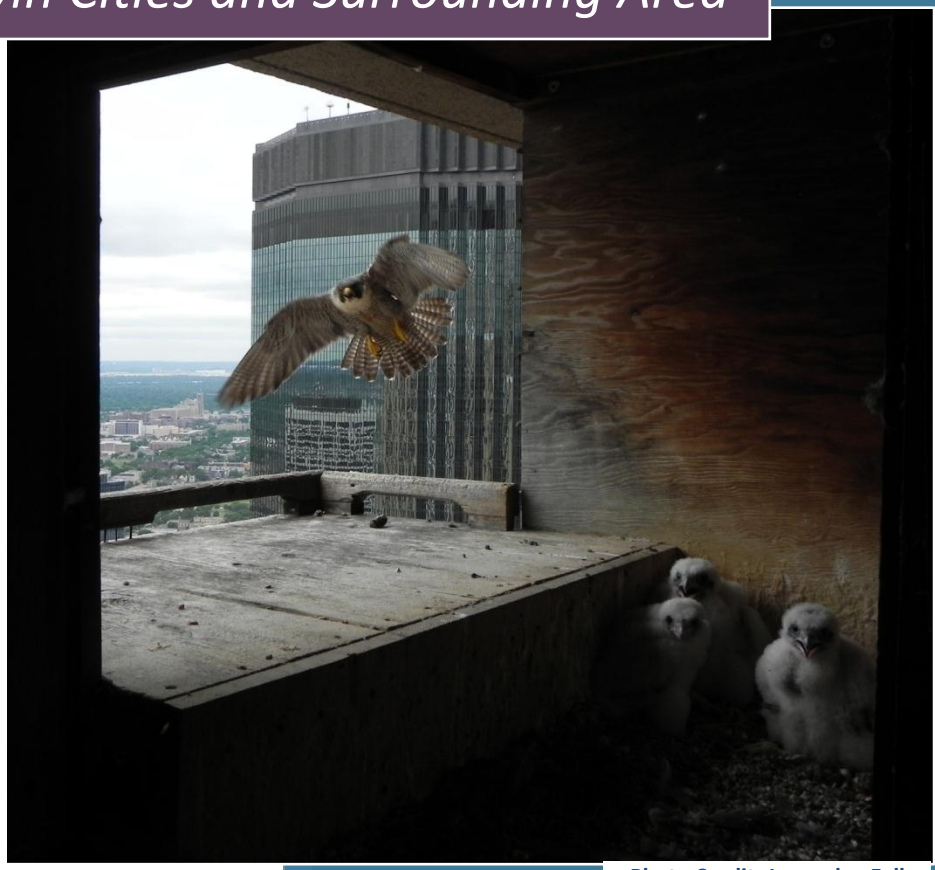
2012

The Guide to Urban Bird Conservation:
For the Twin Cities and Surrounding Area



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Introduction

The idea of a land ethic was eloquently summarized by Aldo Leopold: *"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it does otherwise."* This philosophy of the environmental land ethic is the basis for the majority of natural resource conservation work today. The land ethic, however, is challenged when it is applied to urban landscapes because the biotic community has been so drastically altered. Yet, if we don't address urban landscapes in the context of conservation, we risk further separating ourselves from the environment.

In his understanding of people and their relationship to the land, Leopold also knew that *"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."* With over half of the world's population living in urban areas, there is an increased need for environmental conservation within those areas. By emphasizing the community element of the land ethic, conservation in urban areas considers not just the relationships between parts of the natural world, but includes the social structures (economies, communities and infrastructure) that impact the environment as well.

The United States Fish and Wildlife Service, in recognition of the need for conservation within the urban environment, developed the Urban Conservation Treaty for Migratory Birds (Urban Bird Treaty) Program in 1999 to support bird conservation initiatives in urban areas throughout the country. This program was created to help municipal governments conserve birds that live or nest in, or overwinter or migrate through, their cities. On July 14, 2011, the cities of Minneapolis and Saint Paul were jointly recognized as a member of the Urban Bird Treaty Program and are one of only 18 treaty cities throughout the nation.

As part of the Urban Bird Treaty, the Twin Cities was challenged to further urban bird conservation. This guide provides details on how the Twin Cities and surrounding area can work to protect, restore and enhance urban/suburban areas for birds through targeted habitat restoration, species management, environmental education, and community involvement activities. For the purposes of this plan, the urban area consists of the seven-county metropolitan area making up the Twin Cities, Minnesota - Anoka, Dakota, Carver, Hennepin, Ramsey, Scott and Washington Counties - which will be referred to collectively as the "metro area" hereafter. These counties make up the area covered by the Metropolitan Council planning agency and thus provide a logical boundary for this plan.

The seven counties making up the metro area consist of a mix of heavily urbanized, suburban and rural/agricultural land uses. According to the Metropolitan Council, the population of the area is approximately 2.88 million, and expected to grow by nearly a third by 2030, likely extending areas of dense urbanization and putting increased pressures on agriculture, open space, and natural areas.

Many protected and managed natural areas already exist in the Twin Cities metro area, providing a solid foundation of natural communities which foster bird conservation beyond their boundaries. *The Guide to Urban Bird Conservation* strives to support and direct bird conservation activities at professional, community and local levels. This guide draws on the expertise of agencies, municipalities and conservation organizations to ensure that:

- key habitats are protected or enhanced
- threats and hazards to birds are identified and reduced
- residents and citizens are engaged in conservation action
- scientific monitoring needs are identified and supported

This guide identifies priority conservation strategies for birds within the metro area and will facilitate partner collaboration and, ultimately, bird conservation.

Background

The following sections provide background *for The Guide to Urban Bird Conservation* and include a succinct overview of the birds currently found in the metro area, from the more common back yard species to those of conservation concern. Changes in the species composition of birds found throughout the metro area have been primarily driven by changes in habitat quality and availability. Therefore, an overview of habitat changes within the metro area over the past 200 years is also provided.

Following the summary of species composition and habitat changes, we highlight the existing areas currently managed for natural resources by federal, state and local agencies as well as private organizations throughout the metro area.

Metro Area Bird Species Composition

A total of 298 bird species regularly occur within the metro area; of those, 163 are breeders or permanent residents, while the others are migrants or winter/summer visitors (Appendix A). This impressive tally doesn't include an additional 97 occasional/accidental visitants that have also been documented within at least one of the seven counties of the metro area (Appendix B). While it is important to acknowledge and continue to track the presence of accidental species, these birds will not be discussed further as it is difficult to determine their habitat associations and they are not present in manageable numbers. Species considered to be regular visitors to or residents of the metro area can be further categorized into three groups; migratory species (non-breeders), birds that nest in the metro area (common backyard birds, nuisance species and birds enhanced by human alterations to the environment), and breeding birds of conservation concern.

Migratory Birds

Migratory birds pulse through the metro area in waves each spring and fall[i], often stopping to forage before continuing on their journeys. Waterfowl are generally the first migrants to arrive in spring. They appear once the ice starts to break up, anywhere from late February through April. "Puddle ducks," such as Mallards, Wood Ducks, Northern Shovelers and Blue-winged Teal, require shallow water and congregate a bit later in the spring on expanding patches of open water. The second wave of spring migrants includes shorebirds, which typically travel thousands of miles before stopping to rest, refuel and then head farther north into Canada and the Arctic to breed. While a few, such as Killdeer, are summer residents, the majority are migrants that arrive from late April through May. The last wave of migrants includes the songbirds that arrive from late April and peak in numbers in mid- to late May. The presence of these migrants, although sometimes brief, embellishes the rich birding opportunities that are available throughout the year. Many Twin Cities residents anxiously await the arrival of spring migrants after a long cold winter. And the metro area provides important habitat where these species can rest and "refuel".

Birds that Nest in the Metro Area

Backyard and Common Birds

Bird life throughout the Twin Cities metro area is rich and varied. Metro area residents are fortunate to enjoy a surprising diversity of common birds. A colorful array of birds, including Northern Cardinals, Downy and Hairy Woodpeckers, American Goldfinches, Black-capped Chickadees, White-breasted Nuthatches, Orioles, and American Robins grace even the most densely urbanized areas. Even some larger birds are easily found along rivers and other water bodies, including Ospreys, Great Blue Herons and Great Egrets. Other iconic birds that were once hard to spot are rapidly increasing in numbers, such as the Cooper's Hawk, Bald Eagle and Wild Turkey.

Nuisance Species

Because the nuisance designation is one of human perception, any species, including native species, could potentially be considered a nuisance. A species generally becomes a "nuisance" when its

population becomes so dense that it causes human/wildlife conflicts. Some familiar "nuisance" birds found throughout the metro area include Canada Geese, and non-native European Starlings, House Sparrows, and Rock Doves (pigeons).

Canada Geese thrive where lakes or wetlands border the open space of parks, golf courses and athletic fields, a combination that is very common in the metro area. A large resident population is present year-round and it can almost triple when fall migrant Canada Geese come through. Large concentrations of Canada geese are often considered both a messy nuisance and dangerous. Geese are also the biggest concern at metro airports, followed by starlings.

European Starlings consume a wide variety of food but are mainly insectivores. They nest in cavities and will aggressively displace native cavity-nesting birds such as Purple Martins, Bluebirds and Woodpeckers. By competing for these nest sites, Starlings are believed to be partly responsible for the decline of some of these native species.

House Sparrows are considered a nuisance in the Twin Cities primarily because they dominate bird feeders and may drive away native birds such as Northern Cardinals, various finches and Chickadees. Like Starlings, they also compete with some native cavity-nesters. It appears that repeated introductions occurred in various parts of the U.S and Canada in the 1850's and in Saint Paul as early as the fall of 1876. They are now one of the most abundant songbirds on the continent.

Rock Pigeons are ubiquitously associated with city landscapes. They are social and can nest and forage in large flocks, leaving large amounts of droppings which can pose a human health hazard and be destructive to buildings and other structures. The city of Saint Paul is experimenting with contraception, mixing OvoControl-P with cracked corn and grain scattered about the rooftops. The pellets do not harm the birds, but prevent eggs from hatching.

Birds Enhanced by Alterations in the Urban Environment

A small number of species have become increasingly dependent on human-made structures and nesting sites. These include cavity nesting species such as Eastern Bluebirds or Wood Ducks, whose use of nest boxes mitigates for the lack of suitable dead trees and snags in the urban environment. Purple Martins are cavity nesters that, east of the Rockies, are totally dependent on human-supplied housing. Others, such as Chimney Swifts and Ospreys, can adapt to specific human-made structures (such as chimneys or power and light poles) and will also use structures specifically designed and placed for their needs (see artificial nest section). Other species, such as Barn Swallows and Peregrine Falcons, have adapted to nesting under bridges or on ledges or rooftops of tall buildings.

Birds of Conservation Concern

As part of the Audubon Minnesota 2012: *Operational Blueprint for Bird Conservation in Minnesota*, priority bird species were identified for major landscapes throughout the state. The metro area is part of a larger landscape, identified for bird conservation purposes as Bird Conservation Region (BCR) 23 - the Prairie Hardwood Transition. Priority bird species in BCR 23 which also occur in the metro area are listed as "Birds of Conservation Concern" (Table 1.1). Species in all three categories of concern share each of

the following characteristics: 1) populations in decline, 2) dependency on vulnerable habitats and 3) are present in manageable numbers.

Twin Cities Area Bird Habitat Overview

The deciduous forests of the eastern United States, the conifer forests of Canada and the prairie grasslands of the Great Plains all converge in Minnesota (Figure 1-1) and the Twin Cities metropolitan area falls within the transition zone between prairie and deciduous forest. Historically, oak savanna formed an extensive swath throughout this region, separating the dominant tall-grass prairies to the west and south from the beech-maple forests to the north and east. Before European settlement and accompanying urbanization, floodplain forests covered the bottomlands of the Minnesota, St. Croix and Mississippi rivers; maple-basswood forests covered northern exposures and sheltered ravines; oak woodlands and forests formed transitional zones between the river's edge and the oak savanna and prairies, dominated by native grass and wildflowers filled in wherever fires prevented trees from becoming established.

The Minnesota Department of Natural Resources (MN DNR) and the U.S. Forest Service have developed an Ecological Classification System[ii] (ECS) that divides the state into 4 provinces, 10 sections and 26 subsections. The metro area overlaps 6 subsections (Figure 1-2) with a variety of habitats in each subsection. Detailed information about each subsection and their habitats can be found in *"Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife[iii]".* We use *"Tomorrow's Habitat"* to discuss the changes that have taken place in the landscape over the past century and to apply some of the habitat change analysis that is relevant to conservation actions within the metro area.

Land Cover Changes

Although the metro area has an impressive park system and extensive open spaces that provide a degree of habitat function, the original landscape has been considerably altered and, from a wildlife perspective, degraded. “Tomorrow’s Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife” has a statewide analysis of terrestrial habitat change between 1890 and 1990. Habitat types that were an important part of the 1890s landscape that have declined significantly across the metro area include prairie, oak savanna, wetland, and deciduous upland hardwoods. All of these habitat types are important for breeding and migratory bird conservation.

Current land cover classification of the 7 county metro area using 2000 Landsat data[iv] shows that the metro area is approximately 36% urban, 36% cultivated land, 12% forested, 11% non-forested natural land, and 6% water. Metro Greenways conducted a habitat quality assessment of terrestrial and wetland habitats in the metro area in 2003 and discerned that approximately 14% (280,000 acres of 1.9 million) could be classified as remaining high quality habitat but it exists in small fragments throughout the landscape (Figure 1-3).

