

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compiler of this form:

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Designation date

Site Reference Number

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2. Date this sheet was completed/updated: June 13, 2011

3. Country: United States of America

4. Name of the Ramsar site: Sue and Wes Dixon Waterfowl Refuge at Hennepin & Hopper Lakes

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

a) Designation of a new Ramsar site ; or

b) Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update: Not applicable, this is an application for a new Ramsar site

7. Map of site:

a) A map of the site, with clearly delineated boundaries, is included as:

i) **a hard copy** (required for inclusion of site in the Ramsar List): ;

ii) **an electronic format** (e.g. a JPEG or ArcView image) ;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** .

b) Describe briefly the type of boundary delineation applied:

The Sue and Wes Dixon Waterfowl Refuge is roughly oval-shaped, narrowing towards the north and south ends of the Refuge. The site is entirely bounded to the west by a levee running along the eastern shore of the Illinois River. The upper (most northern) quarter of the east side is bounded by a levee running along the southwest shore of Coffee Creek, a seasonal stream flowing northwest to the Illinois River. The rest of the east side is bounded by a glacial outwash terrace that delineates the eastern edge of the Illinois River floodplain. Illinois State Route 26 runs along the edge of the northern quarter of this terrace. Moving south along the remainder of the terrace, the site is bounded by private landowners with property found along or just above the terrace slope. The very south end of the project is bordered by a short section of levee running east to west along Seibert Creek, a seasonal stream flowing west to the Illinois River (Appendix A1).

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Lat: 41°13'19.83492554"N

Lon: 89°20'16.87948538"W

9. General location:

The Dixon Waterfowl Refuge is located along the east side of the Illinois River in north-central Illinois, immediately south of the Village of Hennepin in Putnam County, about 120 miles southwest of Chicago (Appendix A2).

10. Elevation:

Mean elevation is approximately 133.5 m MSL (NAVD 88), ranging from 131.4 m (min) to 140.2 m (max) (Appendix A3).

11. Area: 1,117 hectares.

12. General overview of the site:

Restoration of the 1,117-ha Dixon Waterfowl Refuge at Hennepin & Hopper Lakes ("the Refuge") began in April 2001, following 90 years of agricultural production behind a levee on the Illinois River floodplain. Prior to levee construction in 1909, the site was a complex system of backwater lakes, wetlands, prairie,

savanna, and forest. The Refuge has now been restored to a landscape that closely resembles the presettlement conditions found there more than 200 years ago. However, due to the Illinois River’s highly altered hydrology, the levee remains in place today to insulate the site from destructive floods and river-borne invasives. In addition to the lakes, key features of the site’s original hydrology – primarily the extensive system of springs, seeps, and depressional wetlands – have successfully been restored. The site is located within the Illinois segment of the Mississippi River Flyway, an important corridor for migrating birds that provides critical resting and feeding habitat for waterfowl and other wildlife species.

The Wetlands Initiative’s goal for restoring the site was to develop the rich mosaic of habitat space that once characterized this region. In addition to the lakes, the Refuge has a wide range of wetland plant communities (submersed aquatic, hemi- or deep marsh, shallow emergent marsh, wet or sedge meadow, wet and wet-mesic prairie, wet and wet-mesic sand prairie, wet shrub meadow, wet forest, and spring, seep, and fen) (Appendix A4). These wetlands are all integrated within a mosaic of upland habitats (sand and mesic savanna, mesic forest, and mesic, dry-mesic, dry, mesic sand, and dry sand prairies) (Appendix A5). The most abundant habitat is the complex of submersed aquatic and hemi-marsh (305 ha), followed by: shallow emergent marsh (241 ha), the complex of wet and wet-mesic prairie (216 ha), mesic prairie (140 ha), and sedge meadow (100 ha). The Refuge’s mix of relatively rare wetland habitats integrated within the extensive natural landscape is unique in this region, where most remaining wetlands have been isolated and/or fragmented.

A remarkable diversity of species have been observed at the Refuge, including 630 plant, 29 mammal, 261 bird, 14 reptile, 10 amphibian, 17 fish, 57 butterfly, and 31 dragonfly and damselfly species (Appendices B1 to B7). Due to the extent and quality of habitat, the Refuge is home to or has been utilized by many state and/or federally endangered or threatened species such as the decurrent false aster (*Boltonia decurrens*), Piping Plover (*Charadrius melodus*), and King Rail (*Rallus elegans*). The National Audubon Society has designated the Refuge as a state Important Bird Area, a distinction that recognizes sites with unique and critical importance to vulnerable bird species.

The proposed Ramsar site is an excellent example of how intensive, strategic efforts undertaken on a large scale can restore natural ecosystems in a relatively short period of time. The Refuge has become a living laboratory where restoration techniques, successional dynamics, and adaptive management strategies can be tested and evaluated. The public can appreciate this jewel of biodiversity by climbing the observation tower to take in the view, exploring the Dore Seep Nature Preserve trail, or taking a stroll on the newly constructed wetland boardwalk. The Refuge offers excellent opportunities for hiking, bird-watching, wildlife photography, canoeing, and kayaking, attracting thousands of visitors each year.

13. Ramsar Criteria:

- 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

14. Justification for the application of each Criterion listed in 13 above:

Criterion 1. A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

The Refuge is characterized by a mosaic of different wetland habitats nested within the upland ecosystem matrix. Many elements of this wetland landscape are regionally rare and considered either globally or regionally imperiled or vulnerable to extinction (Table C1-1). Although some elements appear to be globally secure, high-quality examples are relatively rare within this region, especially when considered on this scale (e.g., the 434 ha of emergent and hemi-marsh (G4, S2) that is contiguous with the 316 ha of sedge meadow, wet prairie, and wet-mesic prairie embedded within the site).

The seep and fen community is extensive in size, with a portion (the Senachwine Seep) extending nearly unbroken for over 2 km along the base of the southeastern sand and gravel terrace, a geologic feature created approximately 16,000 years ago by the catastrophic Kankakee Torrent. Seep and fen habitat along the

terrace further north is not contiguous, but is comprised of several smaller zones that were isolated by sandy alluvial outwash deposits associated with seasonal streams draining the adjacent uplands. The southern seep zone is one of the largest contiguous examples of this rare community in the state (G2, S2). Groundwater surfaces along the base of the terrace and flows onto a deep shelf of muck and peat soils, up to several meters thick. The organic soils extend away from the terrace for up to 300 m to the mineral soils that comprise the bulk of the prairie/wetland system. Although much of the terrace sand and gravel is composed of calcareous or dolomitic material, the water is not sufficiently calcareous to form tufa deposits.

The Illinois Natural History Survey lists this wetland area as a “forested fen” on the Illinois Natural Areas Inventory, but it may be better described as a complex mosaic of seeps and springs emerging at the edge of a forested terrace that eventually transitions into a neutral fen. Ultimately, the fen transitions into a mixture of sedges, cattails, forbs, and shrubs at the edge of the lake or prairie. In the southern terrace-seep complex, 10.9 ha have been dedicated as an Illinois State Nature Preserve (the Thomas W. and Elisabeth Moews Dore Seep).

The Refuge has a total 217 ha of four regionally rare and globally imperiled prairie/wetland ecosystem types: wet prairie (G3, S1), wet-mesic prairie (G2, S1), wet sand prairie (G3, S2), and wet-mesic sand prairie (G2, S2). These once common wetland elements of the tallgrass prairie region are now exceedingly rare due to more than a century of converting natural habitats to agricultural, industrial, and urban development. Few examples remain today, and most of these are small, isolated remnants that provide little habitat value to the plants and wildlife once dependent upon them. In addition, the Refuge has 100 ha of sedge meadow (G3, S2), another wetland system that has been extensively drained for agriculture.

