United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
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Bloomington, Minnesota 55425-1665

December 22, 2011

William Fannucchi
Docket Coordinator
Public Service Commission
P.O. Box 7854
Madison, Wisconsin 53707-7854

Dear Mr. Fannucchi:

This letter contains U.S. Fish and Wildlife Service's (Service) comments on the Alma–La Crosse 345 kV Transmission Project Draft Environmental Impact Statement [(DEIS, Public Service Commission of Wisconsin (PSCW)] docket number 5-CE-136). The DEIS assesses the impacts of a new 345 kilovolt (kV) electric transmission line and substation, submitted as part of the CapX2020 Transmission Expansion Initiative (CapX2020) by three Wisconsin electric utilities (applicants) – Northern States Power Company–Wisconsin (NSPW), Dairyland Power Cooperative (DPC), and WPPI Energy (WPPI). In Wisconsin the 345 kV line would extend from the Minnesota boundary in the Mississippi River west of Alma, Wisconsin, in Buffalo County, through Trempealeau County to a new 345/161 kV substation, known as the Briggs Road Substation, to be built on the southwest side of Holmen, Wisconsin, in La Crosse County.

Upper Mississippi River National Wildlife and Fish Refuge and Trempealeau National Wildlife Refuge – Statutory Context

The proposed routes include sections that would cross through and near Upper Mississippi River National Wildlife & Fish Refuge (Upper Mississippi River NFWR). Congress established the Refuge on June 7, 1924 "a. as a refuge and breeding place for migratory birds included in the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916, and b. to such extent as the Secretary of Interior may by regulations prescribe, as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and flowering plants, and c. to such extent as the Secretary of Interior may by regulations prescribe as a refuge and breeding place for fish and other aquatic animal life."

The Upper Mississippi River NFWR and the Trempealeau National Wildlife Refuge, which lies near a section of one proposed route, are part of the National Wildlife Refuge System, which has its beginning in 1903 when President Theodore Roosevelt used an executive order to set aside tiny Pelican Island in Florida as a refuge and breeding ground for birds. The system has grown since then to over 550 refuges, conserving critical habitats for all kinds of fish and wildlife across all 50 states. "Upper Miss" is the flagship refuge of the Mississippi Flyway, where an

estimated 40 percent of the North American Continent's waterfowl and a substantial portion of its other migratory birds travel, rest, feed and nest each year.

The mission of the National Wildlife Refuge System, as defined in the Refuge Improvement Act of 1997, is "to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." The refuge system is administered by the U.S. Fish and Wildlife Service, an agency of the Department of the Interior, with the stated mission of "working with others to conserve, protect and enhance fish, wildlife and plants for the continuing benefit of the American people."

Under the National Environmental Policy Act of 1969 and the National Wildlife Refuge Improvement Act of 1997, major actions affecting the environment require full consideration of potential impacts, public involvement and an interdisciplinary approach to decision-making that considers a reasonable range of alternatives. Decisions reached that affect refuge lands and waters must meet certain standards relative to compatibility, biological integrity, diversity and environmental health. Wherever possible, efforts must be made to avoid adverse impacts by selecting least damaging alternatives to public trust resources.

Migratory Birds/Bald and Golden Eagles – Statutory Context

The Service has the legal mandate and the trust responsibility to maintain healthy migratory bird populations for the benefit of the American public and is authorized by more than 25 primary conventions, treaties, and laws to ensure the conservation of more than 800 species of migratory birds and their habitats. The Service is committed to undertaking an unprecedented level of cooperation and coordination to protect and conserve these international treasures.

Originally passed in 1940, the Bald and Golden Eagle Protection Act provides for the protection of the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle ((*Aquila chrysaetos*) by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22). "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (16 U.S.C. 668c; 50 CFR 22.3).

Endangered Species Act – Statutory Context

When Congress passed the Endangered Species Act (ESA) in 1973, it recognized that our rich natural heritage of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people." The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. The Service has primary responsibility for terrestrial and freshwater organisms listed under the ESA. Partnerships with States are critical to our efforts to conserve listed species. Section 6 of the ESA encourages States to develop and maintain conservation programs for threatened and endangered species.

In addition to endangered and threatened species, the Service also maintains a list of "candidate" species. These are species for which the FWS has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities. While listing actions of higher priority go forward, the FWS works with States, Tribes, private landowners, private partners, and other Federal agencies to carry out conservation actions for these species to prevent further decline and possibly eliminate the need for listing. Conservation of candidate species maximizes management options for landowners and for the species, minimizes the cost of recovery, and reduces the potential for restrictive land use policies that may be necessary in the future.