Managed Lands

A variety of lands are managed for conservation in the metro area by: non-governmental organizations, federal and state agencies, and regional units of government. Many of these areas provide the framework for conducting habitat restoration and conservation activities, but to effectively act on these opportunities, an integrated approach is needed that focuses on implementing cooperative projects and incorporating shared management strategies.

Important Bird Areas

(http://mn.audubon.org/important-bird-areas-3)

Important Bird Areas (IBAs) are focus sites for bird conservation that work through partnerships to identify, monitor, and conserve essential habitat for breeding, wintering or migrating birds. Nationally, the Important Bird Areas Program is overseen by The National Audubon Society and Bird life International[v]. In Minnesota, the IBA program is overseen by Audubon Minnesota and the MN DNR Nongame Wildlife Program. IBAs are typically comprised of multiple ownerships, including natural resource agencies, non-governmental organizations and private land owners. The designation of an IBA is an important tool for prioritizing land use options for national, state, and local land managers. An IBA is identified because it: 1) is important to a large number of migrating, breeding, or wintering birds; 2) has a significant population of a bird species of conservation concern; 3) consists of unique or rare habitats and their associated bird communities; or 4) is an important urban or research site. The Twin Cities metro area currently has ten IBAs (Figure 1-4) and the area around Carlos Avery Wildlife Management Area (WMA) is being considered for IBA designation.

Federally Managed Lands

U.S. Fish and Wildlife Service

Minnesota Valley National Wildlife Refuge (http://www.fws.gov/midwest/minnesotavalley/)

This 14,000-acre refuge in the heart of the metro area was established in 1976 specifically to preserve the diverse and abundant wildlife and plant communities found along a 34-mile stretch of the Lower Minnesota River Valley floodplain, from Bloomington to Jordan (Figure 1-5). The refuge is growing with funds managed by the Minnesota Valley Trust which was established in 2000, with $26 million in compensation from the expansion of the Minneapolis/Saint Paul Airport. The refuge is part of the Lower Minnesota River Valley IBA and attracts over 260 bird species, including 120 breeders.

Common waterfowl include Canada goose, Mallard, Wood Duck, and Blue-winged Teal. The Wilkie Unit contains a heron rookery consisting of an estimated 750 nest sites of Great Blue Herons and Great Egrets. Exposed mud flats on refuge riverbanks and wetlands attract shorebirds including Greater and Lesser Yellowlegs and Spotted Sandpiper. Both Common Snipe and American Woodcock are commonly found here as well. Neotropical migrants attracted to forested habitats include thrushes, vireos and warblers. This site has unparalleled value for migrating songbirds and waterbirds.

Waterfowl Production Areas (http://www.fws.gov/refuges/whm/wpa.html)

The metro area also has three Waterfowl Production Areas (WPAs) in Scott and Carver Counties: Perbix East, Perbix West and Soberg, each approximately 100+ acres in size. WPAs are public lands purchased by the USFWS for the purpose of increasing the production of migratory birds, especially waterfowl. WPAs are open to the public for many non-motorized activities such as bird watching, hiking, hunting and cross country skiing.

National Park Service

Mississippi National River and Recreation Area (http://www.nps.gov/miss/index.htm)
Established in 1988, the Mississippi National River and Recreation Area (MNRRA) includes 72 miles (53,775 acres) of the Mississippi River corridor that passes through the metro area and is part of an IBA. MNRRA features a wealth of nationally significant cultural, historic, scenic, scientific and natural resources. A true partnership park, the National Park Service owns very little land and works with 25 local governments, several state agencies and numerous organizations to protect the globally significant resources along the stretch of river running through the Minneapolis/Saint Paul metro area. MNRRA is currently conducting Bald Eagle research to determine more about Mississippi River water quality and landbird collision monitoring with Audubon Minnesota. Park rangers conduct birding programs along the river.

St. Croix National Scenic Riverway (http://www.nps.gov/sacn/index.htm)
A portion of the 255 miles of river that constitute the St. Croix National Scenic Riverway flows along the eastern edge of Washington County. A popular spot for outdoor activities, the St. Croix is home to swans, eagles, Ospreys and Louisiana Waterthrush, along with numerous other species.

State Managed Lands

Scientific and Natural Areas (http://www.dnr.state.mn.us/eco/sna/index.html)
The MN DNR's Scientific and Natural Areas (SNA) program preserves lands that have rare natural resources of exceptional scientific and educational value. Many of these sites contain functional and varied bird habitat contributing greatly to the local landscape for birds. The Twin Cities Metro Area has 15 SNAs: Black Dog Nature Preserve, Blaine Airport Rich Fen, Boot Creek, Chimney Rock, Grey Cloud Dunes, Hastings, Hastings Sand Coulee, Helen Allison Savanna, Lost Valley Prairie, Pigs Eye, Pine Bend Bluffs, Seminary Fen, St Croix Savanna, Wolsfeld Woods and Wood Rill. Avian inventories have been conducted on each of these sites within the past decade. These inventories, which can be found at the above website, provide baseline information for establishing future avian conservation goals.

Wildlife Management Areas (http://www.dnr.state.mn.us/wmas/index.html)
The MN DNR designates Wildlife Management Areas (WMAs) to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing and other recreational uses. WMAs are considered key to: 1) protecting wildlife for future generations; 2) providing citizens with opportunities for hunting, fishing and wildlife watching; and 3) promoting important wildlife-based tourism in the state. The metro area has 40 WMAs. A few of these (Carlos Avery, Lamprey Pass and

Gordie Mikkelson) are located within larger areas under consideration as Important Bird Areas. Gores Pool #3 WMA is part of the Vermillion Bottoms – Cannon River IBA.

State Parks (http://www.dnr.state.mn.us/state_parks/index.html)

Minnesota has 66 state parks, five of which are within the metro area (Afton, Fort Snelling, William O'Brien, Minnesota Valley Recreation Area and St. Croix Island Recreation Area), collectively offering approximately 8,750 acres of open-green space. Many of the parks offer camping, picnicking and a variety of recreational activities while protecting habitat for birds and wildlife. Afton State Park contains a combination of oak openings, woodlands, remnant prairies and oak savannas. Fort Snelling, located at the confluence of the Minnesota and the Mississippi Rivers, hosts large cottonwood, silver maple, ash, and willow trees nestled in heart of the Twin Cities and within the Lower Minnesota River Valley Important Bird Area. William O'Brien State Park is along the St Croix River floodplain and is characterized by hickory forests, scattered white pine areas, marshes, oak savanna, upland prairie and rolling meadows, providing habitat for diverse wildlife populations.

Lands Managed by Local Governments

Regional Parks

(http://www.metrocouncil.org/parks/parks_partners.htm)

Regional parks include the county, city and neighborhood parks system. The metro area has an extensive regional park system, one that has few rivals anywhere in the world, highlighting the importance of natural spaces and outdoor recreation to Minnesotans, including those living in the metro area. The current park system includes: 54,633 acres open for public use; 51 parks and park reserves; seven special recreation features, such as the zoo and conservatory at Como Park; and 38 regional trails, with 231 miles currently open to the public. By 2030, the Regional Parks System plans to expand by nearly 70,000 acres and to quadruple the trail system from 231 miles today to almost 1000 miles. New greenway corridors will link regional parks in Scott, Dakota and western Hennepin Counties.

Watershed Management Districts

***(http://www.mnwatershed.org/* click on "What is a Watershed District")**

Other local entities that help facilitate water conservation and management are the Minnesota Watershed Management Districts, 14 of which are in the metro area. Watershed Management Districts are local, special-purpose units of government that work to solve and prevent water-related problems. The boundaries of each district follow those of a natural watershed and consist of land in which all water flows to one outlet. While all other government units, such as states, counties and cities have political boundaries, Watershed Management Districts manage natural resources on a watershed basis, which allows for a holistic approach to resource conservation. The districts are made up of partnerships with the state, counties and cities for water and soil conservation as well as wetlands protection and management.

Figure 1-6 depicts the publicly managed lands throughout the seven county metro area.

Metro Area Bird Habitat

Although population growth and its associated urbanization have caused considerable, on-going, habitat degradation and fragmentation, functional examples of quality habitat types remain throughout the metro area and host thriving bird communities. In order to ensure that the metropolitan area is an increasingly effective sanctuary for resident and migratory birds, habitat enhancement and restoration projects are critical.

This section describes the three geographic regions and eight general habitat types within the metro area:

- Highly Developed
  - Urban/ backyard/ campus
  - Urban forests
- Outer Region
  - Open woodland- including oak savanna
  - Grassland-including prairie and agricultural lands
  - Wetlands/ marshes
- Throughout the Metro Area
  - Upland forests
  - Floodplain forest
  - Open water- including lakes and rivers
  - Artificial nest structures

Each habitat type is followed by a brief description of birds which thrive in that habitat, along with more detailed information on a few "target species". Target species are meant to provide focus to this plan and should be viewed as good representatives for a larger suite of species found in the same habitat. Management actions directed at these target species will benefit many other birds that occupy the same habitat. Most of the target species are species of conservation concern (Table 1.1) and were selected because: 1) they breed in the listed habitat type, 2) they have specialized requirements that emphasize various elements within that habitat and 3) they are species that can benefit from conservation actions. Target species for the highly developed habitats are not necessarily species of conservation concern, but focus on common, easily recognizable birds that are found in the urban core and can directly benefit from specific urban management practices, such as nest platforms, nest boxes, snag retention or restoration activities.

Highly Developed Region

Birds utilizing habitat within the highly developed sections of the metro area include migrants following the Mississippi River in spring and fall and common backyard birds.

Highly Developed: Urban/Backyard/Campus

The urban habitat type is divided into three main categories: urban, backyard, and campus. The term urban is used in this document to describe the central city areas dominated by buildings, industrial development and paved landscapes. The designation of backyard habitats refers to privately-owned, smaller, landscaped green spaces that occur in varying densities throughout the seven county metro area. Lastly, the campus classification refers to larger manicured landscapes such as golf courses, university and corporate campuses, and to some extent city parks. This classification does not include the various "islands" of natural areas that can be found within the highly developed region of the metro area; these "islands" are further addressed in the habitats found Throughout the Metro section. Each classification within the urban habitat type is subject to varying degrees of human activities. Although densely populated urban areas have been significantly altered from their natural, pre-settlement conditions, they are still able to provide habitat for many resident and migratory birds.

Birds that thrive in Urban/Backyard/Campus Habitats

Approximately 50 birds nest or are permanent residents within the urban/backyard/campus habitat, six of which are species of conservation concern: Bank Swallow, Brown Thrasher, Chimney Swift, Northern Rough-winged Swallow, Purple Martin and Warbling Vireo. Seasonal migrants rely on the metro area for critical stop-over habitat each spring and fall and encounter unique hazards which are discussed in the bird safe section.

Target Species

The ***Northern Cardinal***[vi] is a great ambassador for birds in urban habitats. Highly identifiable and iconic, the cardinal is responsible for sending people to the nearest bird guide, perhaps for the first time, just to find out what that brilliant, loud and charismatic bird is. Typically found in back yards, using shrubs and small trees, cardinals have benefitted from human alteration of the environment, especially winter bird feeders filled with black oil sunflower seeds. Although relatively abundant, cardinals are still susceptible to the hazards present in urban environments such as window collisions and pesticide exposure. Conservation efforts that will keep the cardinal a common sight throughout the metro area include; applying integrated pest management strategies to reduce pesticide use, and ensuring the proper placement of landscaped shrubs, trees and bird feeders in relation to reflective glass to minimize the potential for fatal impacts.

Purple martins are the largest member of the swallow family. East of the Rockies, purple martins depend almost exclusively on human-built houses and gourds for nesting. In Minnesota, annual surveys show an average martin population decline of 6.3% yearly from 1966 to 2009 (Breeding Bird Survey[vii]). Experts believe the bird's decline is due in part to the House Sparrow and the European starling, two exotic species that out compete martins for existing natural nest

sites and invade or destroy martin nests and eggs in artificial nesting sites. In addition, there are fewer human-built martin houses, once found commonly on nearly every farmstead. Martins are also insectivores and are negatively impacted by the use of pesticides.
Purple Martins benefit greatly from the placement and maintenance (removal of competitor nests) of martin houses and the reduction of pesticide use in back yards.

House Wrens [viii]are partial to the open, shrubby woodlands that are readily available in small towns, and suburban back yards. House Wrens nest in natural and artificial cavities typically located in small forests patches and in forest edges. Including the House Wren among the target species for the highly developed habitat type is a way to emphasize that even fragmented urban areas have the potential to contribute to conservation and species diversity. Creating multi-level vegetative structure in a back yard, retaining dead standing trees with natural cavities and minimizing pesticide use are relatively simple ways to support House Wrens and their allies within the urban environment.

Conservation Actions - Transform Urban Spaces into Bird-friendly Havens

- Corporate campuses, school yards and golf courses can provide suitable bird habitat with proper management through programs like Audubon at Home and the Corporate Sanctuary Program.
- Habitat in neighborhood backyards can be enhanced to provide important links to larger habitat corridors.
- Retain standing dead trees that can provide food and natural cavity nesting sites.
- Manage backyard forests to mimic natural forests which include an understory, mid level shrub layer and canopy.
- Avoid or reduce the use of pesticides by applying integrated pest management practices.