Today, the restored landscape at the Refuge has developed and functions in a manner similar to that found prior to European settlement more than 200 years ago. Similar examples of intact and functional landscape mosaics at this scale are exceedingly rare throughout this region.

Criterion 2. A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Many federal and/or state endangered or threatened species of plants and animals may be found at the Dixon Waterfowl Refuge (Appendices B1 to B7). A remnant population of the federally threatened decurrent false aster (*Boltonia decurrens*) has been thriving and expanding its range throughout the Refuge as the restored wetland has developed. State-endangered or threatened wetland flora include queen of the prairie (*Filipendula rubra*), tall sunflower (*Helianthus giganteus*), yellow monkey flower (*Mimulus glabratus jamesii*), American burnet (*Sanguisorba canadensis*), and American bur-reed (*Sparganium americanum*). The yellow monkey flower is one of only five populations extant within the state.

Other plant taxa found within the Refuge that are characteristic of threatened wetland communities include water parsnip (*Berula erecta*), prairie Indian plantain (*Cacalia plantaginea*), brown bog sedge (*Carex buxbaumii*), bulblet-bearing water hemlock (*Cicuta bulbifera*), fringed gentian (*Gentiana crinita*), meadow blazing star (*Liatris ligulistylis*), Ohio goldenrod (*Oligoneuron ohioensis*), fen betony (*Pedicularis lanceolata*), wild senna (*Senna hebecarpa*), swamp goldenrod (*Solidago patula*), and hairy valerian (*Valeriana edulis ciliata*). In addition, two species of sedge are found at the Refuge that have yet to be identified, and do not appear in any key or description of flora from Illinois or the adjacent states.

The biologically diverse flora at the Refuge in turn provides critical support for a rich fauna, including several vulnerable, endangered, or threatened species. The lakes and marsh support two state-listed fish species: the state-endangered red-spotted sunfish (*Lepomis miniatus*) and the state-threatened starhead topminnow (*Fundulus dispar*). With the Refuge’s strategic location at the northern end of the Illinois segment of the Mississippi River Flyway, the lake and marsh vegetation and abundant aquatic life are a great attraction and critical food source for thousands of resident and migratory birds, including Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), Black Tern (*Chlidonias niger*), Hooded Merganser (*Lophodytes cucullatus*), Ruddy Duck (*Oxyura jamaicensis*), and King Rail (*Rallus elegans*). Of the 30 state-listed birds in Illinois, 22 can be found at the site, including the Piping Plover (*Charadrius melodus*) and Sandhill Crane (*Grus canadensis*), and breeding populations of the Common Moorhen (*Gallinula*

chloropus) and Least Bittern (*Ixobrychus exilis*). The Refuge is one of only seven areas within Illinois where the state-endangered Wilson's Phalarope (*Phalaropus tricolor*) has been known to breed.

It is both the diversity of species and the scale on which they occur that attracts and supports so much wetland-dependent wildlife at the Refuge. Given its position on the Illinois River Valley landscape, these wetlands are extremely important in maintaining populations of the vulnerable, endangered, or critically endangered species utilizing the Refuge. Based on the conservation status ranking of species pioneered by The Nature Conservancy and now managed by the international non-profit organization NatureServe, all listed, recently delisted, or Illinois watch list species are ranked as either globally or regionally imperiled, critically imperiled, or vulnerable to extinction (see Table C2-1). The wetland flora and fauna recorded at the Refuge includes five species with a G-rank of at least G3 (at best, globally vulnerable to extinction), 30 species with an S-rank of S1 (critically imperiled in Illinois), 30 species with an S-rank of S2 (imperiled in Illinois), and 86 species with an S-rank of S3 (vulnerable to extinction in Illinois; see Appendix B8).

Criterion 3. A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Over the past 200 years, more than 90% of Illinois' wetlands, nearly 3 million hectares, have been drained for agricultural, industrial, or urban development. This ongoing loss has severely compromised the integrity of many populations or species that utilize or once utilized the wetland ecosystems of Illinois. Consequently, the 1,117-ha Dixon Waterfowl Refuge has come to play a critical role in maintaining the biological diversity and integrity of the Illinois River Valley. Significant populations of rare species are component parts of the wetland flora, such as the federally threatened decurrent false aster (*Boltonia decurrens*), a species endemic to the Illinois River Valley and a small portion of the lower Missouri River. Other rare species, such as James' yellow monkey flower (*Mimulus glabratus jamesii*), survive across a larger area, but in exceedingly small and isolated populations due to habitat loss. The Refuge's yellow monkey flower population is one of only five that remain in Illinois. With most of the state's natural wetlands gone and the remaining habitat becoming increasingly degraded and/or fragmented, the Refuge's 566 native wetland plant species have been permanently protected under a perpetual conservation easement.

The Refuge flora has provided critical migratory, nesting, resting, feeding, and/or overwintering habitat for 261 bird, 29 mammal, 14 reptile, 10 amphibian, 17 fish, 57 butterfly, and 31 odonate species (Appendix B1 to B7). Other groups are also strongly represented, but have yet to be surveyed in a systematic manner. Among the bird species observed at the site, 29 are found year-round and 55 are confirmed as breeding. The wetland-dependent species include 31 ducks, swans, and geese; 11 herons; 1 cormorant; 2 cranes; 4 grebes; 1 jaeger; 10 gulls and terns; 2 pelicans; 5 plovers; 5 rails; 2 raptors; and 25 sandpipers (Appendix B6). Other than the Bald Eagle (*Haliaeetus leucocephalus*), these species are all migrants; most utilize the site in significant numbers as either a migratory stopover or as a seasonal destination for nesting, feeding, or loafing. For example, from 2,000 up to 3,500 Canvasbacks (*Aythya valisineria*) were found feeding on the Refuge's submersed aquatic vegetation for a period of more than three weeks in spring 2011. It is very uncommon for such a high number of Canvasbacks to be observed within the Illinois River Valley on any one day, but especially for a period of weeks.

The Refuge's wetland plant communities occupy a regionally rare gradient of contiguous habitat from open water to marsh, sedge meadow, seep and fen, and wet prairie and forest up to various upland prairie, savanna, and forest zones. The complexity of these different habitats is enhanced, as they occur across a wide range of hydrologic conditions interspersed among 15 different soil types (9 hydric and 6 non-hydric), including hydric calcareous soils (e.g., Calco silty clay loam), hydric prairie soils (e.g., Titus silty clay loam), and two regionally rare hydric soils not previously reported in Illinois (Medo muck and Wautoma loamy sand; see Appendix A6 and A7). These conditions translate into diverse and extensive high-quality habitat space for many animal species. The complexity of the landscape mosaic functions to internally buffer the biological diversity of this area, increasing ecosystem resilience, and insulating the flora and fauna from extremes in seasonal variability and longer-term climatic change.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

The Refuge's location within the Illinois River Valley migratory corridor provides critical habitat support for many of the 203 species of birds that regularly utilize the site during annual spring and fall migration between Wisconsin, Michigan, Minnesota, and /or Canada and the southern U.S., the Caribbean, Mexico, Central America, and/or South America. The Refuge's wetland food resources are especially important for the wetland-dependent long-distance migrants making very few stops, such as Redhead (*Aythya americana*) and Canvasback duck (*Aythya valisineria*). Rarer migrants such as the Common Tern (*Sterna hirundo*) and American Bittern (*Botaurus lentiginosus*) have been using the site in ever greater numbers to rest and provision prior to making the next push either north or south in their journey.