Comments on Proposed Routes

Our comments below focus on the three major routes proposed by the applicants – the Q1-Highway 35 Route, the Q1-Galesville Route, and the Arcadia Route. We also provide comments on the "Original Q1 Route," which was not proposed by the applicants, but was described in the DEIS.

Q1–Highway 35 Route

"The surest ways to prevent birds from colliding with a proposed power line are either not to build it, to bury it underground, or to route it well away from areas known or considered likely to support collision-prone species" (Jenkins et al. 2010). From a wildlife management perspective, and particularly focusing on Service trust species that circulate out into the surrounding countryside from state and federal public lands, alternatives that route power lines well away from the Mississippi River corridor (i.e., Arcadia and Blair alternatives) are most likely to minimize impacts. Power line routes should be located as far as possible from the Refuge, wooded bluffs, floodplain wetlands and lower stream reaches that form the complex habitat matrix that buffers the Refuge and helps preserve water quality and scenic beauty. Burying, removal or doubling of lines should be considered, wherever feasible and appropriate.

As is well described in the DEIS, the Q1-Highway 35 Route would have substantial adverse impacts to migratory birds, large and important forested wetlands in the Black River bottoms, and to the eastern massasauga rattlesnake (*Sistrurus catenatus*), an official candidate for listing under the Endangered Species Act. As is stated in the DEIS (p. 130), the Q1-Highway 35 Route "... is located close to, and in some place adjacent to, a number of large and important federal- and state-owned natural resource areas" and would cross the Refuge in three locations.

The Service has a number of concerns that cumulatively underscore risks and potential ecological costs to migratory birds of routing the 345 kV transmission line near the Mississippi River.

- There is a large chicken production plant in Arcadia and a number of chicken production barns between Buffalo Country Road P and the Black River. These producers spread chicken waste, including carcasses, in fields from Arcadia to Galesville and along Wisconsin State Highway 35. It is not unusual to see 50-100 bald eagles sitting in these

fields eating chicken remains. Several hundred bald eagles may move back and forth daily between these fields and the Mississippi River, where they normally roost, nest and fish. The abundant and readily available food source on surrounding agricultural lands is a powerful attractant. Under frequently foggy or otherwise inclement weather conditions in spring or fall when the eagles are most abundant, this attraction could present significant strike hazards where the 345 kV line would closely parallel the Mississippi River or other areas where eagles have gathered to roost or forage. More thorough investigation of these potential impacts is needed for the Q1-Highway 35 and Q1-Galesville Routes.

- Substantial numbers of waterfowl, including ducks and geese, as well as sandhill cranes move between the agricultural fields and the Refuge, especially around dawn and dusk. These birds are flying from tree-top height to an altitude of a few hundred feet as they cross to and from the Mississippi River. Existing power lines paralleling or crossing the river are generally at or below tree-top height. Building additional lines that rise more than twice the height of the trees may have the effect of "fencing" in the river. The potential for bird strikes, especially for large birds like geese and ducks, cranes and herons, and eagles and hawks, will increase. Moreover, flight patterns of waterfowl may be significantly altered. Some waterfowl may avoid flying over power lines in open (e.g., marsh) habitats, preferring instead to fly over the lines where they cross through forested habitats and are below tree-top levels (Shimada 2001). The dense fog that often blankets the river and surrounding lands can compound the hazard. For each alternative, the final EIS should evaluate the relative impacts on daily or seasonal flight patterns linking birds that rest or roost along the river to agricultural fields where they traditionally feed or search for prey.

- Because the river corridor and adjoining bluffs or farmlands are frequently blanketed with thick fog, even at night, at dusk or dawn, when songbirds may be using the tops of trees to orient their flight path and elevation, power lines or towers extending well above the tree tops may present a significant strike hazard. In 1980, a significant bird strike was documented at a single television transmission tower near Galesville, WI. An estimated 3,000-5,000 songbirds were killed on a foggy night in August when they struck the tower and support wires. The frequency of such events is unknown because systematic searches or studies are rare.