Highly Developed: Urban Forest

Urban forests are essential areas of second growth forests that became established after the initial settlement and logging of the metro area in the 19th century and are typically comprised of native deciduous trees, conifers, shrublands and mixed hardwoods. Forested boulevards and shade trees can also be included in this category. Urban forests[ix] have a wide range of economic, social and environmental benefits from increased property values and energy savings to enhanced esthetic values and recreational opportunities. Environmentally, urban forests provide clean water, clean air and important wildlife habitat. The metro area would not be the bird haven that it is today without its urban forest and intact river ecosystems. The protection and restoration of these urban forests is essential. Efforts should focus on connecting wooded areas across the urban landscape so that they can function as important wildlife corridors within a fragmented ecosystem.

Birds that thrive in Urban Forests

Approximately 35 species nest in or are permanent residents of the urban forest habitat type, three of which are species of conservation concern; the Northern Flicker, Chimney Swift and Brown Thrasher. Urban forests also play a critical role for larger birds in the urban environment such as the Cooper's Hawk, Barred Owl, Broad-winged Hawk, Pileated Woodpecker and American Crow. Also of important note are the 100 plus seasonal migrants that rely on the urban forest habitat type. Seasonal migrants are considered as a "target group" rather than selecting specific target species, detailed management actions for migratory birds are included in the BirdSafe section.

Target Species

Baltimore Orioles[x] are colorful and charismatic with an easily recognizable nest structure and are a good gateway species into the world of birds and birding. They are common and widespread in Minnesota, utilizing a broad range of habitat types, yet appear to have a strong preference for riparian or open deciduous forests. Specific forest management practices including planting native deciduous hardwoods, maintenance of healthy trees in parks, and preservation of small groves of shade trees in urban and suburban areas will help conserve the Baltimore Oriole within the urban landscape.

Black-capped Chickadees[xi] are one of the most widespread and familiar birds in North America, seen most readily in small flocks at backyard bird feeders in winter. Cavity nesters that are often found within 75 meters of forest boundaries, Black-capped Chickadees are common in deciduous forests with alder, cottonwood, willow and birch trees that provide suitable nesting and foraging habitat. Snag retention and supplemental bird feeders are easy conservation actions to support Black-capped Chickadee populations within the metro area.

The ***Gray Catbird***[xii] is a gray bird with a black cap and chestnut-colored undertail, named for its distinctive "mewing" call. Commonly found in dense shrubs, edge and early successional forests, the Gray Catbird requires structural diversity within the urban forest. Planting native shrubs in back yards, maintaining shrub rows in agricultural fields and creating or maintaining a shrubby layer of vegetation within the overall urban forest structure are conservation actions that can benefit this target species.

Conservation Actions- Urban Forest

- Retain dead standing trees (snags) within an urban landscape
- Apply integrated pest management strategies wherever possible to reduce pesticide use.
- Mimic the structure of a natural forest within the urban environment by including a layer of understory vegetation, shrubs and an upper canopy.
- Use native trees, shrubs and herbaceous plants found locally, in parks and other public landscaping.

Outer Region

Outside of the highly developed region are three habitat types which are important to bird conservation: open woodland/oak savanna, wetlands and grasslands.

Outer Region: Open Woodland - Including Oak Savanna

Savannas are a transition between prairie and woodland, maintained to a large extent by some form of disturbance, most typically fire. Prairie plant species and select trees—bur and northern pin oaks in particular—successfully re-sprout after disturbance. In the past, when fires swept across the prairie and burned into forested areas they restricted the growth of most other forest trees, preventing a closed-canopied forest from developing. The remaining bur and pin oak trees provided structure for the oak savanna by forming a relatively open canopy of scattered trees while prairie grasses and wildflowers filled in a continuous ground cover beneath. This mixture of grassland and oak forest creates a particularly rich habitat, able to support a great variety of plant, and animal species.

Prior to European settlement, oak savanna was one of the most common ecosystem types in the Midwest, covering roughly 10% of Minnesota and a greater percentage of the metropolitan area. Fire suppression, agriculture and urban growth have reduced the extent of oak savanna coverage to less than 0.1 percent of its original acreage[xiii] making the oak savanna system highly endangered and one of the rarest plant communities in the region. Given the significance of this habitat type and the acreage that has been lost, as well as its importance to a diversity of birds and wildlife, oak savanna is another priority community for restoration work.

Birds that thrive in a healthy oak savanna

Of the 16 breeding species that utilize open woodlands, six are species of conservation concern: Eastern Whip-poor-will, Red-headed Woodpecker, Northern Flicker, Loggerhead Shrike, Brown Thrasher and Lark Sparrow. Other birds found in this habitat include Eastern Bluebirds, Indigo Buntings and Orchard Orioles. Concerted efforts to restore and conserve open woodland within the seven county metro area would benefit many species that are currently in decline.

Target Species

Loggerhead Shrikes are hunters and rely on open woodlands for foraging and small trees for nesting. A predator of small mammals and reptiles, they impale prey on thorns or barbed wire fence hooks in order to consume a meal. Loggerhead shrikes have adapted to open farm and agricultural lands. Populations are in decline due to changes in farming practices, the use of various pesticides, and loss of habitat to development[xiv]. Dakota County is one of the few remaining breeding areas for the Loggerhead Shrike in Minnesota. Maintaining mid-succession, open woodlands within an agricultural setting is crucial in providing suitable loggerhead shrike habitat.

Red-headed Woodpeckers[xv] are omnivorous but specialize in feeding on insects within wood and under bark; they are also expert flycatchers. Breeding habitat consists of open woodland with scattered trees typical of oak savanna. Red-headed Woodpeckers can also be found in parks, gardens, small woodlots, cultivated areas, and orchards. As a cavity nester, Red-headed Woodpeckers rely heavily on large snags.

Low intensity controlled burns to create new snags while leaving established snags intact, and/ or grazing to clear understory vegetation are strategies that could enhance Red-headed Woodpecker habitat.

Conservation Actions - Open Forests/Oak Savanna

- Conservation easements can be used to protect existing open space and quality habitats.
  - All land being considered for acquisition or easement should have a prescribed management plan.
- Apply prescribed burning, mowing and grazing management to maintain open areas.
- Remove or control encroaching tree species such as cedar and box elder.
- Retain standing dead trees to provide nesting habitat for cavity nesters.
- Properly site, place and maintain nest boxes for cavity nesters to provide nesting opportunities when natural habitat is limited.

Outer Region: Wetlands/Marshes

There are several types of non-forested wetlands throughout the metro area, including marshes, wet meadows, fens, and bogs. Emergent marshes are most common and are dominated by cattails, bulrushes and arrowheads mixed with annual forbs during low-water periods. Species composition varies over time in response to changes in hydrological conditions, although water levels are generally high and persistent enough to prevent trees and most shrubs from becoming established.

Birds that thrive in wetland systems

Forty-three species breed in metro wetlands, including 19 that are species of conservation concern: Trumpeter Swan, Mallard, Blue-winged Teal, Redhead, Pied-billed Grebe, American Bittern, Least Bittern, Black-crowned Night-heron, Sora, Common Gallinule, American Coot, Wilson's Snipe, American Woodcock, Black Tern, Forster's Tern, Willow Flycatcher, Bells' Vireo, Marsh Wren, and Yellow-headed Blackbird. The retention, protection and restoration of wetland habitat is critical to nesting, resident and migrating species alike.

Target Species

Black Terns[xvi] are semi-colonial nesters and prefer large complexes of semi-permanent wetlands that have a nearly equal ratio of open water to emergent vegetation. Aside from the protection and restoration of existing wetlands within the metro area, Black Terns would likely benefit from a flood management regime which provided suitable water depths of greater than 30 cm throughout their breeding season.

Trumpeter Swans were reintroduced into Minnesota in the mid-1980s as they had been extirpated from the state due to over-hunting and habitat loss[xvii]. The reintroduction project has been a great success and Minnesota is now a prime area for trumpeters because of the high number and quality of remaining wetlands throughout the state. Threats still exist as their feeding habits make them quite susceptible to pesticides and exposure to lead shot and lead sinkers. Working with the hunting and fishing community to reduce the use of lead in lakes and wetlands, along with the protection and restoration of wetlands within the urban and agricultural lands of the metro area, are some of the conservation measures that would ensure the Trumpeter Swan reintroduction program remains a success story.

Conservation Actions - Wetlands

- Prevent the spread and establishment of invasive species particularly, non-native narrow-leaved and hybrid cattail and purple loosestrife.
- Prepare and implement flood management plans to avoid flooding nests.
- Retain or create diverse stands of both fine leaved and robust emergent vegetation.
- Restore natural wetlands by breaking field tiles and plugging drainage ditches.
- Retain and preserve wetlands on working farms and agricultural lands.

Outer Region: Grasslands - Including Prairie and Agricultural Lands

Grasslands, particularly native prairies, are highly productive systems dominated by various grasses and forbs. Historically, metro area prairies included big bluestem and Indian grass on relatively moist sites and little bluestem, side-oats grama and porcupine grass on drier sites. Like the grasses, forb composition varied with moisture and soil characteristics. There are also several prairie shrub species including buck brush and leadplant. Most prairie species have deep roots that reach moist soils enabling them to thrive through times of drought.

Grasslands and remnant native prairie are among the most diverse and important plant communities in the Midwest. Native grassland restoration has occurred on a number of small sites throughout the metro area. The occurrence of fire, needed to sustain native prairie has almost completely ceased due to increased barriers such as roads, cultivated fields, cities and towns. This lack of fire has contributed to the growth of trees and shrubs on most prairie remnants. Burning is the traditional management tool employed to suspend grassland succession into forests, but poses a challenge in urban areas. Grazing and mowing are additional options that, when managed correctly, can create the same desired effect.

Birds that thrive in prairie systems

Twenty-nine species breed in metro grasslands, including 16 species of conservation concern: Northern Harrier, American Kestrel, Upland Sandpiper, Eastern Kingbird, Loggerhead Shrike, Clay-colored Sparrow, Field Sparrow, Vesper Sparrow, Lark Sparrow, Savannah Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Dickcissel, Bobolink, Eastern Meadowlark, and Western Meadowlark.

Target Species

Eastern Meadowlarks were once common in prairies, pastures, meadows, and hayfields, but have steadily declined in recent years. This has been attributed to loss of nesting habitat as a result of large scale, high yield, intensive farming practices and urbanization. Meadowlarks and other ground-nesting birds are especially vulnerable to predators such as free-roaming domestic cats[xviii]. Keeping cats indoors and alternative agricultural practices such as; no-till row crop farming, creating grassland buffers around agriculture fields, and the inclusion of a fallow field in a managed crop rotation system, are management practices commonly employed to enhance the presence of meadowlarks and other grassland nesting birds in agricultural areas.

Henslow's Sparrows[xix] were listed as endangered in the state of Minnesota in 1996, having experienced a significant population decline due mostly to changes in agricultural practices and increased development. Henslow's Sparrows prefer grassland with tall vegetation and a substantial litter layer. Some habitat maintenance activities recommended by the MN DNR include prescribed burns, rotational grazing, removal of woody vegetation, and planting native prairie grasses. The Conservation Reserve Program[xx] (CRP) has provided valuable habitat for Henslow's Sparrows on agricultural lands. Currently, CRP is under threat of losing funding. Action is needed to make sure the CRP remains intact with the 2012 revision of the Farm Bill. In addition, limiting pesticide use is a reasonable strategy for grassland

bird species management. Henslow's Sparrows are primarily insectivores and could be negatively impacted by heavy and continued pesticide applications.

Conservation Actions – Grasslands, including Prairie and Agriculture

- Incorporate bird conservation into agricultural practices.
  - Plant native prairie strips within agricultural fields.
  - Use no-till or low-till cultivation.
  - Avoid mowing roadside ditches or mow only the areas that are imperative for safety until after September 1st.
  - Retain shelterbelts and field edge buffers.
  - Plant crops that don't require cultivation or harvest during grassland bird nesting season.
  - Plant and promote prairie in fallow agricultural fields
  - Remove woody material from open grasslands and prairie
- Use integrated pest management to reduce pesticide loads.
- Prevent the spread of invasive species and control those that are already established.

Throughout the Metro

Three additional habitat types that are important to birds and spread throughout the metro area are upland deciduous forests, floodplain forests and open water.

Throughout Metro: Upland Deciduous Hardwood Forest

Upland hardwood forests historically occurred on sites where wildfires were infrequent. The canopy is usually continuous and dense, and comprised of deciduous trees, most commonly sugar maple, basswood, and red oak. Mature forests usually have several nearly closed layers, including a well-defined forest canopy, sub-canopy, and dense shrub layer. These layers combine to produce continuous cover so that the lower canopy plants found in this habitat are adapted to low light intensity.

Because the tree canopy permits so little light from reaching the forest floor during the summer, maple-basswood forests have a suite of early spring wildflower species that bloom, produce seeds and die back before tree leaves are fully developed. Formerly known as the "Big Woods" there are considerable efforts underway in the western portion of the metro area to protect and restore this upland forest habitat. One of the biggest management challenges is controlling invasive species, particularly non-native earthworms[xxi] and European buckthorn.

Birds that thrive in upland forest systems

Sixty-six species breed in metro area deciduous forests, including 12 species of conservation concern: American Woodcock, Black-billed Cuckoo, Eastern Whip-poor-will, Chimney Swift, Northern Flicker, Acadian Flycatcher, Least Flycatcher, Veery, Wood Thrush, Brown Thrasher, Cerulean Warbler, and Louisiana Waterthrush.