Wetland species that breed in the area are also strongly dependent upon the food resources and shelter found at the site. Wood Duck (*Aix sponsa*), Common Moorhen (*Gallinula chloropus*), and Pied-billed Grebe (*Podilymbus podiceps*) all extensively utilize the site for brood rearing. In all, 55 species have been confirmed breeding on the site, with another 36 likely breeders, and 17 possible breeding species. For species that breed in the wetlands surrounding the lakes, such as the King Rail (*Rallus elegans*) and Sedge Wren (*Cistothorus platensis*), this site provides the crucial matrix of wetland and upland habitats required for the birds to successfully breed and raise their young.

Hunting of any kind is prohibited within the boundaries of the Refuge, providing migratory waterfowl with a critical refuge during the fall migration. Strategically located at the northern end of the Illinois River Valley, the Refuge represents the first high-quality site on the Illinois River where ducks migrating in the fall can rest and feed without the stress of being harassed or shot. The Refuge is the second largest area free of hunting in the state after the Chautauqua National Wildlife Refuge, 75 miles to the south. No other refuge or wetland area free from hunting provides high-quality habitat at this (or any) scale within the Illinois River Valley, which is one of the primary reasons so many species utilize the site. Additionally, based on the results of banding studies examining the fidelity of individuals utilizing specific migratory routes, the Refuge represents a key feature directing migrating ducks where to go along the Illinois River Valley migratory corridor. Such landmark features are cues learned by uninitiated juveniles during their first migration with experienced adults.

In addition to avian fauna, the site also supports a wide variety of other species that are obligately dependent on wetlands for some or all parts of their life cycle, including all of the fish and amphibians, and many of the mammals, reptiles, insects, and plants utilizing the wetland landscape (See Appendices B1 to B7). The Refuge not only provides critical support for all of these species now, but will continue to do so in perpetuity under the terms of the permanent conservation easements protecting the site from future development.

In anticipation of the need to maintain stable, high-quality habitat over the long term, our goal in restoring the Refuge was to maximize resilience in addition to biological diversity across all component ecosystems. For example, to address climate change, all plant introductions over the past five years have been made with plants or seed originating from the southernmost portion of their provenance whenever practical or possible. By introducing plant ecotypes from somewhat warmer areas, they are pre-adapted to the future conditions predicted by most climate change models. Whether it is the ongoing loss of high-quality wetland habitat, or the anticipated stresses to all ecosystems from climate change, invasive pressure, fragmentation, or pollution, this site will continue to provide refuge for all wetland-dependent species.

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

The Refuge typically has supported more than 20,000 waterbirds daily throughout most of the fall migration (~October 1st to ice cover in December; see Appendices C1-3). Aerial survey data collected approximately every 10 days during the fall waterfowl migration by the Illinois Natural History Survey from 2002 to 2010 reveal that nearly all migratory waterfowl species censused in Illinois have been observed at the Refuge, including 17 ducks, 3 geese, American White Pelicans, and American Coots. Species such as Mallard, Gadwall, and Northern Pintail have had daily counts exceeding 10,000 individuals. Other waterbird species

not identified or considered in the aerial surveys have also been observed, but not counted, during ground-level surveys, including numerous rails, herons, egrets, bitterns, moorhens, grebes, and other duck, geese, and swan species.

Mean daily waterfowl survey numbers fell below 20,000 from 2006 to 2009 during a period in which the lakes were subject to a massive population explosion of the non-native common carp (*Cyprinus carpio*). This disturbance led to the loss of nearly all aquatic vegetation at the site for three years. During that period, waterbird numbers in the entire Illinois River Valley were also unexpectedly low, ranging from 79% of the previous 10-year average in 2006 down to 53% of the previous 10-year average in 2007 (mean of 64% of previous 10-year average from 2006 to 2009). The lakes were rehabilitated late in 2009, with mean daily migratory waterbird counts again exceeding 20,000 individuals after the recovery of aquatic vegetation in 2010 (see Appendix A8). Comparable data for the spring migration have not been collected by the Illinois Natural History Survey.

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Originally, Hennepin and Hopper lakes were permanent backwaters off the Illinois River that were perched above the river during low water periods. The connection to the river was eliminated following construction of a levee system in 1909, and the river and lakes remain disconnected today due to significant alteration of the Illinois River hydrology and water quality and the presence of invasive fish and plants. Currently, the lake and marsh system has been restored to the original lake footprint, and water levels are managed to resemble the former hydrologic rhythms of the original backwater lake community.

The Refuge lake and marsh now represents the type of habitat that was once common throughout the Illinois River system, but that is now all but extinct. Consequently, the Wetlands Initiative and the Illinois Department of Natural Resources have restored a native fish community that is no longer found across most of the region. In addition to several relatively common species, rare, state-listed, and regionally extirpated species have been introduced to and are thriving in the lakes. Some of the more ancient fish species of the Midwest are found in the lakes, including bowfin (*Amia calva*) and spotted gar (*Lepisosteus oculatus*). Other species present include the state-endangered red-spotted sunfish (*Lepomis miniatus*) and state-threatened starhead topminnow (*Fundulus dispar*), each of which occur in very few populations in Illinois. The alligator gar (*Atractosteus spatula*) has also been introduced; this species no longer occurs in the state, outside of Hennepin and Hopper lakes and a few other areas designated as appropriate for restoring the species to Illinois.

This fish community represents the native backwater lake community once found throughout northern Illinois. As these species reproduce and multiply, the Illinois Department of Natural Resources now uses the Refuge as a nursery from which to harvest fish for introductions elsewhere throughout the state.

15. Biogeography

a) biogeographic region:

The Refuge is located in the humid temperate ecoregion domain, prairie ecoregion division and forest steppes and prairies in the ecoregion province of North America.

b) biogeographic regionalisation scheme (include reference citation):

The information was obtained from the US Forest Service--Ecoregions of North America MAP. United States Forest Service, <http://www.fs.fed.us/rm/ecoregions/products/map-ecoregions-north-america/>

16. Physical features of the site:

Prior to the geographic and river channel changes of the last Ice Age, the Refuge area was a channel of the Mississippi River. As the glaciers were receding north, they left a large amount of residue that blocked the channel of the Mississippi River, resulting in a lake forming behind the moraines. As the Mississippi broke

through the rock and residue, it entered its current channel. The remnant channel became the Big Bureau Creek, now a tributary to the Illinois River, which has filled the old Mississippi channel (Appendix A7).

The movement of the newly-formed Illinois River also had a large influence on the Hennepin & Hopper Lakes area. The Illinois River has shifted a few times, creating various elevations within the site and depositing different materials, and is responsible for the general shape of the Refuge. The soils (Appendix A6) along the west side of the site, as well as along areas where a natural levee existed thousands of years ago, are mostly silty clay loams (Mundprairie silty clay loam, Calco silty clay loam, Sawmill silty clay loam, Titus silty clay loam), which are hydric soils. Other hydric soils include Wautoma loamy sand, Wallkill silt loam, Cohoctan loam, Ambraw clay loam, and Medo muck, which has not previously been encountered in Illinois, and is found along the seep. Alluvial deposits exist where sand had been deposited at the old joining of the site and Coffee Creek at the east side of the Refuge; the dry prairie is found there today.

Currently, the Refuge is separated from the Illinois River by a manmade levee that was built upon the natural levee at the river's edge. The site's hydrology is controlled by the precipitation and groundwater contributions to the Refuge. Previously performed isotopic water quality analysis revealed that only a small amount of water is contributed to the site by the Illinois River and agricultural runoff.

