | 5 | | 0 | 0 | S | S | | S | S | S | S | | | S | S | |
| *Gastrophryne carolinensis* | **Eastern Narrow-mouthed Toad** | S | | 2 | | | 1 | | | 5 | | | | | | 0 | S | S | | | 0 | 0 | | S | S | | | | 104 |
| *Gastrophryne olivacea* | **Western Narrow-mouthed Toad** | S | | | | | 5 | | | 3 | 2 | | | | | S | S | S | S | | | | | 0 | S | | S | | |
| *Hyla avivoca* | **Bird-voiced Treefrog** | S | | 3 | | | | | | | | | | | | 0 | 0 | | S | 0 | 0 | | | | | | | | vi |
| *Hyla chrysoscelis* | **Cope's Gray Treefrog** | S | | 4 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | | NR | 2 | 5 | 0 | 0 | | | | 0 | 0 | | M | | | M | S | 11, 75, 125 |
| *Hyla cinerea* | **Green Treefrog** | S | | 3 | 2 | | | | | 4 | | | | | | 0 | 0 | | | | 0 | 0 | | | | | | S | 121 |
| *Hyla versicolor* | **Gray Treefrog** | S | | 4 | 4 | 4 | 4 | 5 | 5 | 5 | | 4 | NR | 2 | 5 | 0 | 0 | | | | 0 | 0 | | M | | | M | S | 120, 125 |
| *Lithobates (Rana) areolatus* | **Crawfish Frog** | S | | 4 | 2 | 1 | 3 | | | 3 | | | | | | 0 | S | | S | | | | 0 | 0 | | | M | | |
| *Lithobates (Rana) blairi* | **Plains Leopard Frog** | S | | 4 | 1 | 5 | 5 | | | 5 | 5 | | | 3 | | 0 | 0 | 0 | | | | | | 0 | | | M | | 95 |
| *Lithobates (Rana) catesbeianus* | **American Bullfrog** | S | | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | | 5 | 5 | 3 | | 0 | | S | S | | | | M | | | S | M | 53 |
| *Lithobates (Rana) clamitans* | **Green Frog** | S | | 4 | NR | 4 | 1 | 5 | 5 | 5 | | | 5 | | 5 | M | 0 | S | 0 | S | S | | | S | | | S | M | 53 |
| *Lithobates (Rana) palustris* | **Pickerel Frog** | S | | 3 | 4 | 4 | X | 4 | 4 | 5 | | | NR | | 3 | S | 0 | S | 0 | | 0 | | S | | S | S | | | 58, 103 |
| *Lithobates (Rana) pipiens* | **Northern Leopard Frog** | S | | 5 | 2 | 5 | | 5 | 4 | 2 | 5 | NR | NR | 5 | 4 | S | 0 | 0 | S | | | | | 0 | | | M | | 25 |
| *Lithobates (Rana) septentrionalis* | **Mink Frog** | S | | | | | | 3 | 5 | | | | | | 3 | | 0 | S | 0 | M | S | | | | | | | | 52 |
| *Lithobates (Rana) sphenocephalus* | **Southern Leopard Frog** | S | | 5 | 4 | 4 | 5 | | | 5 | | | NR | | | 0 | 0 | S | S | | 0 | 0 | S | S | | | S | S | |
| *Lithobates (Rana) sylvatica* | **Wood Frog** | S | | 3 | 4 | | | 5 | 5 | 3 | | NR | NR | 1 | 5 | 0 | S | | | | 0 | | | | | S | | M | 9, 35, 43 |
| *Pseudacris brachyphona* | **Mountain Chorus Frog** | S | | | | | | | | | | | NR | | | 0 | 0 | S | | | 0 | 0 | | M | | | S | | |
| *Pseudacris clarkii* | **Spotted Chorus Frog** | S | | | | | 5 | | | | | | | | | | | | | | | | | 0 | | | | | |
| *Pseudacris crucifer* | **Spring Peeper** | S | | 5 | NR | 4 | 2 | 5 | 4 | 5 | | | NR | | 5 | 0 | 0 | 0 | | | 0 | S | S | M | | | M | | 5, 89 |
| *Pseudacris feriarum* | **Upland Chorus Frog** | S | | 4 | | | | | | 5 | | | | | | 0 | S | S | | | 0 | 0 | | S | | | M | | |
| *Pseudacris illinoensis* | **Illinois Chorus Frog** | S | | 2 | | | | | | 2 | | | | | | 0 | S | | | | | | S | 0 | | | S | S | |
| *Pseudacris maculata* | **Boreal Chorus Frog** | S | | | | 4 | 5 | 1 | 5 | 5 | 5 | NR | | 5 | 5 | 0 | 0 | 0 | | | | | | S | | | | | |
| *Pseudacris streckeri* | **Strecker's Chorus Frog** | S | | | | | 2 | | | | | | | | | 0 | 0 | 0 | S | | 0 | | | M | | | S | | |
| *Pseudacris triseriata* | **Western Chorus Frog** | S | | NR | 4 | | | 5 | | | | | NR | | | 0 | S | 0 | | | 0 | | | S | | | | S | 15, 86, 92, 108 |