Target species

The ***Northern Flicker***[xxii] is a generalist that prefers forest edges, has adapted to human-altered landscapes and is fairly common at backyard bird feeders. However, Breeding Bird Survey data has shown that its population is declining for reasons that are unclear. Some explanations include habitat loss and competition for nest cavities from European Starlings. Whatever the reason, the decline is alarming in that flickers are primary cavity nesters and provide nesting habitat for a wide variety of forest bird species. The loss of the Northern Flicker would likely have a large impact on woodland ecosystems, therefore proactive management is important. A workable equilibrium needs to be established for snag retention in urban areas allowing for some standing dead trees to remain and provide nesting habitat for Northern Flickers and other cavity nesters.

Wood Thrushes are a good benchmark species for the deciduous forest system as they are relatively common but experiencing an overall decline (Breeding Bird Survey data) due to habitat loss and fragmentation. Specifically, the Wood Thrush is a common victim of Brown-headed Cowbird parasitism; cowbirds rely on other birds to incubate and hatch their eggs and raise their young. With the increase in habitat fragmentation in deciduous forests, the cowbird has extended its range dramatically, negatively affecting the productivity of Wood Thrushes. A conservation strategy for the sustainability and

enhancement of this species (as well as other species that rely on upland forests) is to create intact, large areas of deciduous forests within the outer region of the metro area, by linking already established systems with suitable habitat corridors.

Conservation Actions – Deciduous Upland Forest

- Protect and enhance the remaining large “islands” of upland deciduous forest.
- Restore degraded upland forests and control invasive species.
- The species composition of these “forested islands” should be used as a reference and resource when assessing what native tree and shrub species to plant in landscaped parks and open areas.
- Create habitat corridors of connectivity between the larger patches of upland forest throughout the metro area.
- Retain snags and natural nest cavity sites.

Throughout Metro: Floodplain Forest

Floodplain forests dominate the bottomlands adjacent to the Mississippi, Minnesota and St. Croix rivers. These forests stand dry, above the river channel, most of the year, but tolerate seasonal flooding that saturates the soil and is a defining cause of the vegetative complex. Silver maple typically dominates the canopy, often occurring in nearly pure stands, along with cottonwood, some black willow and ash. Woody climbers such as wild grape, Virginia creeper and poison ivy are often present. Germination and survival of tree and shrub seedlings are restricted by flooding, leaving the understory typically open.

Floodplain forests are particularly valuable to migrating songbirds that rely on vegetative corridors along the rivers. Although canopy coverage is fairly continuous from Pig's Eye south to Pine Bend, large areas of floodplain forest throughout the metropolitan area have been lost to urbanization and agriculture, leaving the forest fragmented and patchy. Invasive plant species pose another key threat and compound the overall degradation. Given the threats to this system and its importance to migrants, floodplain forests are a top priority for protection and restoration.

Birds that thrive in healthy floodplain forests

Thirty breeding species are associated with floodplain forests in the metro area and 11 are priority species of conservation concern: Wood Duck, Black-crowned Night-heron, Cerulean Warbler, Black-billed Cuckoo, Acadian Flycatcher, Least Flycatcher, Warbling Vireo, Blue-winged Warbler, Prothonotary Warbler, and Louisiana Waterthrush. Other important species using this habitat include colonial nesting waterbirds such as Great Blue Herons and Great Egrets.

Target Species

Prothonotary Warblers breed in the metro area and rely on tracts of floodplain forest greater than 250 acres[xxiii] with suitable nest cavities. Enhancing connectivity (via land acquisition, conservation easements or the creation of ecological buffers) of existing bottomland hardwood forests is a good approach toward mitigating habitat loss, which is a major threat to floodplain forest dependent species. Prothonotary Warblers also benefit from snag retention for nesting.

Wood Ducks are cavity nesters that use closed canopy, densely vegetated floodplain forests surrounding wetlands or along streams and rivers. Habitat loss, particularly of cavity nesting trees, is the main threat to Wood Ducks and, therefore, protecting and restoring floodplain forests, river oxbows and riparian habitat is the best management strategy for Wood Ducks and allied species. Relatively adaptive in nature, Wood Ducks have also benefitted greatly from the strategic placement of nest boxes throughout forested floodplain habitat.

Conservation Actions - Floodplain Forest

- Use conservation easements with willing land owners to protect existing floodplain forest and quality habitats.
- Develop forest stewardship plans for existing conservation easements.

- Prevent the spread of invasive species and control those that are already established (reed canary grass in particular).
- Plant floodplain forest native tree and shrub species where invasive species have been removed.
- Integrate multi-succession plantings into restoration management to create a diverse understory and canopy.
- Support watershed and conservation district programs that assist local governments and landowners in stabilizing slopes and protecting upland habitats.

Throughout Metro: Open Water - Including Lakes and Rivers

The open water habitat type includes both shallow and deep-water lakes, rivers, streams and their associated shorelines. Open water habitat is abundantly available within the metro area, including three major rivers (the Mississippi, St. Croix and Minnesota) and more than 500 lakes greater than 20 acres in size.

Shallow lakes often have abundant aquatic plant growth due to high nutrient content and available sunlight. Stands of emergent and floating-leaved aquatic plants as well as submerged plants are often present and provide food and habitat for waterfowl. Deep lakes typically provide large open spaces, clear water and varying levels of vegetation and productivity. The three major rivers of the metro area can be generally characterized by slower moving, warmer waters with the capacity for larger and deeper pools. The clarity level of larger rivers tends to be naturally lower than faster moving smaller streams but sedimentation load is also greatly affected by human activities. Shoreline habitats occur as linear strips along lakes, ponds, rivers, and streams. Most of these communities are sparsely vegetated because of the absence of well-developed soils.

Lakes and rivers are not only desirable as suitable habitat to birds; they are also the most sought after areas for human recreation, fishing and development. Lakeshore development, as well as chemical, nutrient, and sediment runoff from roads, parking lots, and roofs have played a part in degrading open water habitat within the metro area. Since European settlement hundreds of thousands of acres of Minnesota's shallow lakes have been ditched and drained. In addition, many of our lakes and rivers throughout the metro area have been impacted by aquatic invasive species including curly-leafed pondweek, Eurasian watermilfoil, and more recently, zebra mussels.

Birds that thrive in open water habitats

Thirty-four species nest in these habitat types in the metro area, including 11 species of conservation concern: Trumpeter Swan, Wood Duck, Mallard, Blue-winged Teal, Redhead, Pied-billed Grebe, Black-crowned Night Heron, Spotted Sandpiper, Belted Kingfisher, Purple Martin, and Northern Rough-winged Swallow. Open water and the associated shoreline habitat is also critical to the many migrants that utilize the Mississippi River flyway in spring and fall.

Target Species

The ***Black-crowned Night Heron***[xxiv] is often used as an indicator of environmental quality, mainly because it is a widly distributed colonial nesting waterbird that is susceptible to contaminants. A fish eating bird, it shows a broad range of flexibility in selection of nesting and foraging habitats, is somewhat tolerant of degraded habitats, and has the ability to habituate to moderate amounts of disturbance, which makes it a very suitable target species for conservation in an urban environment. Conservation efforts that benefit the Black-crowned Night Heron include restoring degraded wetlands, creating 100 meter buffers around established nest colonies, using integrated pest management to reduce overall pesticide loads,

and ensuring agricultural and industrial run-off are not impacting water quality and flooding low-lying nests at a critical stage during the nesting period. Black-crowned Night Herons, as well as other colonial nesting waterbirds, may also be impacted by climate change. Changes in temperature and precipitation may result in less suitable wintering and breeding habitat.

Spotted Sandpipers[xxv] are an ideal target species for the open water habitat type because their breeding behavior emphasizes the use of shoreline and island habitats occurring in an open water system. Spotted Sandpipers typically nest in semi-open areas within approximately 100 meters of the water's edge. Their nests are ground scrapes, typically created at the base of vegetation, which provides cover from predators as well as shade. Loss of shoreline habitat due to development poses the greatest threat to this fairly common and widespread shorebird.

Belted Kingfishers[xxvi]favor areas with overhanging vegetation along streams, rivers, ponds and lakes. The most important habitat requirements for Belted Kingfishers appear to be open water supporting a variety of food resources such as fish and aquatic insects, as well as steeply sloped bank exposures for digging nest burrows. Water quality, cover and the availability of suitable nesting habitat are essential for breeding Belted Kingfishers. Allowing for some forms of natural, steep bank erosion, where safety and water clarity issues are adequately addressed, will provide suitable nesting habitat for kingfishers and allow them to continue to thrive in the metro area.

Conservation Actions – Open Water/ Lakes/ Rivers

- Establish environmentally-based shoreline setback regulations for commercial and residential properties built in close proximity to waterways.
- Apply seasonal water level management regimes to controlled impoundments.
- Employ erosion prevention practices in areas susceptible to high water run-off by planting native emergent vegetation, specifically around storm water runoff impoundments.
- Allow for some levels of natural stream bank erosion to take place to provide nesting habitat for belted kingfishers and bank swallows.
- Work with regulators and the fishing industry to reduce the use and availability of lead jigs and lead sinkers.
- Conduct habitat restoration of existing wetlands through invasive species removal/ control and native plantings.
- Continue monitoring of Ospreys, Common Loons and Bald Eagles for contaminants that persist in the environment.

Throughout Metro: Artificial Nest Structures

The following section details a small number of birds are increasingly dependent on humans for survival and have adapted to the human-built nesting structures. Although a few of these species have been highlighted as target species in relation to specific habitat types such as the Purple Martin and Wood Duck, this is a distinct section describing the variety of species that can benefit from the use and proper management of artificial nest structures. There is great potential for citizens to work with community or conservation organizations to enhance the urban habitat for these species.

Birds that respond well to artificial nest structures

Many birds appear to benefit from the proper placement, maintenance and use of artificial nest structures where natural nest sites may be limited, including; the Common Nighthawk, Wood Ducks, Purple Martins, House Wrens, Screech Owls, American Kestrels, Osprey, Peregrine Falcons, Chimney Swifts and many cavity nesting songbirds, the most famous of which is the Eastern Bluebird.

Target species

Chimney Swift populations have declined by an average of 1.5% per year from 1966 – 2009, with an overall decline in Minnesota of 48%[xxvii]. The Chimney Swift is a small, agile, fast-flying bird that is readily identified by its characteristic "flying cigar" profile. It breeds across much of eastern North America, historically nesting and roosting in hollow trees. Over time this species readily adapted to the insides of masonry chimneys. Since swifts have come to rely on the insides of chimneys, creating artificial chimneys and towers will help to conserve this species.

American Kestrels have experienced a steady decline of 2.1% per year in Minnesota, for a decline of 59% over the past 43 years[xxviii]. Some explanations for the decline are loss of its prey base through increased pesticide use and loss of nesting cavities to so-called "clean" farming practices, which remove hedgerows, trees, and brush. An additional threat is exposure to pesticides and other pollutants, which can reduce clutch sizes and hatching success. Kestrels have shown that they readily adapt to nest boxes. Audubon Minnesota is participating in a partnership with the Peregrine Fund and others to develop a statewide kestrel nest box program.

The reintroduction of ***Peregrine Falcons*** is a great success story. Although peregrines continue to nest in traditional habitats such as cliffs along rivers, they have proven themselves as habitat generalists and have readily adapted to utilizing human built structures such as smokestacks, bridges and buildings. The population decline of Peregrine Falcons was due primarily to exposure to environmental toxins (DDT), although they had historically suffered from persecution, and to some degree egg collection. Increased regulations, from the Migratory Bird Treaty Act, and the banning of DDT in the United States, have cleared the way for peregrines to come back. Within the Twin Cites metro area in 2011, there were 12 active nests on buildings, bridges or smokestacks. Continued management and support of urban peregrines has played a critical role in re-establishing the population throughout the Midwest.

Ospreys are associated with open water because they feed on fish, although they may nest in deciduous or floodplain forests. Ospreys are fairly tolerant of human activity and have rebounded significantly in the metro area after being reintroduced in a cooperative effort by Three Rivers Park District and the Raptor Center at the University of Minnesota that began in 1984. Existing threats to Ospreys include: electrocution, as they will build their nests on power structures; decreased water quality directly affecting the availability of fish; and exposure to contaminants such as mercury. Management applications that benefit Ospreys include providing nesting platforms in suitable habitats away from utility structures and working to enhance overall water quality through best management practices to prevent erosion and run off. Another strategy for clean water is to establish environmentally based shoreline setback regulations for commercial and residential properties built in close proximity to waterways. Continued monitoring of the Osprey population is also essential as the effects of new pesticides and chemical toxins are largely unknown.

Conservation Actions- Artificial Nest Structures

- Retain snags and natural nest cavity sites
- Enhance nesting habitat by providing nest boxes and platforms
- Utilize nest structures in public spaces and integrate education with the nest box program.
- Emphasize the value of maintaining and monitoring nest boxes.

Reduce Habitat Threats to Birds

This section outlines the current habitat related threats to birds, such as habitat loss and fragmentation and invasive species. Each threat is called a **conservation concern** and is preceded by the goals pertaining to that specific issue. A general description of the problem, suggested conservation strategies, and specific conservation actions follow.