Eastern Massasauga

Conservation of eastern massasauga in and around the Van Loon Wildlife Area and the Nelson-Trevino Research Natural Area while the species is still just a candidate for listing under the Endangered Species Act may maximize management options for all landowners whose lands are inhabited by the species and may avoid or minimize the cost of actions needed to recover the species in the future. If further consideration is given to the Q1–Highway 35 Route, surveys for eastern massasauga should be conducted in the area that would be directly and indirectly affected by project activities. The survey areas should be identified with assistance from the Service and the WDNR. Indirect effects may result, for example, from invasive species that occupy the site after construction of the project is complete. The applicants should design surveys in

coordination with the Service and Wisconsin Department of Natural Resources. If the Q1-Highway 35 route is selected, the applicants should also develop measures to avoid, minimize, and mitigate adverse effects to eastern massasauga in coordination with the two resource agencies.

U.S. Fish and Wildlife Service's protocol for conducting surveys for eastern massasauga is available on the Internet - http://www.fws.gov/midwest/endangered/reptiles/eama-survey.html. This protocol is now about ten years old, however, and should be used with the following qualifications, based on new information:

- Begin monitoring soil surface temperatures no later than one week after the first spring thaw (i.e., when soil surface temperatures first exceed zero degrees Celsius). Monitoring soil temperatures is especially important when weather is unseasonably warm or rainy because soil temperatures may rise quickly under those conditions. Robust monitoring of soil surface temperatures is important to ensure that survey effort is maximized during the 3-4 week period after eastern massasaugas have left their burrows and have not yet dispersed
- Eastern massasaugas begin leaving burrows when surface soil temperatures rise to about 11-12 degrees Celsius. Therefore, begin surveys when surface soil temperatures reach 9-12 degrees. Surveys should be conducted before eastern massasaugas disperse – within the four weeks after surface soil temperatures reach 12 degrees Celsius. Eastern massasaugas are most likely to be detected during this period.
- At least 100 hours of survey effort may be needed to detect eastern massasauga where populations are small.

Additional information is available in our handbook for land managers (http://www.fws.gov/midwest/endangered/reptiles/pdf/eama-mgmt-guide.pdf) and at our website, http://www.fws.gov/midwest/Endangered/reptiles/index.html#massasauga.

Finally, the attached draft 'recovery scorecard', produced by biologists in our Chicago, Illinois Field Office, also contains avoidance, minimization, and mitigation measures that may be useful and applicable to the proposed action, depending on final project design.

Blair Route

An existing 161kV line and right-of-way runs from Alma to Blair, with an additional segment running south to Ettrick and Holmen. This line was eliminated from consideration early in the project primarily because it was judged to be somewhat longer and more costly than other alternatives. There are, however, other considerations besides length and cost that need to be fully evaluated. We recommend that the Blair option be fully analyzed in the final EIS for the following reasons:

- The length of the Blair option is only slightly longer than the Arcadia option and the entire Blair route apparently follows established 161kV routes across existing easements, where impacts are already present. This suggests potential savings in both impacts and costs.

- The Blair option places the line the greatest possible distance from the refuge and Mississippi River corridor, where ecological as well as some economic impacts are likely to be greatest. By avoiding areas affected by high fog and poor visibility at different times of the day and year, there is less likelihood that bird strikes will occur. There is also reduced impact to residences, communities and farms concentrated along the Great River Road and National Scenic Byway, which generate millions of dollars of tourism and recreation revenues in this area alone.
- As with the Arcadia Route, the Blair route would minimize habitat destruction, species disturbance and impacts to wetlands in the vicinity of the refuge and to the Black River bottomlands and the Wisconsin Department of Natural Resources' Van Loon Wildlife Area. The Blair route would primarily cross agricultural land, where most crop production could still be sustained on these regularly disturbed lands. A cursory inspection of land use and density of human habitation from aerial photos suggests that, in considering general impacts and cost and benefit tradeoffs, further analysis and consideration of this route is warranted.

Q1-Galesville Route

This route would avoid the significant adverse impacts to the Black River bottoms and to the Refuge that would result from implementation of the Q1-Highway 35 Route. The Q1-Galesville route, however, closely parallels the Mississippi River for much of its length and would result in substantial impacts to migratory bird habitat and would present significant risks to birds flying to and from Refuge lands. Therefore, our comments on the Q1-Highway 35 Route above that focus on the hazards of placing the new 345 kV line near the river also generally apply to this proposed route.