The lake water levels reach an average of 438 feet above sea level and fluctuate between 428 and nearly 441 feet above sea level (See Appendix C4). Under the Conservation Reserve Enhancement Program (CREP) contract with the United States Department of Agriculture (USDA), the water levels are controlled during the growing season using the pumps that used to drain the Hennepin Drainage and Levee District. The pumps work for about two months starting in March to drain excess water during the wet season, recreating water levels similar to what a true backwater lake would experience during the spring flooding. After that time, the pumps are shut down to allow for the natural water fluctuations controlled by precipitation, evaporation, and transpiration. These fluctuations are needed for the various wetland habitat types (hemi-marsh, marsh, wet and sedge meadow, and wet prairie) to establish and build resilience.

The meteorological data for the Dixon Waterfowl Refuge comes from the nearby towns of Peru and Lacon. Between the two weather stations, the average rainfall is 89 cm per year (Appendix C5), and temperatures vary from around -10 °C in winter to more than 30°C in the summer (Appendix C6).

17. Physical features of the catchment area:

The Refuge is located on Illinois River floodplain at the edge of a glacial terrace defining the eastern border of that floodplain (Appendix A7). The floodplain itself has been disconnected from the Illinois River by a levee constructed in 1909. The levee has also disconnected the floodplain from Coffee Creek, a small seasonal stream draining approximately 2,850 ha. There are a few remaining very small streams that only flow every few years during extreme rain events, each of which is draining the agricultural fields on the terrace to the east of the Refuge. However, the vast majority of water entering the Refuge is from direct precipitation or local runoff, or from groundwater seeps and springs. Isotopic studies of spring and well water indicate that very little of this water comes from the Illinois River, but rather from the catchment area to the east of the Refuge (Appendix A9).

As part of the Illinois River floodplain, most of the Refuge is relatively flat. Average depth throughout the lakes is approximately 0.96 meters, while the average elevation above the lake surface within the levied area is 0.86 meters above the mean lake surface elevation of 133.5 meters MSL NAVD 1988 (Appendix A3). The lake basins represent former channels of the Illinois River, with the more shallow Hopper Lake basin running north to south and centered along the midpoint of the east side of the Refuge (see Appendix A1). The deeper Hennepin Lake basin runs from the south end of the site to the north-northwest approximately two-thirds of the way to the northwest corner of the Refuge.

The catchment area to the east of the Refuge comprises 9,090 ha. Like the proposed Ramsar site, this catchment is located in humid temperate ecoregion domain, prairie ecoregion division and forest steppes and prairies in the ecoregion province of North America. Most of the soil in the HUC 12 catchment basin (5,800 ha) is associated with dark and moderately dark prairie and wet prairie soil, providing it with fertile organic material; 1,907 ha are covered by wetland soils. The parent material consists mostly of sandy Wisconsin

outwash and Aeolian material (3,863 ha), while thick loess composes 2,851 ha. Most of the basin (5,269 ha) has excessive to high leeching potential including the nitrate leeching grounds; 2,825 has moderate potential for nitrate leeching. The land use is dominated by agriculture (3,852 ha) and upland/rural grass, which is often put under pasture (2,760 ha). Urban development is limited (358 ha).

18. Hydrological values:

The restoration of wetlands on the Refuge has been instrumental in restoring groundwater levels throughout the 1,117-ha site. Removal or disconnection of the extensive draintile network has restored wetlands over 83% of the Refuge. However, these wetlands play little role in recharging local groundwater, as their hydrology is primarily driven by upwelling groundwater (i.e., the site represents an area of groundwater discharge rather than recharge). Excess water may be occasionally pumped from the site to the Illinois River, and nearly half the annual input is lost to evapotranspiration.

The lake and marsh shorelines are very stable in that there is little flow within the Refuge. Moreover, the dense marsh vegetation extending from shore out into the lakes effectively insulates the shoreline from any wave erosion associated with strong windy storms.

As the site remains levied off from the Illinois River, the Refuge plays little role in flood control. Moreover, with its location at some distance away from significant population or agricultural resources, there would be little impact on local or regional flooding should the site become flooded. With no risk of flooding, the Refuge plays little role in trapping sediments other than those that occasionally enter the site from small intermittent seasonal streams.

The quality of the Refuge’s relatively clear, clean water and the life forms that it supports is one of the primary attractions for many of the migratory species that spend time at the site. Some of these species, in particular waterfowl, provide economic benefits to the local economies by attracting more hunting dollars to the area, despite the fact that hunting is not allowed anywhere on the Refuge. Moreover, the local populace has taken a proprietary interest in the site because of their interest in waterfowl, some of which is driven by an interest in hunting. However, the majority of this interest appears to lie in the site’s function as a *refuge* supporting waterfowl, i.e., not as a way to attract ducks in order to increase the hunters’ “take.”

19. Wetland Types

a) presence:

Inland: L • M • N • Q • P • Q • R • Sp • Ss • Tp Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

b) dominance:

wetland type	wetland description	% cover	hectares
Tp	Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.	38.8%	433.4
Ts	Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.	19.9%	222.6
O	Permanent freshwater lakes (over 8 ha); includes large oxbow lakes	10.1%	112.5
Xf	Freshwater, tree-dominated wetlands; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.	4.4%	49.4
U	Non-forested peatlands; includes shrub or open bogs, swamps, fens.	1.0%	10.9
-	non-wetlands	25.8%	288.1

20. General ecological features:

The different types of habitat at the Refuge are expressed and defined by the plant communities that occupy them. The gradient of hydrological conditions overlying different soil types and chemistries allows for the diversity of plant species to grow in the niche space most appropriate to their individual characteristics and adaptations. Temporally and spatially fluctuating water inputs closely mimic conditions found locally more than 100 years ago, resulting in seasonally dynamic lake levels, discharge from springs and seeps, water depths across prairie wetlands and swales, and soil moisture levels. The diversity of plants and animals reflects the dynamic nature of this wetland system.

The **hemi marsh** consists of mixed submersed, emergent, and floating-leaved herbaceous vegetation (e.g., sago pondweed (*Stuckenia pectinata*), broad leaf cattail (*Typha latifolia*), and white water lily (*Nymphaea odorata*)). The interspersed is, on average, a 50:50 mix of open water and emergent or floating-leaved vegetation. The heterogeneity of this community creates ideal habitat for various fish, ducks, coots, rails, muskrats, frogs, turtles, and a host of insects. A number of the rarer species such as Common Moorhen (*Gallinula chloropus*), Least Bittern (*Ixobrychus exilis*), Wood Duck (*Aix sponsa*), and river otter (*Lontra canadensis*) make extensive use of these areas for feeding, cover, and brood rearing. The structurally diverse plant community also provides exceptional cover for the many smaller organisms at the base of the wetland's intricate food web.

The **emergent marsh** is more densely vegetated with herbaceous emergents, and encompasses a wider range of hydrologic conditions. The marsh plant community thrives on saturated soils that may be seasonally flooded out to those that are underwater up to 75 cm in depth. A matrix of graminoids are distributed across this gradient such as hardstem bulrush (*Schoenoplectus acutus*), lake sedge (*Carex lacustris*), and rice cut grass (*Leersia oryzoides*), with a diverse mixture of forbs including common bur-reed (*Sparganium eurycarpum*), duck potato (*Sagittaria latifolia*), purple false-foxglove (*Agalinis purpurea*), sweet flag (*Acorus americanus*), and nodding bur-marigold (*Bidens cernua*). The marshes at Hennepin & Hopper Lakes support a variety of birds, including the state-threatened Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) and American Bittern (*Botaurus lentiginosus*), Marsh Wren (*Cistothorus palustris*), Virginia Rail (*Rallus limicola*), and Sora (*Porzana carolina*). Other species found there include mink (*Mustela vison*), plains leopard frog (*Rana blairi*), northern leopard frog (*Rana pipiens*), and northern water snake (*Nerodia sipedon*).