Habitat Threats: Loss, Degradation and Fragmentation

Goals:

- Prioritize the protection of existing areas of open space and quality habitat
- Focus on connecting existing areas of open space and quality habitat
- Encourage restoration efforts in priority habitats, specifically, grasslands/prairie, oak savanna, wetlands and floodplain forests, and deciduous upland forests
- Enhance cost effectiveness through collaborative conservation efforts among partner organizations and agencies

Conservation Concern: Loss, degradation and fragmentation of habitat is the leading cause of declining bird populations.

Conservation Strategy: Significant parcels of quality bird habitat remain throughout the metro area. In order to ensure that the metro area is an increasingly effective sanctuary for resident and migratory birds, resources need to be directed toward protecting existing parcels of quality habitat while enhancing areas of degraded habitat, and creating habitat corridors to improve connectivity of isolated areas. The extent and approach to land restoration will differ considerably between highly developed and outer regions and should be considered on a case by case basis.

Land Acquisition and Conservation Easements

Because of high land values and the small patch sizes of real estate in the metro area, it is important that land acquisition and conservation easements are strategic to protect the highest quality existing areas of open space and habitat. Opportunities for the outright purchase of significant parcels of land are limited and unlikely to be a significant factor in bird conservation in the metro area. Conservation easements, however, are a tool that may have significant impact in protecting habitat. Conservation easements are voluntary, legally binding agreements that limit certain types of land uses or prevent development from taking place on a piece of property, while protecting the property's ecological or open-space values[xxix]. Conservations easements are a way for a landowner to maintain private land ownership and receive support for providing an ecological public benefit.

Current Land Protection Programs

Conservation easements are established at multiple scales and through many different agencies and organizations. In the metro area, Ramsey and Hennepin Counties had land protection programs in the 1970's and lead to what is now their established county parks and open space areas. Currently, Dakota and Washington counties have established land programs for habitat protection. Dakota County has an

agricultural preservation focus and specializes in two types of easements: agricultural and natural area. Both require a Stewardship or Natural Resource Plan. These plans, which describe activities, responsibilities and costs, are jointly developed between the participating land owner and the county.

The Minnesota Land Trust is also working in the metro area, helping developers and communities to successfully combine development with the protection of natural areas[xxx]. Their focus is on working with landowners, communities and conservation partners to preserve land and water resources as well as to educate and advocate for the preservation of unique environmental systems. The Metro Greenways Program[xxxi] has likewise been committed to the establishment of a regional network of natural areas and open spaces interconnected by green corridors in the metro area. It has been a collaborative effort including many partners working together to assist in restoring habitat on prioritized public and private lands, in part by using conservation easements with willing and interested land owners.

Metro Greenways, which ended in the summer of 2012, created several useful tools aimed at directing conservation activities within the metro area, including maps of desirable Metro Conservation Corridors[xxxii] (2005) and Regionally Significant Ecological Areas[xxxiii] (2005). The latter map is based on Landsat data as and used various habitat modeling applications, including songbirds and their breeding habitat, as a significance indicator.

In an effort to develop bird habitat conservation strategies, Audubon Minnesota created a map layering the Metro Greenways areas of highest ecological significance with designated Important Bird Areas (Figure3-1). This helps provide guidance on ideal areas for conservation practitioners to focus their concerted and collaborative efforts.

Future Direction

Better coordination among the many agencies and organizations that work toward land protection is needed if quality wildlife habitat is to remain in the metro area. This includes organizations that have natural resource protection as a major goal, but should also include other potential partners. A tangible example of this would be working with the Dakota County Farmland and Natural Area Protection Program, which focuses on farmland preservation. By incorporating Best Management Practices for birds that are compatible with the working lands focus into the required plans developed by these easement programs, environmental protection efforts would be enhanced and strengthened beyond the original intent of farmland protection.

The absence of Metro Greenways has left a general void in the overall organization of partnerships and direction of land protection and restoration efforts. A replacement strategy needs to be found and high priority needs to be placed on maintaining the existing tools developed by Metro Greenways through updating land cover data on a regular basis. Similarly, the overall organization of partnerships provided by Metro Greenways cannot be left to chance.

Conservation Actions for Addressing Habitat in the Metro Area

- Establish a metro area working group and decide how to facilitate and coordinate the implementation of the Guide to Urban Bird Conservation
- All land being considered for acquisition or easement should have a prescribed management plan outlining the activities, responsibilities and costs
- Support the continued success of existing programs by building on what has already been done, forging new partnerships and creating tangible goals for the future
- Maintain and update the tools created by Metro Greenways (i.e. update land coverage information)
- Develop an overall support network including agencies, NGOs and landowners, for continued collaborative partnerships
- Develop and promote Best Management Practices for birds that can be incorporated into existing programs, such as the Dakota County Farmland and Natural Area Protection Program

Habitat Threats: Invasive Plant Species

Goals:

- Manage invasive plant species where appropriate and cost-effective
- Encourage use of native plants in landscaping

Conservation Concern: Invasive species are non-local plants, insects and animals that are introduced into a native ecosystem and cause harm to the economy, environment or human health. In contrast, native plant species occur naturally in a particular region, state, ecosystem, and habitat without direct or indirect human actions[xxxiv]. Native plants provide important services to the ecosystems in which they are found such as erosion protection, drought tolerance, and seasonal adaptability. Native plants are adapted to local conditions and generally require less maintenance and fewer resources, such as water and fertilizers, than non-natives. In addition, native plants increase the availability of insects to songbirds.

Controlling invasive species is an important component of maintaining the ecological integrity of natural areas and is very often a restoration priority for land managers and conservationists. However, invasive species control is labor and resource intensive and requires long term effort. In some cases, invasive species control is just one component of overall habitat management and secondary to ensuring habitat functionality. An area that is both free of invasive species and lacking in structure, such as an herbaceous or shrub layer, may not provide suitable avian habitat. Addressing invasive species needs to be done in a focused way and is generally more successful in smaller, more manageable, areas where volunteers can help manage and monitor these species.

Conservation Strategy: The best methods for controlling invasive plant species is to: 1) avoid planting invasive species, 2) remove the invasive species by implementing an Integrated Pest Management Plan (see contaminant hazards); 3) replace the invasive species with native plants suitable for the area; and 4) maintain the area by weeding reoccurring invasive plants and watering and feeding the restored native plantings. This sounds easy, but the labor involved is intense and native plants usually require a lot of initial maintenance to become established. Invasive species control cannot be short-sighted and it helps to have a long-term management plan in place. In the long run, control efforts, followed by successful restoration, results in a healthier ecosystem and increased suitable habitat. Invasive species control is a prominent aspect of many habitat restoration plans on federal, state and local scales, but an important and often neglected factor in the spread of invasive species is the local landowner. Invasive species outreach and education (see Education) is a fundamental factor in successful prevention.

Government agencies increase their invasive species control efforts by engaging communities and private landowners with extension programs focused on avoiding the spread of invasive species, removal techniques, and suitable native replacements for specific environments. A variety of organizations and cities, such as Audubon and the City of Minnetonka, offer evening lectures for residents about buckthorn and garlic mustard to help people manage their own yards, native trees at

reduced prices, and a network of volunteers who help city employees and contractors do restoration work.

An equally important strategy in invasive species control is working with the horticultural industry. Effective approaches to working with local nurseries and big garden centers include encouraging them to promote native landscaping, to include invasive species education as part of their sales practices, and to provide a broad offering of native species. In general, garden nurseries are a great way to engage people, build partnerships and promote sustainable practices that benefit not only the individuals' back yard but also the broader community around them.

Conservation Actions for Invasive Species

- Early Detection of new invasive species
- Prevent invasive species from entering into a new area and becoming established
- Avoid planting known invasive species
- Remove invasive species by implementing an integrated pest management plan that utilizes prescribed burns, manual weeding, and targeted pesticide applications only when necessary
- Replace invasive species with native plants suitable to the area
- Maintain the site by keeping invasive species to a minimum and supporting the growth of native species
- Engage communities and private land owners (education and outreach)
- Work with the horticultural industry to reduce the availability of invasive species, educate gardeners and landowners about the detrimental effects of invasive species and promote native landscaping
- Recommend that municipalities use only native trees, shrubs and herbaceous plants in parks and other public landscaping
- Promote the creation of wild areas within parks- plant prairie demonstration gardens

Habitat Improvement Actions for Citizens, Landowners and Community Members

Having discussed two priority habitat threats within the urban environment, loss/ fragmentation due to development and degradation due to invasive species, this section focuses on what concerned citizens, landowners and community members can do for bird conservation within the metro area.

Goals:

- Transform urban spaces into bird habitats
- Enhance nesting habitat
- Transform small spaces into bird-friendly havens.
- Incorporate bird conservation into agricultural practices

Conservation Strategy: Because of the unique pressures facing birds, and their habitats, in urban areas it is appropriate to utilize strategies that might not be feasible in larger, less-impacted landscapes. Working with volunteers and private landowners can go a long way towards accomplishing bird habitat conservation in the urban area. Incorporating native plants into home and corporate landscaping, providing bird feeders, nest boxes and platforms, and retaining naturally occurring elements such as multi-story canopy cover and standing dead trees, are all fairly easy and compatible ways to improve avian habitats on public and private lands in an urban landscape. Here are some bird specific habitat enhancement strategies for nesting habitat and transforming small spaces into bird-friendly havens[xxxv].

Snag Retention

Standing dead trees are important for birds in both natural and landscaped settings. Significant emphasis should be placed on allowing for or retaining naturally occurring snags as an important habitat component within the environment. Snags provide nesting habitat for primary cavity nesters, such as woodpeckers, which in turn provide nesting and shelter habitats for secondary cavity nesters, such as bluebirds, wood ducks and owls. Safety considerations and invasive species management, such as controlling the emerald ash borer, need to be taken into account, but under the right conditions, snag retention is an easy way to promote habitat use by cavity nesters.

Nest Boxes and Structures[xxxvi]

Where snag retention is not feasible, nest boxes can help cavity nesters and nest structures can help other species. From a habitat standpoint, nest boxes- for American Kestrels, Eastern Bluebirds, Wood Ducks and Purple Martins, and nesting structures— such as Osprey poles and Chimney Swift towers — help compensate for the lack of natural nest sites and are vital to maintaining certain bird populations in the metro area. In addition, nest boxes provide outstanding educational opportunities when erected and/or maintained by schools, businesses, scout troops and other groups, or when they are placed in a conspicuous but safe setting.

Most nest boxes require regular maintenance so they are not invaded by exotic nuisance species such as European starlings and house sparrows. Given the need for maintenance, it is often better to manage land for natural cavities or place nest structures where they are easy to maintain, such as golf courses that have maintenance staff.

The chimney swift and the purple martin are two aerial insectivores that have experienced consistent population declines in Minnesota throughout the past forty years[xxxvii]. Building and maintaining nest structures for these species is a great way to increase their populations. Peregrine falcons, and possibly common nighthawks, benefit from gravel filled trays placed on building ledges, rooftops and tower structures, where they can lay their eggs without having them roll away. Most bird species that have benefitted from the placement of nest boxes and artificial nest structures have all been generally tolerant of human activity.

Structures can also be built for a number of species that breed in or close to lakes, rivers, marshes, ponds and adjacent upland habitats including: wood duck, mallard, hooded merganser, common loon, great blue heron, osprey, black tern, Forster's tern and cliff swallow. The black tern is a species that would benefit greatly from the proper placement and maintenance of adequately sized nest platforms in shallow wetlands and marshes.

Transforming Backyards

As wild land and open space are lost to development, birds and other wildlife are increasingly looking to yards and gardens for food and shelter. Homeowners can respond by creating mini - backyard refuges that help to both sustain and shelter songbirds. Homeowners should take an inventory of their backyard to see what elements already exist, then become familiar with the birds in their area and what habitats they prefer. All wildlife need space, food, shelter, and water. Native plants can provide the first three elements and a water source can be easily added by something as simple as shallow dishes, a bird bath or small pond. Enhancing a neighborhood of backyards can act as a collective effort and provide important links creating larger habitat corridors. The National Wildlife Federation has a well established Garden for Wildlife program that includes tips on making wildlife habitat at home.

Links to resources:
Audubon at Home- http://mn.audubon.org/audubon-home-2
National Wildlife Federation- Backyard Wildlife Habitat Programs -
http://www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife.aspx
Plant Conservation Initiative - http://www.nps.gov/plants/intro.htm
United States Forest Service Urban and Community Forestry - http://www.fs.fed.us/ucf/

Roadsides for Wildlife[xxxviii]

The MN DNR has a "Roadsides for Wildlife" program that encourages the use of existing, although small, grassland ditches along the sides of roads for ground nesting bird habitat. The program has three main objectives: 1) reducing disturbance such as mowing and spraying, until after the bird breeding season (August 1st); 2) incorporating native prairie species in roadside plantings; and 3) educating the public on

the advantage of having an undisturbed and diverse roadside environment. Safety considerations and invasive species control efforts would also need to be addressed in implementing a roadside management program based on reduced mowing and clearing. A program like this would be best employed in areas outside of the urban core.

Links to Resources:
MN DNR Roadsides for wildlife http://www.dnr.state.mn.us/roadsidesforwildlife/index.html

Corporate Campuses – Corporate Environmental Stewards

Sixteen of the Fortune 500 U.S. corporations are headquartered in the Twin Cities and they, along with other businesses, often own and maintain tracts of land that can be managed as habitat for birds and other wildlife. The Wildlife Habitat Council keeps a registry of corporate wildlife projects nationwide and is a good source of information. Some corporate sites in the metro area that actively manage wildlife include 3M, Flint Hills Resources, Aveda and Thomson Reuters.