# APPENDIX C: CONSERVATION PROGRAMS AND SOURCES OF INFORMATION

There are many opportunities available to help you protect and improve natural resources on your property. Many include incentives such as annual rental payments, cost-share payments, tax relief, and technical assistance. Deciding which of them is right for you can be confusing, especially when the program names and goals change over time. Perhaps it is most important to know that a variety of options exist and that help is available to sort out what to do. Some of the more popular options are presented here.

share payments of up to 75% are available for implementing certain conservation practices. For some practices, incentive payments are available on a per-acre basis over a term of 1 to 3 years. Funding and technical assistance are provided to establish various conservation practices.
Website: *http://www.nrcs.usda.gov/programs/eqip*

### GRASSLAND RESERVE PROGRAM (GRP)

GRP is a voluntary program that provides landowners the opportunity to protect, restore, and enhance grasslands on their property. The program is designed to conserve grasslands from conversion to cropland or other uses and to help maintain ranching operations. GRP provides both technical and financial assistance.
Website: *http://www.nrcs.usda.gov/programs/grp/*

### WETLAND RESERVE PROGRAM (WRP)

WRP is a voluntary land-retirement program. The program is designed to improve water quality and enhance wildlife habitats by restoring wetlands that

# APPENDIX D: RECOMMENDED READING AND ONLINE RESOURCES

## SUGGESTED READING FOR LANDOWNERS AND LAND MANAGERS

The references below provide a starting point for land managers who wish to learn more about this subject. This is a small sample of the abundant literature available.


Biebighauser, T.R. 2003. A Guide to Creating Vernal Ponds. USDA Forest Service, Morehead, KY. 33 pp. Note: Out of Print, but free copy available at: *http://www.wetlandsandstreamrestoration.org*

Biebighauser, T.R. 2007. Wetland Drainage, Restoration, and Repair. University Press of Kentucky, Lexington, KY. 252 pp.

Biebighauser, T.R. 2011. Wetland Restoration and Construction – A Technical Guide. The Wetland Trust. 180 pp.

Buhlmann, K.A., and J.W. Gibbons. 2001. Terrestrial

Galatowitsch, S.M., and A.G. van der Valk. 1994. Restoring Prairie Wetlands: An Ecological Approach. Iowa State University Press, Ames, Iowa.

Heyer, R.W., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institution Press, Washington, DC.

Hunter, M.L., Jr. (ed.). 1999. Maintaining Biodiversity in Forest Ecosystems. Cambridge University Press, New York, NY. 698 pp.

Johnson, E.A., and M.W. Klemens (eds.). 2005. Nature in Fragments. Columbia University Press, New York, NY. 382 pp.

Kenney, L.P., and M.R. Burne. 2000. A Field Guide to the Animals of Vernal Pools. Massachusetts Division of Fisheries & Wildlife, Westborough, MA. *(http://www.vernalpool.org/fldgide.htm)*

Klemens, M.W. (ed.). 2000. Turtle Conservation. Smith-

# APPENDIX E: DISINFECTION GUIDELINES FOR INDIVIDUALS WORKING IN FRESHWATER HABITATS

While some invasive species are large and obvious, many are microscopic. The fungus *Batrachochytrium dendrobatidis*, cause of chytrid disease, and the viruses of the ranavirus group have provided new and devastating challenges to the amphibians of the Midwest. These pathogens can infect a broad range of host species, particularly in aquatic settings. Populations of amphibians may be destroyed by the arrival of these diseases or when novel strains appear.