Arcadia Route

The Arcadia route would avoid the Mississippi River corridor "and the Black River bottomlands and the Van Loon Wildlife Area almost entirely" (DEIS, p. XXI). The Arcadia Route would cause adverse impacts to migratory birds by destroying and altering upland forest, but bird collision risk for the 345 kV line may be the least among the proposed routes due to its distance from the Mississippi River.

Original Q1 Route

The applicants did not propose the "Original Q1 Route", but the DEIS includes "comparable information" regarding this route "so that the Commission can make informed decisions if it determines that it should be considered." The Original Q1 Route (also referred to in the DEIS as the "Q1 Route") would follow an existing power line that runs through an expired right-of-way (ROW) on the Upper Mississippi River NWFR.

The Service does not regard the Original Q1 Route as a viable alternative. Regulations and policy concerning uses on national wildlife refuges prohibit new uses or projects that fragment habitat and such projects include roads, bridges, and power lines. Addition of the 345 kV line through this route would approximately double the width of the current (expired) ROW through the Refuge, would require additional clearing of approximately 5 acres of forested wetlands,

introduce additional lines that would increase the likelihood of bird collisions, and would likely cause adverse effects to eastern massasauga.

There are practicable alternatives to placement of the 345 kV line through the expired right-of-way on the Refuge. Therefore, the Service stands by the position stated in Refuge Manager Kevin Foerster's 16 August 2010 letter to Mr. Thomas Hillstrom (Xcel Energy) that expansion of the expired right-of-way to accommodate a rebuild of the 161 kV line and the new 345 kV line should not be considered as a viable alternative. This position was reaffirmed in Regional Director Tom Melius's 7 December 2011 letter to Ms. Stephanie Strength (USDA-Rural Utilities Service). The Service's position regarding this route is well summarized in the DEIS (p. 131).

Effects to Bald Eagles and Other Migratory Birds

Take of bald eagles and golden eagles is prohibited by the Bald and Golden Eagle Protection Act (BGEPA). Under BGEPA, take means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb. The law defines "disturb" as, "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Take is prohibited even if it results from, but is not the purpose of, carrying out an otherwise lawful activity.

It is likely that the proposed action, regardless, of which proposed route is selected, will disturb nesting or wintering bald eagles; impacts to golden eagles, which spend winters in the project area, is also possible. Therefore, we would recommend that the applicants contact the Service's eagle permits coordinator for Minnesota and Wisconsin, Ms. Margaret Rheude, at (612) 725-3548 ext. 2202, to discuss the potential need for a BGEPA permit. Please note that while permits are available for disturbance and unintentional mortality of bald eagles, no permits currently exist for take of the eastern population of golden eagles.

Bald eagles may construct new nests within route alternative corridors before construction begins. In addition, the project may result in the disturbance of nesting, foraging, or roosting bald eagles or other forms of take even if the route most favorable to eagles is selected. In the National Bald Eagle Management Guidelines(U.S. Fish and Wildlife Service 2007), the Service recommends siting transmission utility lines away from nests, foraging areas, and communal roost sites in order to avoid collisions, and to bury utility lines in important eagle areas. To ensure that locations where project activities may disturb nesting bald eagles are completely and correctly described, it will be necessary for the applicant to develop accurate and up-to-date information regarding the precise locations of bald eagle nests and other Important Eagle Use Areas (see below) in proximity to proposed power line routes.

Surveys should be conducted to ensure that likely impacts of the project to bald and golden eagles are well understood before project construction. Bald eagles typically complete construction of new nests in central and southwestern Wisconsin by March 31. Therefore, we recommend conducting aerial surveys for bald eagle nests during the month of April that

immediately precedes any planned construction activities. If construction on a power line segment is planned to begin in July, for example, an analysis of potential impacts to nesting bald eagles should be based on an aerial survey conducted during the immediately preceding April. The Implementation Guidance for Eagle Take Permits under 50 CFR 22.26 and 50 CFR 22.27 indicates that because breeding home ranges of bald eagles can extend up to two miles from the nest, new potentially lethal infrastructure should be sited at least two miles away from Important Eagle Use Areas. Therefore, we recommend surveying all areas within two miles of proposed power line routes. Nests of other migratory birds, especially other raptors and colonial nesting waterbirds [e.g., great blue heron *Ardea herodias*)], should also be noted. In addition, surveys for wintering golden eagles should be conducted throughout the project corridor. Golden eagle surveys should be planned in coordination with the Service, Wisconsin DNR, and the National Eagle Center in Wabasha, Minnesota. The National Eagle Center has an ongoing project, in cooperation with Minnesota Audubon, Wisconsin DNR, and Minnesota DNR to track and study golden eagles wintering along the Upper Mississippi River.