The Eagan campus of Thomson Reuters formed a partnership with Audubon to restore native grasslands on their 292 acre corporate campus in Eagan. The project began in September 2009 and the restoration was implemented by conducting two separate plantings — one for grasses and one for wildflowers. The overall cost for the restoration was approximately $10,000, much of which will be offset from reduced maintenance and watering. The project also included dozens of bluebird houses, chimneys swift towers and wood duck houses.

Golf Courses[xxxix]

Audubon International (not affiliated with the National Audubon Society) has developed a Cooperative Sanctuary Program for golf courses outlining ways in which they can be more environmentally sustainable. The Cooperative Sanctuary Program offers guidance for golf courses interested in developing habitat conservation programs for their grounds and provides support for implementing such plans. In the Twin Cities this program is currently being coordinated by the Wood Lake Nature Center. To date there have been 25 Minnesota golf courses certified by the program, including at least 9 within the metro area.

To participate in the Cooperative Sanctuary Program, golf courses need to develop a resource management plan which includes a qualifying project. The project can be in any number of categories, from water clarity and conservation to providing wildlife habitat. For continued participation, enrolled golf courses must recertify their grounds every other year and the recertification process requires a new qualifying project. This structure allows for flexibility and offers conservation support and incentives to the golf course rather than setting strict standards that may not be initially achievable for some courses who seek certification. The Cooperative Sanctuary Program also applies to business campuses.

Links to resources:
Wildlife Habitat Council - http://www.wildlifehc.org/

Audubon International Cooperative Sanctuary Program for Golf Courses - http://www.audubonintemational.org/ge.html

Schoolyard Habitat

There are many environmentally-themed schools throughout the Twin Cities; some are charter schools with an environmental emphasis and others are schools in close proximity to open spaces ideal for outdoor classroom settings. Even athletic fields can serve as a great place for habitat enhancement on school grounds. Many of these schools have partnerships with Park Boards, or Audubon (chimney swift towers), and work in collaboration with the Minnesota Conservation Corps. Involving schools, students and teachers in creating habitat includes developing an environmental curriculum that has elements of math, science, reading, and writing all focused around a central environmental activity.

Links to resources:
Audubon Center of the North Woods - http://audubon-center.org/schools.htm.
National Wildlife Federation- Schoolyard Habitat Program – http://www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife.aspx
USFWS Schoolyard Habitats Program - http://www.fws.gov/cno/conservation/schoolyard.cfm
University of MN - Schoolyard Ecology Explorations - http://www.monarchlab.org/see/

Agriculture

There are a variety of resources available for farmers to incorporate bird friendly practices into their agricultural practices: The Natural Resource Conservation Service(NRCS); The US Department of Agriculture- Farm Bill, Conservation Reserve Program, Conservation Reserve Enhancement Program; the MN DNR Working Lands Initiative, The Nature Conservancy (TNC), , Dakota County Farmland and Natural Area Protection Program, and many others.

Actions to incorporate bird conservation into agricultural practices include:

- Plant alternative crops, such a winter wheat, that don't require harvesting or cutting during grassland bird nesting season
- Leave a fallow field in the crop rotation or plant native prairie strips within an agricultural field
- Plant a fallow field with native prairie
- prevent woody vegetation from becoming established in open grassland areas through prescribed burns, grazing or cutting.
- Create shelterbelts and field edge buffers
- Use no-till or low-till cultivation
- Apply integrated pest management to reduce pesticide use

Links to resources:
Natural Resource Conservation Service
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/farmranch

United Sates Department of Agriculture
http://www.fsa.usda.gov/FSA/fbapp?area=home&subject=landing&topic=landing
Minnesota Department of Natural Resources
http://www.dnr.state.mn.us/workinglands/index.html
The Nature Conservancy
http://www.nature.org/aboutus/privatelandsconservation/conservationeasements/index.htm
Dakota County Farmland and Natural Area Program.
http://www.co.dakota.mn.us/CountyGovernment/Projects/FarmlandNaturalArea/default.htm

Conservation Actions for Habitat Enhancement

- Enhance nesting habitat by providing nest boxes, retaining snags, utilizing nest structures in public spaces and integrate education with these actions.
- Emphasize the value of maintaining and monitoring these nest boxes to ensure they are being used by the desired species and not over run by aggressive non-native species.
- Transform small spaces into bird-friendly havens. Utilize native landscaping and avoid disturbance (mowing and spraying) during nesting season.
- Incorporate bird conservation into agricultural practices
- Provide educational materials to municipalities and individual homeowners to help guide creation of quality habitats on private property
- Encourage creation of contiguous backyard habitats, leading to the assemblage of habitat corridor

Reduce Hazards to Birds

Urban environments pose a number of anthropogenic threats to both resident and migrating birds. These hazards—including building and window strikes, free-roaming cats, communication towers, vehicle collisions, power lines, and exposure to pesticides and other chemicals—account for millions of fatalities each year. Addressing these issues is an important component of urban bird conservation. Each hazard is called a conservation concern and is preceded by the goals pertaining to that specific issue. A general description of the problem, suggested conservation strategies, and specific conservation actions follow.

Bird-building Collisions

Goals:

- Reduce bird strikes to buildings in metro area
- Enroll ~20 more businesses into the Lights Out program by 2015

Conservation Concern: Bird collisions with buildings are estimated to kill millions of birds each year in the U.S. alone. The problem is most pronounced during spring and fall migration, accounting for the death of up to 5% of the fall bird population[xl]. Audubon volunteers started monitoring window collision fatalities in the Twin Cities in 2007. Since then they have collected over 1,500 specimens of at least 110 species[xli]; the ten most common among them are: White-throated Sparrow, Nashville Warbler, Ovenbird, Tennessee Warbler, Dark-eyed Junco, Common Yellowthroat, Black-capped Chickadee, Brown Creeper, Yellow-bellied Sapsucker, and Ruby-throated Hummingbird.

After studying the issue, ornithologists have concluded that birds do not perceive glass as a barrier the way people do - birds are not able to distinguish reflections from actual trees, plants and sky. Consequently, the presence of nearby trees and ornamental plantings at some buildings actually increases the frequency of window strikes[xlii]. New “green” or sustainable architectural trends that encourage the use of both native landscaping and vast expanses of glass to increase natural light, ironically, exacerbate the threat of window strikes by attracting birds to the glass.

Despite the severity of risk posed by building strikes, the problem remains inconspicuous, with the actual discovery of dead birds being relatively less common than the strikes themselves because maintenance crews and predators, including cats, dogs, and raccoons, quickly remove dead or injured birds. Monitoring in many cities, including Minneapolis, Saint Paul and Rochester, is helping to document the species and relative numbers of birds most affected by collisions.

Lighting Hazards

One factor in building strikes is urban lighting. Architectural lighting on tall skyscrapers and buildings of any size can confuse night-migrating birds as they try to navigate through urban areas. This problem dramatically increases during periods of bad weather including fog, low clouds, or rain that cause birds to fly lower where they encounter the skyglow from night lighting. Once in the urban area, birds either

hit buildings outright or end up at ground level where they encounter windows, cars, people and myriad other difficulties.

Conservation Strategy: Led by Audubon Minnesota, a number of organizations in the metro area are collaborating to address and better understand the problem of bird-building collisions, making the Twin Cities a leading player in this important problem.

Monitoring Avian Mortality

Project BirdSafe[xliii] is a joint effort to reduce the number of birds killed or injured when they collide with structures such as buildings. Since 2007 volunteers have walked prescribed routes in downtown Minneapolis, Saint Paul and Rochester during the spring and fall migrations to gather data on the species and relative numbers of birds that are affected by collisions (Figure 4-1). Volunteers walk in the early morning to collect casualties before scavengers and clean-up crews clear them away. The volunteers release live birds outside the city and take any injured birds to the Wildlife Rehabilitation Center. Dead birds are taken to the University of Minnesota's Bell Museum. All birds are documented as to where and when they were found. These critical data highlight the fact that not all buildings pose an equal threat to birds and are being used to discern what factors about a building create the most risk.

Bird-Safe Building Design

Audubon Minnesota published Bird-Safe Building Guidelines in 2010 to address the problem of bird-window collisions at the design level[xliv]. The book is an important first step in promoting the understanding and adoption of bird-safe strategies for new and existing buildings in Minnesota, offering best practices for the design and retrofitting of all structures—from landscaping to lighting to glass choices—to reduce impact on birds.

Work with architects is ongoing and collaborative. Architects and designers who understand the building characteristics that lead to collisions can design features that serve to help birds avoid glass. There are many ways buildings can be modified to incorporate bird safety using existing technology. Window films, translucent glass, fritted (patterned) glass, and other high and low-tech products can be planned into projects in a concerted attempt to help birds. New products and innovative uses of existing products are more available as architects and designers request them.

The Minneapolis Public Library was actually designed with birds in mind, among other things. Patterns on the windows help reduce heat gain and energy use while helping birds see the glass. Trees planted close to the building help prevent birds from seeing the tree's reflections and, if they do fly towards the building, they can't gain enough speed to experience a fatal impact.

Lights Out

Audubon Minnesota' Project BirdSafe also encompasses a *Lights Out*[xlv] program. Initiated in the spring of 2007, this program encourages building owners and managers to reduce lighting during spring and fall migration in an effort to reduce building strikes. Nearly 60 tall buildings in the metropolitan area

participate, including iconic structures such as Wells Fargo and the IDS Center. Hundreds more state-owned and operated buildings also follow Lights Out lighting parameters during migration.

Conservation Actions: Building Collisions and Lighting Hazards

- Monitor avian mortality and continue to collect structure related data to better guide the response to the problem
- Work with architects and allied businesses to develop new and innovative bird friendly building products and designs
  - Present Bird Safe information at professional architect conferences
  - Add Bird Safe building guidelines into green building certification programs
- Raise residential building awareness: how the home is built, where it is located, and habitat restoration efforts at home to reduce strike risks
- Lights Out: Work with Building Owners and Managers Association(BOMA) and individual building owners to raise awareness about Lights Out and enroll new participants into the program.

Aircraft Strike Hazards

Goal:

- Reduce avian interactions with aircraft

Conservation Concern: Airports and bird habitat often occur in proximity of one another by design; airports require a certain amount of open space surrounding their property and typically that open space is dominated by grasslands and wetlands - ideal bird habitat. Nationwide, according to the Federal Aviation Administration, 7,439 bird strikes to civil aircraft were reported in 2007, with 122 of those in Minnesota[xlvi]. While they are relatively rare events, and they don't pose a significant threat to bird populations, aviation bird strikes are a hazard to humans. The economic impacts are also great, with millions of dollars being spent each year to repair aircraft involved in bird strike interactions.

The Minneapolis-Saint Paul International Airport (MSP) is located near the Minnesota Valley National Wildlife Refuge. This is an ideal layout on the ground with ample space available for both wildlife and the airport. Once airborne, however, the uncertainties of bird movement and the limited agility of aircraft during takeoff and landing necessitate continuous management and monitoring regarding avian/ aircraft interactions.

Conservation Strategy: Avian management at airports can be categorized as nuisance wildlife control. The MSP airport, with the assistance of the United States Agricultural Department – Animal and Plant Health Inspection Services – Wildlife Services, uses noise-making propane cannons and the strategic placement of animated "scare crows", such as a mounted coyote or fox that moves in the wind, to deter birds from using their runways. These techniques are high maintenance, ongoing activities that have become a regular part of airport grounds management. Habitat management strategies like avoiding the use of desirable forage grasses for geese, such as Kentucky bluegrass, are a long term strategy that reduces the likelihood of having flocks utilize the airport. Some species, such as Bald Eagles, are captured and relocated with the assistance of the US Department of Agriculture Wildlife Services Program. As a last resort, and in emergency situations, the U.S. Fish and Wildlife Service can issue depredation permits that allow airport authorities to do limited lethal control of birds to alleviate the likelihood of aircraft strikes.

Conservation Actions to Reduce Bird- Aircraft Strike Hazards

- Utilize noisemakers and scare crow tactics to deter birds from using runways
- Avoid planting desirable forage such as Kentucky bluegrass on or near the tarmac
- Work with natural resource agencies to create suitable habitat away from the airport fly-zone to serve as both mitigation and lure habitat
- USFWS can issue depredation permits allowing limited lethal take of nuisance birds if non-lethal options have not alleviated aircraft strike threats
- Airport expansions are required to do an environmental impact assessment in which they need to consider their impacts on existing bird habitat.

Utility Structures and Communications Tower Hazards

Goal:

- Reduce avian electrocutions and line strikes
- Keep up to date on the development of new utility infrastructure, such as wind power, and its affects to birds.

Conservation Concern: Utility poles can benefit raptors and other birds by providing perching or nesting structures where few natural sites exist. However, utility structures can also pose a threat through electrocutions and collisions. It is estimated that collisions with power transmission and distribution lines may kill anywhere from 100,000 to 175 million birds annually; electrocutions account for an additional 10,000 to 100,000 more bird deaths per year. These estimates are broad, reflecting the fact that utilities are poorly monitored for both strikes and electrocutions[xlvii].