Humans have been implicated as major transporters of these pathogens. While some of this transport is by persons engaged in every day affairs, some of it is a consequence of the activities of biologists, be they land managers moving machinery from project to project, or a fisheries biologist moving a boat from wetland to wetland. Herpetologists may themselves do the same thing as they move from site to site conducting surveys or research. Such transportations of pathogens are not only insidious in that the very people trying to help herps are harming them, but potentially

and pre-rinse or soak the gloves before going out in the field so as to minimize the presence and transfer of toxins to larval amphibians.

## HYGIENE PROTOCOL

For Control of Disease Transmission between Amphibian Study Sites (USGS Feb. 2005) the following protocol should be completed between any sites that are not "water-connected" or that amphibians don't freely move between. The procedure should be completed on all gear/equipment that may have touched site water or used to handle amphibians, including but not limited to:

- Waders
- Shoes/boots
- Dip nets
- Rulers and other instruments
- Specimen bags/containers
- Traps

| Application | Disinfection | Strength | Time | Target pathogen |
|---|---|---|---|---|
| Disinfecting surgical equipment and other instruments (e.g., scales, calipers) | Benzalkonium chloride | 2 mg/ml | 1 min | *B. dendrobatidis* |
| | Ethanol | 70% | 1 min | *B. dendrobatidis*, Ranaviruses |
| Disinfecting collection equipment and containers | Sodium hypochorite (bleach contains 4% sodium hypochorite) | 1% | 1 min | *B. dendrobatidis* |
| | | 3% | 1 min | Ranaviruses |
| | Path X or quaternary ammonium compound 128 | 1 in 500 dilution | 0.5 min | *B. dendrobatidis* |
| | Trigene | 1 in 5000 dilution | 1 min | *B. dendrobatidis* |
| | F10 | 1 in 1500 dilution | 1 min | *B. dendrobatidis* |
| | Virkon | 2 mg/ml | 1 min | *B. dendrobatidis* |
| | | 1% | 1 min | Ranaviruses |
| | Nolvasan | 0.75% | 1 min | Ranaviruses |
| | Potassium permanganate | 1% | 10 min | *B. dendrobatidis* |
| | Complete drying | | >3h | *B. dendrobatidis* |
| | Heat | 60° C | 30 min | *B. dendrobatidis* |

# ACKNOWLEDGEMENTS AND CREDITS

This guide would not have been possible without the help of numerous individuals and organizations. To give credit where credit is due, we need to follow the path of its development. The notion of the guides was an outcome of dialogue between Monica Schwalbach, chair of the Federal Steering Committee, and others, notably Kurt Buhlmann and Whit Gibbons. Regional conservation guidelines emerged as a potential tool to convey "best management practices" for herpetofauna to land managers. With start-up funding from the U.S. Forest Service, Kurt Buhlmann, Whit Gibbons, and Joseph Mitchell began work on what such a guide might look like, and using the Savannah River Ecological Laboratory property as the "region," developed an initial guide—a "straw dog" as Kurt called it. The PARC Management Steering Committee then went to work figuring out how to make the regional herpetofaunal conservation guidelines (HCGs) a reality.

The decision was made to bring an eclectic group of persons with a stake in herpetofaunal conservation together in one place to draft the guides. This would be the HCG workshop. The workshop was a production in and of itself. Through a series of meetings and teleconferences, the PARC Management Steering Committee developed the agenda for the meeting, identified and invited the participants, anticipated problems that might come up during the meeting, and sought solutions. Group members and affiliates that worked intensively on the meeting included Kurt Buhlmann, Erin Clark, Robert Fisher, Whit Gibbons, Randy Gray, John Jensen, Bruce Kingsbury, Joe Mitchell, Earl Possardt, Klaus Richter, and Monica Schwalbach. Illinois Department of Natural Resources Bruce Kingsbury, Michael Lannoo, Chris Phillips, Ron Refsnider, Jay Rubinoff, Lori Sargent, Ray Semlitsch, John Shuey, Diane Tecic, and Kim Vories. Our thanks to them for their efforts in Chicago.