Nests are only one component of Important Eagle Use Areas, which are defined under Code of Federal Regulations (50 Section 22.3) as, "an eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such a nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles." Activities that disturb roosting or foraging eagles are prohibited under the Bald and Golden Eagle Protection Act. Therefore, we also recommend surveys be completed for foraging, roosting, or wintering areas within two miles of all potential line placements. Use of these locations by bald eagles can change throughout the year; therefore, we recommend a fall (pre-ice-up) and a winter (post-ice-out) survey to determine the location and use of these areas by bald eagles. Activity of other migratory birds should also be noted at this time, including waterfowl and water bird concentration areas.

Bird Collisions with Power Lines

The DEIS too briefly addresses the nature and magnitude of the risk to birds posed by power lines placed near the heavily used Mississippi River corridor and over the Black River. Birds in the following groups are most susceptible to power line collisions in the project area: large ducks, geese and swans, pelicans, large herons and waders, rails, cranes, passerines (songbirds), and solitary, high-speed predators such as falcons.

Within each of these groups, the following species are either common or abundant during at least one season in the project area, especially on and along the Mississippi River and Black River bottomlands (U.S. Fish and Wildlife Service 2006):

- Large ducks (>1000 g) – redhead, red-breasted merganser, mallard, American black duck, canvasback, and common merganser
- Geese – Canada goose
- Swans – tundra swan
- Pelicans – American white pelican
- Large herons and waders – Great egret and great blue heron
- Rails – American coot, Virginia rail, and sora

- Cranes – sandhill cranes
- Solitary, high speed predators – American kestrel and peregrine falcons

There are also 63 species of Passerine (songbird) species that are common or abundant on the Refuge during one or more seasons (U.S. Fish and Wildlife Service 2006).

On June 26, 2001, a nonessential experimental population of the whooping crane was designated under the Endangered Species Act in a 20-state area of the eastern United States including Wisconsin and Minnesota. Whooping cranes have been released in Wisconsin since 2001 and currently the Midwest flock numbers about 100 birds. Whooping cranes that are members of this population sometimes range widely from the core of their range near Necedah, WI and occasionally use shallow wetland feeding habitat available along the Mississippi River.

Jenkins et al. (2010) make some useful generalizations that should be addressed in the final EIS to assess and compare the levels of hazard that the various alternatives would pose to migratory birds:

- "Routing lines over or close to water bodies is clearly problematic…";
- "…certain topographic features – valley heads, ridge tops – are probably also high risk options";
- "lines should be kept as low as possible, (ii) span lengths should be kept as short as possible, (iii) cabling used should be as thick as possible, (iv) vertically separated arrays of lines should be avoided as much as possible, (v) lines of similar height and structure with common sources and destinations should run in close parallel in effectively a common servitude, and (vi) lines with very different heights and configurations should be kept well apart." (Jenkins et al. 2010, p. 274).

This additional information should also be considered in the final EIS:

- Local resident waterbirds may fly higher at night than during the day (Deng & Frederick 2001). Therefore, reducing the height of power lines may at least partially offset the increased hazard that the lines pose to birds that fly at night (e.g., great blue herons, black-crowned night herons, etc.).

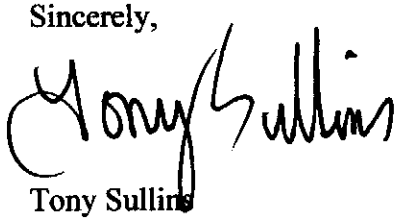
Minimization and Mitigation of Bird Electrocutions and Collisions

We recommend that the applicants follow recommendations made by Avian Power Line Interaction Committee (Avian Power Line Interaction Committee & U.S. Fish and Wildlife Service 2005; Avian Power Line Interaction Committee (APLIC) 1994) to minimize and mitigate impacts to birds that may result from collisions, electrocutions, and other factors. According to the Avian Power Line Interaction Committee an updated edition of one of these resources – *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994* – will be available soon. We assume that this updated document will contain improved measures to mitigate bird collisions. We recommend that the applicants determine whether the project's structure designs are consistent with any changes from the 1994 document and, if not, to modify any structure designs to further reduce the likelihood of bird collisions, as appropriate.