Birds are electrocuted by power lines because of two interactive factors: 1) environmental factors such as topography, vegetation, available prey, and other behavioral or biological factors influence avian use of power poles, and 2) inadequate separation between energized conductors or energized conductors and grounded hardware can provide two points of contact where birds can complete the electrical circuit simply by spreading their wings. Utility line collisions and electrocutions are not specific to the metro area, yet they are elevated to a higher level of concern due to the sheer density of power structures throughout the area.

Bird strikes into power lines are another issue that goes relatively undocumented as they rarely cause power failures. Likewise, the recovery of such casualties is difficult because they often land in water after hitting an over-water line, or the dead bird is located far away from the place where the strike initially occurred as they were in motion when they hit the line. Occasionally a bird will get tangled a line and a response will be warranted by the power company.

Conservation Strategy: In August 2003 Excel Energy and the USFWS developed a Memorandum of Understanding outlining the development of a voluntary Avian Protection Plan for Minnesota. National Avian Protection Plan guidelines and standards[xlviii] have been developed by the Avian Power Line Interaction Committee (APLIC)[xlix] in conjunction with the USFWS and are intended to serve as a tool box for utility companies to select from and tailor components specific to their needs. Included in these standards are retrofitting guidelines to fix problem structures as well as bird friendly design specifications for new structures. The implementation of an Avian Protection Plan involves providing utility company employees with training in the latest design technology, routine monitoring and maintenance, and a detailed reporting protocol to the USFWS. Community members can also play an important role by reporting avian mortalities they suspect are related to electrocution or a utility structure collision to the utility company as well as the USFWS.

Line strikes can be prevented by placing flight diverters on the overhead lines in areas of high mortality, such as “FireFly” or “BirdMark” which are both reflective, swivel, flashers that can be installed directly onto the wire. Another commonly used tactic is to mark the wires by wrapping them with white spiraled

wires- “pig tails” to increase line detection. A third alternative that should be considered for new utility lines is placing the line underground. Though expensive, in areas of critical habitat, underground wires may be the best option.

Although Avian Protection Plans are voluntary, they also act as the primary means for utility companies to meet regulatory requirements of the Migratory Bird Treaty Act, The Bald and Golden Eagle Protection Act and the Endangered Species Act. Beyond the regulatory requirements, Avian Protection Plans also play a major role in improving utility services and protecting human health and safety.

Alternate Energy Resources

The large scale development of wind energy plants may not directly impact the metro area due to land and space constraints. However, more and more of the metro areas energy may be derived from wind in the near future. Ensuring wind power facilities are properly planned, sited and operated to minimize negative impacts to birds and other wildlife is an important part of addressing energy resources and transmission.

Conservation Actions: Electrical Utility Infrastructure Strikes

- Utilize the APLIC guidelines for utility pole retrofitting specifications
- Encourage utility companies to finalize and implement an Avian Protection Plan
- Retrofit problem areas with new structural standards and wiring configurations to eliminate electrocutions
- Report avian mortalities to the USFWS
- Mark overhead wires in areas of high bird traffic
- Bury lines in areas of critical habitat where sensitive species are impacted by overhead line collisions
- Design, site, and operate wind turbines in ways that lessen their potential impact on birds

Unrestrained Feral and Domestic Cats

Goal:

- Increase communication, education and outreach with cat owners and cat advocates.

Conservation Concern: Following habitat loss and strike hazards, unrestrained cats—including stray, feral, free roaming domestic and outdoor—are the biggest source of human caused mortality for birds and other small wildlife. Cats are recognized by the International Union for the Conservation of Nature as one of the worst invasive species, with documented impacts on 254 threatened, near threatened and extinct bird species worldwide. Estimates vary on how many birds are killed annually, with fatalities based primarily on cat prey returns by owners. Species most vulnerable to cat predation include: ground-nesting birds, tree nesting species during the fledging period, and birds en-route during migration when they are exhausted and unfamiliar with an area. The standard methods of declawing, placing a bell on a cat, or ensuring the cat is well fed do not deter predation.

Cat depredation on wild birds is a growing problem. Over the last 40 years, the number of pet cats in the United States has increased threefold to a current total of approximately 90 million. Approximately 65% of pet cats are allowed outdoors for at least part of the day, resulting in approximately 60 million outdoor cats. It is estimated that there are an equal number of feral cats, resulting in between 120 – 160 million free-roaming cats in the United States alone[l]. Cat populations are increasing while nearly one-third of the more than 800 species of birds in the U.S. are endangered, threatened, or in significant decline.

Conservation Strategy: Finding solutions to controlling unrestrained cats must involve dialogue among all stakeholders and especially effective communication with cat advocates. The Wildlife Society recently initiated efforts to develop a coalition of federal and state partners and non-governmental organizations to share information and develop a consensus position on feral-cat policy. This effort is a very important step toward combating the problem of cat predation.

Trap-Neuter-Release is an Unworkable Solution

Growing numbers of cities, towns, and animal shelters, including the Animal Control Center in District 7 of Saint Paul, are adopting trap-neuter-release (TNR) programs to manage overabundant populations of stray, feral, and abandoned cats. Cat advocacy groups present TNR as a humane solution, because cats receive food, water, and shelter. Because the cats are meant to be trapped, sterilized, vaccinated, and returned to the colony, proponents of TNR claim this approach will eventually reduce overall numbers; however, research shows otherwise. In order to stop population growth, between 70 and 80% of the cats in any given colony need to be neutered and the population needs to be closed. Unfortunately, TNR colonies often become dumping grounds for unwanted pets, and because it's impossible to sterilize and vaccinate all feral cats in an area, populations most often remain stable or increase over time.

Voluntary Incentives and Regulatory Requirements

Because cat depredation pressure on birds is not just a feral cat issue, programs like Cats Indoors[li] , developed by the American Bird Conservancy, can be an effective means of reducing the impact of

"owned" cats to wildlife. Likewise, ordinances that set cat containment restrictions, require up-to-date vaccinations, and establish responsible spaying and neutering guidance for domestic cats, have also been successfully developed and implemented[lii] . Advocating keeping cats indoors and investigating the practicality of creating a cat ordinance within the metro area would not only benefit birds, it would be good for the health and safety of cats as well.

Conservation Actions: Free Roaming and Feral Cats

- Municipal governments should not support or encourage or permit Trap, Neuter and Release programs
- Promote the American Bird Conservancy's Cats Indoors Program
- Promote pet ownership responsibility through work with the humane society and local and national pet stores
- Investigate the feasibility of cat ordinances at a local level

Contaminant Hazard: Pesticide Exposure

Goals:

- Reduce wildlife exposure to pesticides.
- Use less toxic yet equally effective alternatives to pesticides.

Conservation Concern: Throughout the United States, migratory birds are threatened directly by pesticides as a mortality factor or reproductive suppressor. Birds are also harmed indirectly when pesticides reduce insect populations. Birds are exposed through inhalation, absorption through the skin, or by eating treated seeds or berries, vegetation, pesticide granules, or poisoned insects. Poisoned birds often exhibit signs of nervous-system overload, including paralysis, excessive mucus secretion, diarrhea, and respiratory distress[liii]. Exposure to pesticides in the metro area can occur in a variety of habitats, ranging from people's back yards to golf courses, agricultural fields and local parks.

Conservation Strategy: In the past 50 years much has been done to reduce the amount of contaminants in the environment: regulatory requirements banning of agricultural pesticides such as DDT and other organophosphates, the recent popularity of organic farming, and the voluntary transition to low impact agricultural practices, yet they still pose a serious problem to wildlife.

The use of pesticides, at times necessary, should never replace good management practices. Integrated pest management[liv] (IPM), already employed by most wildlife areas, is an effective and environmentally sensitive approach to pest management that relies on a combination of pest control techniques. There are four basic steps to developing an IPM plan:

1. Set action thresholds- what is the allowable level of pests?
2. Monitor and identify pests- so that appropriate control decisions can be made.
3. Prevention- planting cover crops and conducting prescribed burns.
4. Control, using the most benign chemical or biological agents available.

After going through the first three phases of a well-developed IPM plan and concluding that it is necessary to apply pesticides, it is important to assess what pesticide to apply, when and where to apply it, and how useful the application will be in reducing impacts and saving money. The primary method of control should be the least toxic method available to reduce the impact to non-target species. Non-toxic control methods include manual weeding, trapping, mechanical removal, and bio-controls. When pesticides are needed, well timed, targeted applications should be employed. IPM planning can be done at all scales, from a large agricultural operation to backyard gardens, and effectively reduces the costs of pest control and the overall amount of toxins used in the environment.

Conservation Actions: Pesticides

- Develop an Integrated Pest Management Plan for areas requiring pesticide application
- Prevent the occurrence of weeds with the use of cover crops and prescribed burns
- Utilize non-toxic means of control when possible: weeding, tilling, burning, mowing and bio-control
- Time pesticide applications to target the pest species life cycle and favorable weather conditions

Contaminant Hazard: Lead Poisoning

Goals:

- Promote greater public awareness of the issue of lead in the environment.
- Prevent new sources of bird-accessible lead from being put into the environment.

Conservation Concern: Lead primarily affects the neurological system; typically impairing birds' ability to fly or walk, decreasing appetite and potentially affecting reproduction if the bird survives the initial lead exposure. The primary source of lead in the environment as it relates to birds (mostly upland game birds, waterfowl, waterbirds and raptors) is from the recreational use of lead in fishing sinkers, and jigs as well as lead shot and bullets used in hunting. High densities of lead shotgun pellets have been found within the fall zone of shooting ranges as well as in commonly used upland game bird and waterfowl hunting areas[lv]. Many upland game birds and waterbirds, such as Common Loons and Trumpeter Swans, ingest lead directly to be used as grit because they cannot discern a lead fragment from a small pebble. Similarly, raptors can ingest lead shot fragments while consuming gut piles or carrion.

Certain areas, such as National Parks, are now established as lead free zones and various regulations have been developed to restrict the recreational use of lead. Lead shot was banned for use in hunting waterfowl, nationwide, since 1991, yet led shot still persists in the environment. Likewise, fish and wildlife managers continue to work with the hunting and fishing industry to create affordable alternatives to lead. Though there has been progress made in the recent past to deal with the source of lead, much work remains to be done about the existing stores of spent shot and sunken tackle that currently exist in the environment.

Conservation Strategy: It is now well understood that lead in the environment, especially in easily accessible forms such as sinkers and shot fragments are detrimental to a wide variety of wildlife. Many efforts to reduce the source of lead have been made and are continuing within the fishing and hunting industry. The American Fisheries Society's action statement on lead includes: advocating to phase out lead-based sinkers and jigheads less than 2.5 cm - with a goal of complete elimination; reducing the economical and social barriers to non-toxic fishing tackle development; supporting efforts to promote greater public awareness in understanding the consequences of lead exposure to wildlife; and emphasizing the potential gains in environmental quality from the use of lead-free fishing tackle.[lvi]

A continued dialogue with users and associated industries needs to remain the forefront of efforts to reduce the amount of lead shot in the environment. Increased education and outreach should flow both ways, allowing hunters to express their constructive concerns about the overall effects of regulation, the cost of alternatives, and the differences in ammunition performance.

Conservation Actions: Lead

- Work with hunting and fishing organizations and the allied industries
- Promote the use of existing economical alternatives to lead
  - Host lead free shooting events
  - ***Link to resource***: Nontoxic Shot Regulations for Hunting Waterfowl http://www.fws.gov/migratorybirds/CurrentBirdIssues/nontoxic.htm

- Put out press releases prior to upland game bird hunting season and the peak of fishing season

- Establish lead free fishing and hunting zones in the metro area
- Employ a balanced mix of both regulatory and voluntary incentives
- Face the cultural and social misunderstandings about hunting with non- lead ammunitions through continued two–way dialogue and open communication

Environmental Education and Outreach

Education, along with research and monitoring, can be considered as fundamental to successful environmental conservation. Natural resource education in the metro area has an advantage that is sometimes overlooked when considering conservation; the sheer volume of people in a relatively small area is great for outreach. Citizens who value their sense of place, are informed about the various threats to birds, and have a good understanding of the issues pertaining to bird habitats, are more likely to make meaningful contributions that will maintain healthy bird habitat in the metro area and beyond.

Birds are excellent indicators of overall environmental quality because they need the same things people do: clean air, clean water and open spaces. Birds can serve as a gateway to a whole world of environmental awareness and advocacy. Providing educational opportunities that raise awareness and engage residents about the unique challenges and threats birds face in our urban environment can motivate people to become pro-active environmental stewards and make informed decisions that improve their community as well as sustain bird populations.

Current Status

Various environmental education and outreach opportunities exist throughout the Twin Cities Region and are accessible at a number of nature centers throughout the metro area: Springbrook Nature Center, Carl W. Kroening Interpretive Center, Harriet Alexander Nature Center, Maplewood Nature Center, Woodlake Nature Center, Dodge Nature Center, Eastman Nature Center (Bird Banding), Como-Woodland Outdoor Classroom and Carpenter Nature Center.

City and County parks, Minnesota Valley National Wildlife Refuge, the Bell Museum, the Minnesota Ornithologists' Union and local Audubon chapters also provide information and education resources specifically related to birds and bird conservation. Bird-related resources for educators, such as curriculum kits, guided tours and available grants, can be found on the Minnesota Sharing Environmental Education Knowledge (SEEK).