Herbaceous sedge or wet meadows are generally dominated by graminoids, with a large number of forbs occurring at lower densities. Various conservative graminoids are found, such as the Bebb's oval sedge (*Carex bebbii*), fringed sedge (*C. crinita*), common yellow lake sedge (*C. utriculata*), and brown bog sedge (*C. buxbaumii*), along with fringed brome (*Bromus ciliatus*) and flat-stem spike rush (*Eleocharis compressa*). The forb community includes the state-threatened queen of the prairie (*Filipendula rubra*), Ohio goldenrod (*Oligoneuron ohioense*), swamp goldenrod (*Solidago patula*), Sullivant's coneflower (*Rudbeckia sullivantii*), and the federally threatened decurrent false aster (*Boltonia decurrens*). Characteristic birds nesting or hunting within the Refuge sedge meadows include King Rail (*Rallus elegans*), Sandhill Crane (*Grus canadensis*), Northern Harrier (*Circus cyaneus*), and Sedge Wren (*Cistothorus platensis*). While pickerel frog (*Rana palustris*) is relatively common throughout the summer, gray tree frog (*Hyla versicolor*), spring peeper (*Hyla crucifer*), western chorus frog (*Pseudacris triseriata*), cricket frog (*Acris crepitans*), green frog (*Rana clamitans*), and American toad (*Bufo americanus*) create a cacophony of sound throughout the spring breeding season.

Wet prairie is a very rare type of herbaceous wetland habitat bridging the Refuge sedge meadow and mesic prairie zones. The plant community is adapted to soils that may be seasonally flooded and remain saturated for much of the growing season, but become somewhat drier during drought or prolonged summer periods with little rainfall. A few of the species characteristic of the Refuge wet prairies are northern dropseed (*Sporobolus heterolepis*), prairie cordgrass (*Spartina pectinata*), Virginia wild rye (*Elymus virginicus*), sweet and prairie Indian plantain (*Cacalia suaveolens* and *C. plantaginea*), marsh phlox (*Plox glaberimma*), Virginia mountain mint (*Pycnanthemum virginianum*), and marsh and prairie blazing star (*Liatris spicata* and *L. pycnostachya*). Some of the animals characteristically found in the Refuge wet prairies include striped skunk (*Mephitis mephitis*), northern leopard frog (*Rana pipiens*), least shrew (*Cryptotis parva*), plains garter

snake (*Thamnophis radix*), Henslow's Sparrow (*Ammodramus henslowii*), and Short-eared Owl (*Asio flammeus*).

The **seep and forested fen** areas represent extremely rare habitats characterized by slightly calcareous groundwater upwelling into a zone of peat and/or muck soils. These wetlands have been relatively undisturbed by any obvious development or other impacts since European settlement in the area, and perhaps as far back as the last Ice Age. These wetlands boast populations of the state-endangered yellow monkey flower (*Mimulus glabratus jamesii*), along with the green twayblade orchid (*Liparis loeselii*), swamp aster (*Aster puniceus*), water parsnip (*Berula erecta*), bulblet-bearing water hemlock (*Cicuta bulbifera*), lizard's tail (*Saururus cernuus*), fringed gentian (*Gentiana crinita*), and northern St. John's wort (*Hypericum boreale*). This unique collection of species making up the plant community is home to a variety of animal species including Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Sedge Wren (*Cistothorus platensis*), mink (*Mustela vison*), prairie crawfish (*Procambarus gracilis*), Great Blue Heron (*Ardea herodias*), beaver (*Castor canadensis*), giant swallowtail butterfly (*Papilio cresphontes*), and tule bluet pond damselfly (*Enallagma carunculatum*).

The part of the Refuge adjacent to the Illinois River is composed of **floodplain forest**, which includes cottonwood (*Populus deltoides*), black willow (*Salix nigra*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), and silver maple (*Acer saccharinum*). These woods provide important breeding and nest-building habitat for birds of priority conservation concern such as the Prothonotary Warbler (*Protonotaria citrea*) and one of the fastest-declining species in Illinois, the Red-headed Woodpecker (*Melanerpes erythrocephalus*), that establish their nests in tree cavities.

Much of the wetland habitat at the Refuge is both buffered and supported by the various upland systems, which compose less than a quarter of the proposed Ramsar site's area (see Table C1-1; Appendix A4). Because uplands provide support for so many wetland-dependent species, they play a critical role in the functioning of the wetland landscape. For example, many nesting hen ducks build their nests in the adjacent mesic prairie surrounding much of the lake and marsh. Upland habitat at the Refuge includes mesic and dry prairie, sand prairie, savanna, sand savanna, and mesic forest.

Prairie habitat is now extremely rare both globally and regionally. At the Refuge, the fine soil prairies are characterized by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), northern dropseed (*Sporobolus heterolepis*), prairie brome (*Bromus kalmii*), buffalo clover (*trifolium reflexum*), cream gentian (*Gentiana flavida*), meadow blazing star (*Liatris ligulistylis*), white wild indigo (*Baptisia alba*), and great St. John's wort (*Hypericum pyramidatum*). Sandier soil prairies are characterized by junegrass (*Koeleria macrantha*), side-oats grama (*Bouteloua curtipendula*), porcupine grass (*Stipa spartea*), rough blazing star (*Liatris aspera*), shooting star (*Dodecatheon meadia*), royal catchfly (*Silene regia*), butterfly weed (*Asclepias tuberosa*), silky aster (*Symphyotrichum pratense*), and prairie onion (*Allium stellatum*). Bobolink (*Dolichonyx oryzivorus*), prairie vole (*Microtus ochrogaster*), overwintering Rough-legged Hawk (*Buteo lagopus*), blue racer (*Coluber constrictor foxii*), long-tailed weasel (*Mustela frenata*), and wild indigo duskywing (*Erynnis baptisiae*) are just a few of the species typically found in the animal community throughout much of the prairie system.

Savannas are open wooded communities with tree cover ranging from 10% to 50%. The mesic savanna tree community is dominated by burr oak (*Quercus macrocarpa*), along with white oak (*Quercus alba*), black cherry (*Prunus serotina*), bitternut hickory (*Carya cordiformis*), and hackberry (*Celtis occidentalis*). The mesic savanna forb and grass community includes Indian grass (*Sorghastrum nutans*), bottlebrush grass (*Hystrix patula*), silky wild rye (*Elymus villosus*), bur sedge (*Carex grayii*), round-fruited St. John's wort (*Hypericum sphaerocarpum*), Maryland senna (*Senna marilandica*), pale Indian plantain (*Cacalia atriplicifolia*), purple false foxglove (*Agastache scrophulariaefolia*), and purple milkweed (*Asclepias purpurascens*). The sand savanna community is dominated by black oak (*Quercus velutina*), with Scribner's panic grass (*Dichanthelium oligosanthos scribnerianum*), hairy puccoon (*Lithospermum carolinense*), aromatic aster (*Symphyotrichum oblongifolium*), fern-leaved foxglove (*Aureolaria pedicularia*), sand coreopsis (*Coreopsis lanceolata*), and prairie blue-eyed grass (*Sisyrinchium campestre*). Both savanna animal communities may be characterized by Red-headed Woodpecker (*Melanerpes erythrocephalus*),

Yellow-throated Vireo (*Vireo flavifrons*), Baltimore Oriole (*Icterus galbula*), fox snake (*Elaphe vulpine*), eastern fox squirrel (*Sciurus niger*), and woodland vole (*Microtus pinetorum*).