The DEIS mentions the use of bird flight diverters to reduce the risk of bird collisions with the power lines. Based on the review by Jenkins et al. (2010), diverters should thicken the appearance of the line by at least 20 cm over a length of at least 10–20 cm and be placed with sufficient regularity (at least every 5–10 m) on either the earth wires (preferably) or the conductors to lower collision rates.

Thank you for the opportunity to provide comments on the DEIS. Please contact Phil Delphey at (612)725-3548, extension 2206, if you have any questions regarding these comments.

Sincerely,



Tony Sullins
Field Office Supervisor

cc: Mr. Kevin Foerster, Upper Mississippi River National Wildlife and Fish Refuge, Winona, MN
Ms. Vickie Hirschboeck, Trempealeau National Wildlife Refuge, Trempealeau, WI
Mr. Pete Fasbender, U.S. Fish and Wildlife Service, Green Bay, WI

Literature Cited

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Eastern Massasauga Rattlesnake

(*Sistrurus c. catenatus*)

Eastern massasauga rattlesnake – historic range in northeast Illinois. Black circles indicate records since 2000, open circles indicate pre-2000 records.

Became Candidate Species – October 25, 1999 (64 FR 57533 57547

Baseline

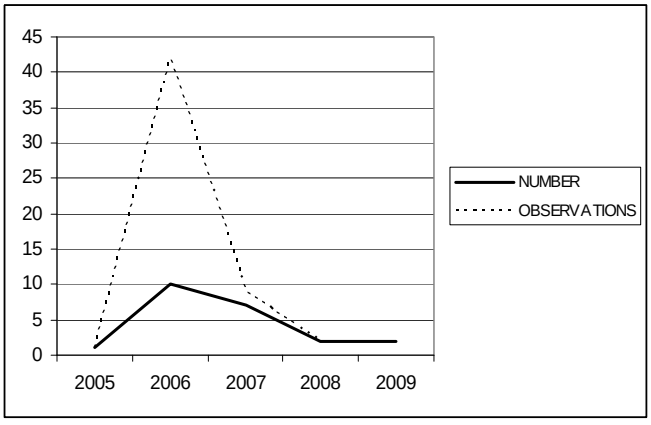
The first well-documented occurrences of the "EMR" in northeast Illinois were made in the mid-1800's by naturalist Robert Kennicott, near what is present-day Glenview. By the mid-1900's confirmed records were available from near Crete (Cook and Will counties), Thornton (Cook County), Wood Dale (DuPage County), Cortland (DeKalb County), and along the DesPlaines River, roughly from Glenview (Cook County) to Lincolnshire (Lake County). By 2000, EMRs were still found only in northern Cook County and along Plum Creek in extreme eastern Will and southeast Cook counties. Intensive mark-recapture surveys between 2005-2009 found no individuals in the southern localities. Also, despite an increase in observations in 2006-2007 (due to even more intensive surveys than previously conducted), data indicated that the total population (limited to one site) along the Upper DesPlaines River may number fewer than 15, and declining.

Recovery

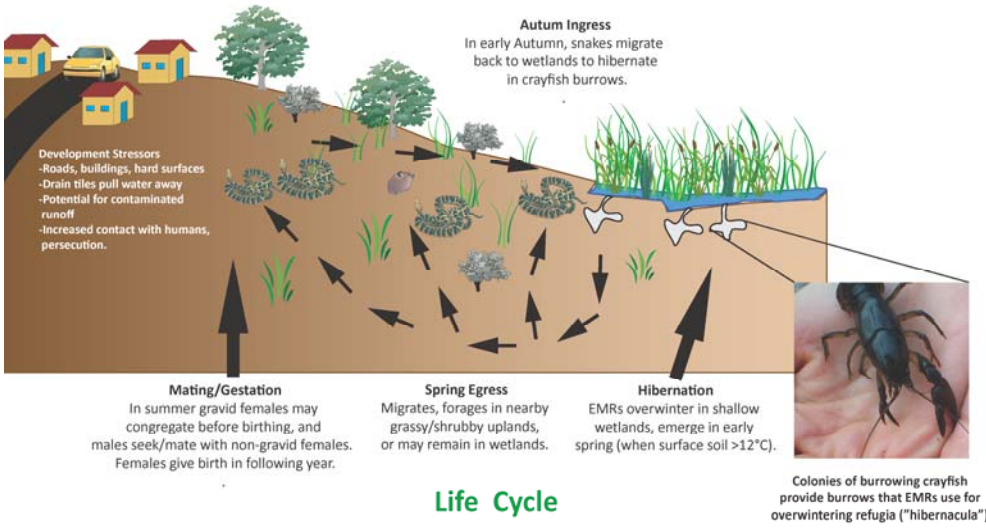
The Illinois DNR's EMR Recovery Plan (2010 DRAFT) requires at least one viable population (>40 adult females), stable for three generations (9-12 years) in northeast Illinois. Until 2009, attempts to recover populations in northeast Illinois were based on habitat restoration (e.g., removal of invasive woody plants). However, due to continuing decline, and imminent extirpation, local stakeholder agencies, as well as both Lincoln Park and Brookfield Zoos began collecting the remaining EMRs from known northeast Illinois sites, to attempt recovery of the population through captive breeding and eventual reintroduction of captive-bred offspring. In the meantime, the Service and other stakeholder agencies recommend, and pursue additional habitat restoration at historic sites, in order to ensure that there are places to reintroduce captive bred EMRs. Because this is a venomous snake, education and outreach will also be crucial to its recovery.