After the Chicago HCG meeting, work began in earnest on the series of guides themselves, which were renamed Habitat Management Guides (HMGs). The Midwest HMG you are holding is actually the second edition of the first HMG produced, and so our acknowledgement path leads us to a number of people who worked extensively on various sections of the first edition. Bob Hay was the lead on the Grassland and Savanna section, Paul Bartelt and Jay Rubinoff provided significant comments and improvements. Paul Bartelt led on Agriculture, assisted by Jay and Bob. Carolyn Caldwell was the lead on the Urban and the Caves and Springs sections. Scott Ballard reviewed Caves and Springs. Chris Phillips drafted Rivers and Streams. Carol Hall took the lead on Permanent Wetlands, and Chris Phillips helped review it. Scott Ballard authored the Primary section (now called "Rock Outcrops, Glades, and Talus"). John Roe drafted the Seasonal Wetlands, and Ray Semlitsch helped with the editing. Joanna and I lead the way on the Toolkit, incorporating additional material provided by Paul Bartelt. John Shuey, Paul Bartelt, Bob Hay, and Ellen Jacquart helped with editing and suggestions. I provided the initial drafts of the Forests, Introduction, and Habitat Fragmentation, and Joanna helped out greatly on these as well. In developing the Introduction and Fragmentation sections, I benefited from previous materials developed in the SREL straw dog document. This document came in handy a number of other times along the way as well.



*The authors are pleased to acknowledge the generous support of the USDA Forest Service (Easter Region), the USDA Natural Resources Conservation Service, and the USDI National Park Service. Their contributions were vital to the development of this and other PARC regional habitat management guides. We also thank the USDI Fish and Wildlife Service (Northeast Region), State Wildlife Agencies, and all other contributors, both for their generous support to PARC, and for their commitment to amphibian and reptile conservation.*

MIDWEST PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION

# Save the Date!

**We are pleased to announce that the 2014 Midwest Partners in Amphibian and Reptile Conservation (MW PARC) annual meeting will be held in Minnesota August 22nd - 24th.**

More details to follow: www.mwparc.org

**Meeting Topic:** Survey and Monitoring of Amphibians and Reptiles with an Emphasis on Restored Habitats.

**Location:** Camp Iduhapi, Loretto, MN (about 40 minutes west of Mpls-St. Paul Airport).

**Registration Cost:** To be announced, but will include meals and on-site lodging.

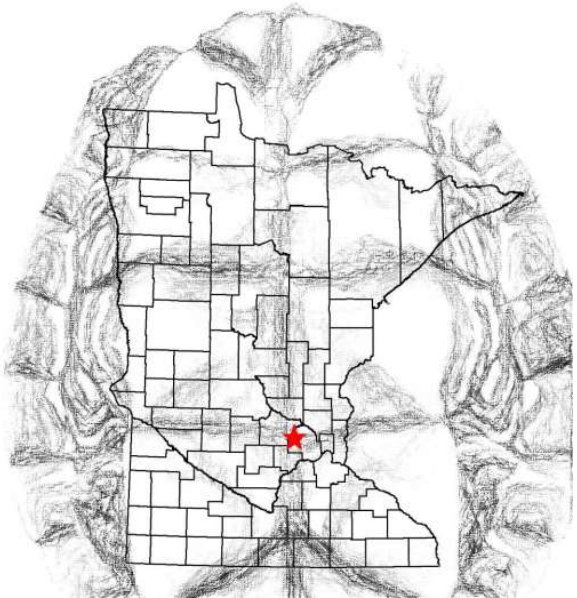
**Optional Field Trips:** Crow Hassan Park Reserve (Friday) and French Regional Park (Sunday).

**Partnering Organizations:**

- Three Rivers Park District
- Minnesota Dept. of Natural Resources
- University of St. Thomas

**Other Local Attractions (family friendly):**

- Baker Park Reserve
- Mall of America
- Minnesota & Como zoos
- Reptile and Amphibian Discovery Zoo
- Valley Fair Amusement Park
- World's Largest Ball of Twine



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QUESTIONS?
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