The Refuge's complex mosaic of habitats spanning the freshwater hydrologic gradient was not common in the upper Midwest even in the presettlement era. Today, this landscape provides a number of critical ecosystem services no longer available throughout much of the upper Midwest. The rich plant and animal biodiversity is in itself a function of the local ecosystem that pays dividends throughout the region; the Refuge represents many source populations, benefitting areas well beyond its boundaries. The site also functions as an important refuge for some species that are only found in a handful of areas in Illinois or scattered thinly throughout the region, such as the state-endangered yellow monkey flower (*Mimulus glabratus jamesii*).

Other services include improvements to water quality. Groundwater entering the site is rich in NO₃-nitrogen (~8.0 mg/l), yet nitrate levels in the lakes typically remain at or near detection levels. Agricultural pesticides and herbicides have been broken down or locked away in the wetland's clay sediments.

The production of game fish and the opportunity to catch them is another ecosystem service valued throughout north-central Illinois. The potential to catch large muskellunge (*Esox masquinongy*) or large-mouth bass (*Micropterus salmoides*), or the smaller bluegill (*Lepomis macrochirus*) and crappie (*Pomoxis nigromaculatus* and *P. annularis*) attract many devout anglers who routinely describe the fishing as some of the best in the Midwest. (Note: In 2011, the lakes are closed to fishing, due to the restocking efforts of the Illinois Department of Natural Resources.)

Because two-thirds of the lake and marsh system has always been closed to fishing, the remaining areas provide important support for breeding populations of waterfowl and other species, including Ruddy Duck (*Oxyura jamaicensis*) and Mallard (*Anas platyrhynchos*). This translates into a positive impact on population numbers for these various species.

Another economic benefit of the diverse plant communities is the support they provide for agriculture in the form of pollination services. The Refuge supports a large and diverse community of bees and other pollinators, whose impact is not limited to the confines of the Refuge itself.

Excellent recreational opportunities also are available for hikers, educators, bird-watching enthusiasts, and kayakers. The Refuge is free and open to the public year-round from dawn to dusk. The Refuge is also listed as a waypoint on the Illinois River Road National Scenic Byway, which links natural and cultural points of interest from the Illinois towns of Ottawa to Havana.

21. Noteworthy flora:

The Refuge has multiple plant communities that reflect the hydrological and soil biogeochemical complexity of the site (Appendix A4 with above descriptions and Appendices B1 to B8). The Dore Seep and other fen areas with calcareous conditions are globally rare (Table C-1.1). Because much of the seep and fen areas were never farmed, many of the original plant populations persist in remnant communities, such as the state-endangered yellow monkey flower (*Mimulus glabratus jamesii*). Other plants found in the rare seep areas are the state-endangered queen of the prairie (*Filipendula rubra*), tall sunflower (*Helianthus giganteus*), and American bur-reed (*Sparganium americanum*).

The federally threatened remnant decurrent false aster (*Boltonia decurrens*) is present in the site's marshes and wet prairies. Prairie communities present at the Refuge feature many other plants that have an endangered or threatened status, such as the downy panicled cup (*Castilleja sessiliflora*), large-flowered beardtongue (*Penstemon grandiflorus*), royal catchfly (*Silene regia*), buffalo clover (*Trifolium reflexum*), savannah blazing star (*Liatris scariosa nieuwlandii*), prairie buttercup (*Ranunculus rhomboideus*), and long-bracketed spiderwort (*Tradescantia bracteata*). Please see Appendix B1 for a complete plant species list, specifying which populations are remnant and which are re-introduced.

22. Noteworthy fauna:

The pristine lakes at the proposed Ramsar site are home to rare fish, including the alligator gar (*Atractosteus spatula*) and spotted gar (*Lepisosteus occulatus*). These species are able to thrive at the Refuge, as the site provides them with the appropriate submersed vegetation, high water quality, and ample hydrology through groundwater and inflowing streams and deeper pond/lake areas. Other rare fish are found at the site, and additional species are candidates for future stocking (see the Appendix B4 for a complete list).

The 261 species of birds found at the Refuge are an unofficial report card for the success and quality of the habitat at the proposed Ramsar site. The National Audubon Society has recognized the site as an Important Bird Area. The Refuge hosts 22 federally or state endangered and threatened birds, including the King Rail (*Rallus elegans*), Peregrine Falcon (*Falco peregrinus*), Common Moorhen (*Gallinula chloropus*), American Bittern (*Botaurus lentiginosus*), and Pied-billed Grebe (*Podilymbus podiceps*).

The above-mentioned animals are often able to thrive thanks to well-developed insect communities that reside in the lakes, wetlands, and surrounding areas. 57 species of butterflies have been recorded, including gorgone checkerspot (*Chlosyne gorgone*) and eastern comma (*Polygonia comma*). In addition, a high diversity (31 species) of dragonflies and damselflies has been recorded (See Appendices B2 and B3)

23. Social and cultural values:

The Refuge has been documented to have unifacial and bifacial artefacts such as fire-cracked rock and other indications of cooking and food-processing activities that point to prehistoric habitation. These artefacts remain in place in the areas of the central-mesic savanna, an area that is and will remain free from any development or ground disturbance, and with limited access by the public.

24. Land tenure/ownership:

a) within the Ramsar site:

The Refuge is owned by nine non-profit entities: the Wetlands Initiative, the Hennepin Drainage and Levee District, and seven independent 501(C)(3) foundations (Blue-winged Teal Habitat Foundation, Gadwall Habitat Foundation, Green-winged Teal Habitat Foundation, Mallard Habitat Foundation, Pintail Habitat Foundation, Ringbill Habitat Foundation, and Wood Duck Habitat Foundation; See appendix A6). All of the Refuge is managed by the Wetlands Initiative under agreement with the other non-profit foundations.

b) in the surrounding area:

The surrounding area is mostly owned by private individuals. A 40-acre in-holding within the Refuge boundary is owned privately and managed separately from the Refuge property. State route 26 borders the northeastern portion of the Refuge. The Illinois River borders the western portion of the Refuge.

25. Current land (including water) use:

a) within the Ramsar site:

The current land and water use in the proposed Ramsar site consists of the Wetlands Initiative's ongoing ecosystem management. These activities are primarily based on a strategy of adaptive management for the control of invasive species while increasing the diversity and habitat quality for native plants and animals. The public has limited use of the site for recreational purposes such as bird-watching and hiking. One-third of the lake and marsh area is accessible for fishing, kayaking, and canoeing. No gasoline-fueled motors are allowed within the lakes or wetlands. The entire site, other than the most fragile of areas, is open for conducting research with an approved research plan.

b) in the surroundings/catchment

The land use in the catchment area around the proposed Ramsar site is mostly agricultural (more than 50%). The remaining uplands form another 15%, rural grassland consists of 13% of the catchment, and the remaining area is categorized as wetland and surface water, forested land, and urban use. This underlines the dire need for wetlands in a landscape that was once covered almost exclusively by wetland habitats, where very few now remain (See Appendix A9).

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

In the past, agricultural use, including draining and ditching, were the main factors that adversely affected the proposed Ramsar site's biological integrity. Since restoration efforts began in 2001, natural hydrology has been re-established at the Refuge, and a wide variety of native species have re-established from remnant populations and the original seed bank, as well as through active planting and seeding efforts.