Site Name	Last Observed	Number individuals: Observations (by year)
Cortland (DeKalb County)	1871	-
Crete-Steger (Plum Creek, Cook County)	2001	1:1 (2001)
Crete (Goodenow Grove, Will County	1999	1:1 (1999)
Thornton (Cook County)	Late 1980's	-
Wheeling (Portwine, Cook County)	2000	1:1 (2000)
Wheeling (Willow-Sanders; Cook County)	2009	1:1 (2005); 10:49 (2006); 7:9 (2007); 2:5 (2008); 2:2 (2009).
Riverwoods (Lake County)	1999	1:1
Wood Dale (DuPage County)	1980	-

Number of Individual EMR's and Observation Since 2005



Eastern Massasauga Rattlesnake



Life Cycle

Threats (loss of resource quantity, quality, or disruption of a process needed for species survival)

- Habitat loss and degradation
- Barriers to movement
- Small population size
- High, or avoidable/unnecessary mortality, esp. to adults

Stressors (clear descriptors of what can be avoided, minimized, or mitigated)

- Wetland fill, or drainage/farm tiles
- Prolonged drought
- Severe floods
- Augmented predator populations
- Unattended cats, dogs.
- Invasive species
- Road mortality
- Poaching/illegal collecting
- Burning during active season
- Soil compaction in EMR hibernacula

Avoidance and minimization of effects (to EMR during project activities)

- Install and maintain trenched-in silt fencing between EMR habitat and project areas
- Avoid measures (ditching, tiles) that would alter water table
- Avoid new hard features (e.g., roads or trails) that would fragment existing EMR habitat
- Restoration should use heavy machinery in EMR habitat only when ground is hard-frozen
- Familiarize work crews with EMR identification
- Establish protocol for removing EMRs if encountered in work zones
- Have expert qualified to handle live EMRs "on-call" in case any are encountered during project
- Restrict prescribed burn window to November 1 through late March (or when surface soil temperatures first rise to >9°C)
- Upon project completion, overseed disturbed soil with native grasses and sedges
- Regularly maintain short (<5" tall) mowed strips of turf grass at least 3m wide along roads

Mitigation Opportunities

- Increase area of suitable habitat at locations of historic populations within the DesPlaines River and Plum Creek Drainages
- Improve condition of existing habitat – remove invasive plants, restore hydrology
- Provide assistance with surveys at historic localities
- Provide assistance to efforts of Lincoln Park and Brookfield Zoos to recover local populations through captive breeding

Short-term objectives (2010) of CIFO

- Work with IDNR and Illinois EMR Recovery Team to finalize and begin implementing state recovery plan for the species
- Survey historic sites in northeast Illinois and continue to salvage live EMRs for captive breeding program
- Farm tile survey and restore at least 4 acres of wetland hydrology at active site in DesPlaines River Drainage
- Work with Forest preserve Districts of Cook and Lake counties to identify funding sources for EMR habitat restoration
- Partner with other local stakeholders to identify opportunities to increase public awareness and support for EMR
- Work closely with Lincoln Park Zoo and the AZA Species Survival Plan on rangewide *in-situ* and *ex-situ* conservation needs