Invasive species control is an ongoing management effort at the Refuge. The Wetlands Initiative continues to remove aggressive woody vegetation such as willows (*Salix spp.*) and green ash (*Fraxinus pennsylvanica*) from wetland areas. Other invasive species such as purple loosestrife (*Lythrum salicaria*), cattails (*Typha spp.*), common reed (*Phragmites spp.*), reed canary grass (*Phalaris arundinacea*), and water milfoil (*Myriophyllum spicatum*) are also present, and their control is a vital part of adaptive management for the Refuge.

In the past, the common carp (*Cyprinus carpio*) caused devastating damage to the lakes in the Refuge. The Wetlands Initiative undertook an intensive aquatic rehabilitation effort in 2009-2010 to address this problem. Hennepin and Hopper lakes were drained, the native fish species relocated to nearby nurseries, and the carp removed. Since the carp removal effort, an abundance of native aquatic vegetation has returned (Appendix A8). In spring 2011, Illinois Department of Natural Resources identified a number of carp still present in the lakes. IDNR fishery biologists will continue to monitor the fish population to determine any needed management.

Another unlikely possibility of carp reintroduction would occur if the Illinois River was to flood the Refuge due to levee damage or overflow. In the nearly 100 years of this levee, such an event has never occurred. The Wetlands Initiative is conducting annual levee maintenance and repairs to ensure that this even will not occur.

Succession is a continuous ecological process present until a plant community reaches a theoretical climax. As the Refuge has been restored for 10 years, the community structure might change as more conservative plant species re-establish and trees try to establish at the site. Various natural occurrences such as fires, now managed, cause disturbance in the habitat, which sets back a community and restarts the succession process.

b) in the surrounding area:

The area surrounding the Dixon Waterfowl Refuge is mostly agriculture, which affects the water retention in the area and the groundwater circulation. As a result of this agricultural use, the wind may carry pesticide residue, and the local streams contain heavy loads of nutrients.

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas

The Dore Seep is a designated Illinois Nature Preserve, which requires that the land be maintained as nearly as possible in its natural condition for the public purposes of present and future scientific research, education, esthetic enjoyment and providing habitat for plant and animal species and communities and other natural object.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site

Ia ; Ib ; II ; III ; IV ; V ; VI

Thomas W. and Elisabeth Moews Dore Seep Nature Preserve is part of the Sue and Wes Dixon Waterfowl Refuge and also a part of the larger Senachwine Seep, which extends out of the management scope of the Wetlands Initiative.

c) Does an officially approved management plan exist; and is it being implemented?:

The general management plan is described in an *Ecological Restoration* article by Dr. Sullivan (See Appendix E-1). Adaptive management is practiced to reach the goals of the restoration project.

The Illinois Department of Natural Resources works together with the Wetlands Initiative to manage and sustain the fishery at Hennepin & Hopper Lakes. Any major management decisions affecting the Dore Seep are reviewed by the Illinois Natural Preserve Commission.

Portions of the property are under the authority of CREP plans, which ensure that the water level in the lakes is controlled and that the land is under perpetual easement – meaning no future development of any type is allowed at the Refuge.

d) Describe any other current management practices:

Adaptive management is practiced at Dixon Waterfowl Refuge. Some of the management techniques include planting seed and plugs, mowing, broadcast and spot herbicide application, and prescribed burning. In order to increase habitat for various wildlife, the Wetlands Initiative takes care to plant host species and increase functional groups at the Refuge. The Refuge is closed to all hunting and bound under perpetual conservation easement, ensuring no development of the site.

28. Conservation measures proposed but not yet implemented:

The Wetlands Initiative is working together with the United States Fish and Wildlife Service to enroll the Refuge as one of the conservation places for the federally threatened decurrent false aster (*Boltonia decurrens*). The Refuge is one of the few remaining areas in Illinois with a remnant population of this species, which is endemic to the Illinois River and the very lowest reach of the Missouri River.

29. Current scientific research and facilities:

Since 2004, lake vegetation monitoring has been conducted annually by recording percent cover of species in the same 100 points randomly picked throughout the lake area. In addition to monitoring the lake, in 2007 and 2008, Wetlands Initiative staff conducted stratified (by habitat) randomized plant cover surveys of 140 points across the entire project site. In 2010, the survey was repeated for the seep and other areas to determine whether there was a need for increased management.

Douglas Stotz, Ph.D., conservation ornithologist with the Field Museum and member of the Wetlands Initiative Board of Directors, regularly performs bird surveys at the proposed Ramsar site to record the migrating patterns and presence of species. The Illinois Natural History Survey also performs aerial bird surveys every fall, recording the number of waterbirds present along the Illinois River, including at the Refuge. This data is available for years 2002 and on (Appendices C1 to C3).

Formal studies have also been performed at the site. The Wetlands Initiative received a State Wildlife Grant from the Illinois Department of Natural Resources in 2005 to conduct a three-year study researching the most practical and effective ways to manage woody invasive species in a marsh or wet meadow habitat. The research found that management of woody invasives and cattail (*Typha spp.*) on a large scale provides different opportunities and challenges than on a small scale, while revealing the management practices that worked best for the site.

Scientists at the University of Minnesota documented the impacts of common carp on the plant and fish species in Hennepin and Hopper lakes. The study showed the fast growth of the carp population and how it resulted in damaged fish habitat and decreased biodiversity in the lake. Results of this study were published in *Hydrobiologia* and presented at local conferences (Appendix E2).

Water quality studies using nitrogen isotope enrichment or depletion determined the agricultural nutrient input into the restoration project and its effects. The study was led by Miquel Gonzalez-Meler from the Lab of the University of Illinois at Chicago. Dr. Gonzalez-Meler and his students have also been studying carbon sequestration potential in wetlands and changes in greenhouse gas emissions by assessing soil cores pre- and post-restoration at the Refuge. The data has not been published yet.

Dr. Susan Romano of Western Illinois University uses the Refuge to study hybridization and spatial and genetic distribution of the federally threatened decurrent false aster (*Boltonia decurrens*) along the Illinois River.

30. Current communications, education and public awareness activities related to benefiting the site:

The 30-foot Arthur A. Nolan Jr. Observation Tower, installed in 2003, provides an expansive view of the site, as well as excellent bird-watching opportunities. Two spotting scopes installed on the tower allow

visitors to get a closer look at wildlife on or near the lakes. The soon-to-be installed half-mile boardwalk trail allows visitors to hike through diverse prairie and wetland ecosystems. Informational signs along main points of interest explain the significance and history of the site.

31. Current recreation and tourism:

Thousands of visitors come to the site annually to fish, bird-watch (taking advantage of the observation tower and telescopes), canoe or kayak, or hike the Dore Seep trail. The proposed Ramsar site is listed as a waypoint on the Illinois River Road Scenic Byway, which links natural and cultural points of interest for tourists along the road from the Illinois towns of Ottawa to Havana. Recently added signs along Illinois Route 26 are expected to raise awareness of the Refuge and draw more visitors.

32. Jurisdiction:

The Refuge at Hennepin & Hopper Lakes is within the territorial jurisdiction of the State of Illinois and Putnam County. In 2002, the land owned by TWI and the seven non-profit foundations was entered into conservation easement, and the majority of the acreage was enrolled in the Conservation Reserve Enhancement Program (CREP). The easements are permanent, held in perpetuity by the Marshall-Putnam Soil and Water Conservation District. The Wetlands Initiative manages the entire site, under legal agreements with the drainage district and the seven other non-profit foundations that own the Refuge property (see Appendix A10).

The Dore Seep Nature Preserve is also managed by the Wetlands Initiative with some oversight and approval of actions from the Illinois Nature Preserves Commission. The Illinois Department of Natural Resources shares managerial jurisdiction over the fisheries under a cooperative management agreement; however, the Wetlands Initiative is responsible for all other aspects of lake management.

33. Management authority:

The Wetlands Initiative is responsible for managing the Sue and Wes Dixon Waterfowl Refuge at Hennepin & Hopper Lakes. The person overseeing the entire project is:

Gary Sullivan, Ph.D., Senior Ecologist
The Wetlands Initiative
53 W. Jackson Blvd, Suite 1015
Chicago, IL 60604
(312) 922-0777, extension 115

The site manager is Rick Seibert.

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Annex 1

Table C1-1. Refuge habitat, categorized by Ramsar criteria, area, and global and regional conservation status.¹ Conservation rank data is courtesy of the Illinois Natural Heritage Database at the Illinois Department of Natural Resources.

Refuge Ecosystem Type	Ramsar Wetland Category	Hectares	G-rank	S-Rank
submersed aquatic	Permanent freshwater lakes	112.9	GNR	SNR
hemi marsh	Permanent freshwater marshes	192.4	G4	S2
emergent shallow marsh	Permanent freshwater marshes	241.5	G4	S2
spring, seep, and fen	Non-forested peatlands	10.9	G2	S2
sedge meadow	Seasonal freshwater marshes on inorganic soil	99.9	G3	S2
wet prairie	Seasonal freshwater marshes on inorganic soil	118.2	G3	S1
wet sand prairie	Seasonal freshwater marshes on inorganic soil	4.1	G3	S2
wet-mesic prairie	Seasonal freshwater marshes on inorganic soil	92.8	G2	S1
wet-mesic sand prairie	Seasonal freshwater marshes on inorganic soil	1.7	G2	S2
wet forest	Freshwater, tree-dominated wetlands	1.8	G3?	S3
floodplain forest	Freshwater, tree-dominated wetlands	47.9	G4	S3
mesic prairie	Non-wetland	139.9	G2	S1
dry-mesic prairie	Non-wetland	12.5	G3	S1
dry prairie	Non-wetland	1.4	G3	S1
mesic sand prairie	Non-wetland	4.2	G1?	S2
dry sand prairie	Non-wetland	4.3	G3	S2
mesic savanna	Non-wetland	4.6	G1	S1
dry sand savanna	Non-wetland	3.4	G2?	S1
mesic forest	Non-wetland	9.3	G3	S4
levee, road, and buildings	Non-wetland	13.5	-	-
Total		1,117.3		

¹A conservation status rank of 1 indicates that the ecosystem is critically imperiled and under threat of being eliminated globally (G1) or within Illinois (S1). A rank of 2 indicates the ecosystem is imperiled, and a rank of 3 indicates the ecosystem is vulnerable to being eliminated. A rank of 4 indicates the ecosystem is apparently secure, and a rank of 5 indicates the ecosystem is common and abundant. Ecosystems with a rank of GNR or SNR were not ranked.

Table C2-1. Federal or Illinois listed wetland or wetland-dependent species recorded at the Sue and Wes Dixon Waterfowl Refuge at Hennepin & Hopper Lakes, with G- and S- conservation status rankings (global and state status respectively), and federal and state endangered and threatened listing status¹. See Appendix B8 for a complete list of the Refuge's wetland species with a G-rank of 1, 2, or 3, and/or an S-rank of 1, 2, 3, X, or H, along with a more complete explanation of G- and S-ranks and their modifiers. Data courtesy of the Illinois Natural Heritage Database at the Illinois Department of Natural Resources.

	Species	Common Name	G-Rank	S-Rank	E&T
bird	<i>Ammodramus henslowii</i>	Henslow's sparrow	G4	S2	ST-D 09
bird	<i>Asio flammeus</i>	Short-eared Owl	G5	S1B,S2	SE
plant	<i>Boltonia decurrens</i>	decurrent false aster	G2	S2	FT
bird	<i>Botaurus lentiginosus</i>	American Bittern	G4	S1S2	SE
bird	<i>Buteo lineatus</i>	Red-shouldered Hawk	G5	S2S3	SE-D 04
bird	<i>Charadrius melodus</i>	Piping Plover	G3	SH	FE, SE
bird	<i>Chlidonias niger</i>	Black Tern	G4	S1	SE
bird	<i>Circus cyaneus</i>	Northern Harrier	G5	S2B,S3N	SE
bird	<i>Dendroica cerulea</i>	Cerulean Warbler	G4	S3	ST
bird	<i>Egretta caerulea</i>	Little Blue Heron	G5	S1	SE
bird	<i>Egretta thula</i>	Snowy Egret	G5	S1	SE
bird	<i>Falco peregrinus</i>	Peregrine Falcon	G4	S1	ST
plant	<i>Filipendula rubra</i>	queen of the prairie	G4G5	S1	SE
fish	<i>Fundulus dispar</i>	Starhead topminnow	G4	S2	ST
bird	<i>Gallinago delicata</i>	Wilson's Snipe	G5	S3	IWL
bird	<i>Gallinula chloropus</i>	Common Moorhen	G5	S3	ST
bird	<i>Grus americana</i>	Whooping Crane	G1	SX	FE
bird	<i>Grus canadensis</i>	Sandhill Crane	G5	S3	ST-D 09
bird	<i>Haliaeetus leucocephalus</i>	Bald Eagle	G5	S2B,S3N	ST-D 09
plant	<i>Helianthus giganteus</i>	tall sunflower	G5	S1	SE
bird	<i>Ixobrychus exilis</i>	Least Bittern	G5	S2	ST
fish	<i>Lepomis miniatus</i>	Redspotted Sunfish	G5	S2	ST
plant	<i>Mimulus glabratus jamesii</i>	yellow monkey flower	G5	S1	SE
bird	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron	G5	S2	SE
plant	<i>Oenothera perennis</i>	small sundrops	G5	S1	ST
bird	<i>Pandion haliaetus</i>	Osprey	G5	S1	SE
bird	<i>Phalaropus tricolor</i>	Wilson's Phalarope	G5	S1	SE
bird	<i>Podilymbus podiceps</i>	Pied-billed Grebe	G5	S3	ST-D 04
bird	<i>Porzana carolina</i>	Sora	G5	S3	IWL
bird	<i>Rallus elegans</i>	King Rail	G4	S2	SE
bird	<i>Rallus limicola</i>	Virginia Rail	G5	S3	IWL
plant	<i>Sanguisorba canadensis</i>	American burnet	G5	S1	SE
plant	<i>Sparganium americanum</i>	american bur reed	G5	S1	SE
bird	<i>Sterna forsteri</i>	Forster's Tern	G5	S1	SE
bird	<i>Sterna hirundo</i>	Common Tern	G5	S1	SE
bird	<i>Tyto alba</i>	Barn Owl	G5	S1S2	SE
plant	<i>Viola conspersa</i>	dog violet	G5	S2	ST
bird	<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird	G5	S2	SE

¹ A G- or S-rank of 1 indicates the species is critically imperiled and in very high risk of extinction (globally (G-) or within Illinois (S-)). A rank of 2 indicates the species is imperiled and in high risk of extinction, and a rank of 3 indicates the species is vulnerable to extinction. A rank of 4 indicates the species is apparently secure, and a rank of 5 indicates the species is common and abundant.