Education can also take place in your own backyard. Minnesota's Audubon at Home program promotes individual bird conservation efforts on private lands such as residences, schools, businesses, and nature areas in Minnesota. It focuses on taking individual conservation action to improve the environmental health and habitat quality of backyards and neighborhoods. Whether it is habitat restoration or providing nesting opportunities, everyone can do something to aid in bird conservation efforts[lvii]. Similarly, Audubon International's Cooperative Sanctuary Program (see Habitat Enhancement) offers support and certification to golf courses, corporate campuses and businesses interested in conducting conservation on their land.

On a community level there are a variety of birding festivals and celebrations in the metro area: the Kids Bird Watching Fair[lviii] and International Migratory Bird Day both at the Minnesota Valley National Wildlife Refuge Visitors Center, and the Urban Bird Festival[lix] which takes place in select areas throughout the metro area, all provide additional opportunities for bird conservation and education.

The intent of this plan is to act as a resource guide to existing information and enhance educational opportunities beyond basic bird information. The overall goal of environmental education in general is to engage people in active conservation by first raising awareness, then educating about the issues and finally offering tangible projects for first-hand involvement.

Links to resources:
SEEK http://www.seek.state.mn.us/sb_topic.cfm?topic=Birds
Kids Bird Watching Fair http://mrvac.org/2011/04/26/2011-kids-birdwatching-fair-may-7/
Urban Birding Festival http://www.stpaul.gov/index.aspx?NID=4813

Education Strategies

Environmental education can be conducted in three basic phases: raising **awareness**, **educating** on the issues, and **engaging** people in conservation.

Goals:
Awareness Goals

- Raise awareness about birds and bird conservation with urban residents through birding
- Sponsor and participate in the Urban Bird Festival and work with local governments to emphasize and celebrate the Twin Cities participation in the Urban Bird Treaty Program
- Increase availability of environmental information to a more diverse audience including underserved communities
- Target issue-specific audiences: architects, nurseries, cat advocates, hunting and fishing groups…

Education Goals

- Develop relationships with universities, secondary and primary schools throughout the metro area to strengthen their focus on environmental education focused on birds
- Develop an internship program within conservation organizations
- Involve underserved communities through schools, churches and community organizations

Engagement Goals

- Use IBA projects as target points for engagement, including hands-on learning, restoration projects, avian inventories, and chimney swift tower construction
- Support and facilitate participation in bird focused citizen science projects as well as volunteerism

Raise Awareness

According to the USFWS, the more sparsely populated an area, the more likely its residents were to watch birds; 17% of urban residents participate in bird watching activities, where as 27% or residents living outside urban areas are birders[lx]. In essence a large portion of urban residents have yet to be introduced to the world of birding. Raising general awareness about birds by birding is a great way to reach a wide range of people through simple actions such as pointing out a cardinal, offering a pair of binoculars or taking a walk by the river in spring. Once the world of birds and birding is recognized and

appreciated, understanding the issues birds face in an urban environment takes on a new meaning at a more personal level.

Raising awareness about the specific bird conservation issues in an urban environment can be general or directed at specific audiences. Raising awareness can occur either passively through the development and distribution of media materials such as information pamphlets and websites, or actively through focused messaging and participation in and promotion of various celebrations and events. Both approaches are needed. The passive approach is a way to offer support and guidance to interested participants seeking information. Active efforts at raising awareness typically aim to engage and attract a segment of the population that may not have known about birds and the conservation issue they face in an urban area otherwise. Below are some suggested actions to raise awareness about birds in urban areas. This list is not comprehensive and is intended to highlight a variety of ways to direct environmental education at diverse audiences.

Awareness Actions: Reaching a More Diverse Audience

- Recognize the strengths in using modern technologies and social media to reach more people
  - For example: in November 2011 The National Audubon Society created a game called "Birding the Web" where participants signed up to participate through their Facebook accounts, could get hints to rare web bird sightings via twitter and those who found all of the birds could enter into a drawing for some great prizes.
- Birding Apps are growing in popularity; introducing tech savvy people the world of birding in a new way
- Focus outreach to underserved communities for hands on habitat enhancement programs such as Audubon At Home
- Participate in the Urban Birding Festival June 16th and 17th 2012
  - ***Link to resource:*** Saint Paul Minnesota Website http://www.stpaul.gov/index.aspx?NID=4813
- Increase accessibility to birding to people with limited mobility-
  - ***Link to resource****:* Accessible birding areas throughout the Twin Cities metro area are highlighted in a Star Tribune article by Jim Williams. 28 June 2011 http://www.startribune.com/lifestyle/homegarden/124655418.html

Educate on the Issues

How is education different from awareness? In general, awareness is a short snippet of information highlighting the conservation issue but giving little detail as to how it affects a person directly, why they should be concerned and what can be done about it. Education offers more in-depth information needed to better understand issues and therefore is better suited to helping citizens make informed decisions addressing the issues.

Education also teeters on becoming engagement. In fact it is that overlap with both awareness and engagement that makes this approach so valuable. The education action recommendations below are not specifically issue-related but rather a general outline on how to get an education message, specifically about birds in an urban environment, integrated into existing systems by focusing on where to place the most effort and what types of programs could be developed.

Education Actions

- Host a "Bring your Kid Birding Day!" Create an opportunity for families to engage in the outdoors and discover birding together
- Support and promote birding and outdoor activities for those with limited mobility
- Work with universities to develop course curriculum about bird strike and lighting hazards for beginning level architecture courses
- Work with universities and cooperative extension offices to create landowner incentives and programs that encourage sustainable farming practices
- Focus on connecting with schools in underserved communities located in or near existing natural areas such as IBA's, County Parks, and National Wildlife Refuges
- Develop an internship program for recent high school graduates or college undergraduates focusing on bird-related environmental issues within different natural resource organizations in the metro area. The program should include developing a project, implementing the project plan and presenting results. Incentives for the intern could include college credit, professional development, conference fee waivers and more

Engage in the Solution

Conservation action is the result of an informed citizenry and can take place in a variety of venues and outlets. For example, a neighborhood tree planting event hosted by Tree Trust brings people together for hands on action, which creates habitat for birds, beautifies the community and gives people a direct connection to a sense of place. Pulling invasive buckthorn with Friends of the Mississippi River on a brisk fall morning in a county park has the same effect. Change can also take place within the political landscape by working with local, state and federal government representatives to affect environmental action and protection through policy. It is the culmination of awareness, education and action that makes events like these possible. Such events can potentially change a persons' perspective and enable them to support and participate in future conservation actions and initiatives at the local and state level, because they now better understand the issue and how it directly relates to them.

Citizen science is another way to foster volunteerism by involving people in specific conservation programs. The Back Yard Bird count, Christmas Bird Count, Nest Watch and Minnesota's Breeding Bird Atlas are all great examples of how people are willing to engage in conservation activities. Employing volunteers is an essential way to engage the public, add value to your work and multiply effort.

Below are some education engagement action recommendations that are tailored to working in an urban environment.

Engagement Actions

- Incorporate citizen science (see Monitoring) into existing education programs: birding with a purpose
- Foster volunteer involvement in research and monitoring projects (bird strike monitoring crew)
- Work with local, state and federal politicians to forward environmental action in the political arena
- Engage corporations and businesses in creating a greener work space

- Enroll new businesses into the Lights Out program and enlist grounds maintenance to be part of the monitoring

- Develop a relationship with schools in or near existing natural areas and add engaging activities to their existing science curricula, such as conducting annual field trips, building and monitoring nest boxes, creating rain gardens, getting out doors to learning to identify birds and use binoculars
- Conduct workshops on nest box building or construction of Chimney Swift towers with Boy and Girl Scout groups, underserved schools, churches, outdoor camps, 4-H groups, corporate campuses, etc.
    - Build 20 new Chimney Swift towers (2011-2015) in underserved communities.
    - Build 50 American Kestrel Boxes (2012) with the help of underserved community youth

Environmental education in the metro area is filled with opportunities to enhance a community member's sense of place and directly engage citizens in bird conservation. A simple action such as putting a bird feeder or nest box on a school playground not only creates habitat for the birds but also creates hands on learning experiences for the students, teachers and community at large.

Monitoring and Research

Natural resource management, without monitoring and research, is only half the equation when striving to solve complex conservation issues. Research is often considered too time consuming and monitoring is often difficult to fund, especially post-project. Striking a balance between the amount of preparation that goes into a project and the action of the project itself is a challenge and research can often yield more questions than results; which is where monitoring and adaptive management become even more valuable.

Fortunately, a number of agencies, organizations, academic institutions, and individuals are conducting a broad array of avian research and monitoring in the metro area. These efforts may focus on the birds themselves, may be monitoring a factor that affects bird populations, or may be using birds as a way to monitor some other condition. Some of these efforts are aimed specifically at the metro area, or sub-units within the metro area, while others include the metro area as part of a larger geographic effort.

Current Monitoring and Research Efforts

Minnesota has an amazing community of environmental professionals within governmental natural resource agencies, universities, and non-profit environmental organizations. This section provides a small sampling of the relevant research and monitoring activities currently taking place in the metro area and beyond.

Monitoring Examples

Localized Urban Area Efforts

- Twin Cities Important Bird Area Migratory Landbird Monitoring - Audubon Minnesota and National Park Service
- Mississippi River Bald Eagle Biosentinel Monitoring – National Park Service and Audubon Minnesota
- Twin Cities Osprey Monitoring -Three Rivers Park District and Audubon Minnesota
- Urban Peregrine Falcon Monitoring -Midwest Peregrine Falcon Restoration Society
- Bellwin Conservancy Landbird Monitoring – Bellwin Conservancy, Audubon Minnesota, Great River Greening
- St. Croix River Landbird Monitoring – National Park Service
- Lights Out – Audubon Minnesota, Bell Museum of Natural History
- Breeding bird point count purveys – USFWS at Minnesota Valley National Wildlife Refuge
- Bike Route Bird Surveys –Three Rivers Park District

Larger Efforts that Include the Urban Area

- Christmas Bird Count – Audubon Minnesota and Minnesota Ornithologists' Union
- Great Backyard Bird Count – Audubon Minnesota
- Chimney Swift Sit- Audubon Chapters, general public
- Minnesota Breeding Bird Atlas (BBA) – Bird Conservation Minnesota
- Breeding Bird Survey (BBS) – Patuxent Wildlife Research Center
- Ebird – Cornell Lab of Ornithology

- Project Feederwatch – Cornell Lab of Ornithology
- Scientific and Natural Areas avian inventory- MN DNR

Research Examples

Localized Urban Area Efforts

- Native bird and butterfly response to development (Dr. Rob Blair- University of Minnesota)
- Nesting success and life history attributes of bird communities along an urban gradient (J.A. Reale, City of Boulder Open Space and Dr. Rob Blair - University of Minnesota)
- Habitat selection of breeding riparian birds in an urban environment (Pennington and Dr. Rob Blair - University of Minnesota)
- Building design and window treatment research (Audubon Minnesota- BirdSafe)

Larger Efforts that Include the Urban Area

- Migration of landbirds and their stop over habitats (University of MN Duluth- Peterson and Niemi)
- Breeding bird communities across an upland disturbance gradient in the Western Lake Superior Region (Miller et al. - University of MN Duluth)
- Ongoing broad scale research- USGS Bird Banding Laboratory, Cornell Lab of Ornithology, National Audubon Society, Patuxent Wildlife Research Center, US Fish and Wildlife Service, and Canadian Wildlife Service
- Citizen science monitoring data (ebird, BBS, BBA, NestWatch, Christmas Bird Count, Great Backyard Bird Count, etc)

Monitoring and Research Needs

The previous section highlights just a few of the current monitoring and research programs related to birds and urban environments. The data to be gathered and questions to be answered are endless and, of course, time and resources are limiting. So rather than suggest new areas of research or new factors to monitor, it is important to encourage increased collaboration and communication among researchers and managers in the metro area.

Integration of information from a variety of researchers toward on-the-ground natural resource decisions will result in more effective and efficient management. Solid research and continued monitoring are the foundation of good conservation and need to be an integral part of metro area planning efforts.

Monitoring and Research Needs:

- Funding acquisition
- Increased communication
- Standardizing methodology
- Managing and disseminating bird data and related information

Coordinated efforts could be used to tackle the larger, more complex issues facing birds on a large scale such as climate change and pesticide exposure. Numerous projects are tracking pieces of information

that, taken together, tell a more complete story or give a more comprehensive picture about the year - round activities of a species rather than the traditional breeding and migration seasonal glimpses.

Monitoring and Research Strategies

In order to strategically increase coordinated and collaborative efforts of natural resource management in the metro area there needs to be a centralized resource for conservation practitioners and researchers to gather and generate information.

Goals

- Better integrate monitoring with bird management and conservation
- Coordinate bird conservation efforts within the metro area
- Create venues and technologies that allow metro area bird researchers and those monitoring birds in the metro area to interact with managers and conservationists

The Midwest Coordinated Bird Monitoring Partnership (MCBMP)[lxi] is a regional network committed to supporting informed bird conservation decisions through the enhanced coordination and exchange of monitoring information. The MCBMP recently developed the Midwest Avian Data Center[lxii], which is a regional node of the Avian Knowledge Network that provides integrated data on birds and ecosystems to improve conservation outcomes. Creating an Urban Bird Group within the MCBMP would allow participants to:

- Network with their peers
- Determine if an existing monitoring program or protocol meets their needs
- Share data collection protocols to promote comparable data analysis
- Present results
- Discuss problem solving strategies

The MCBMP and the Midwest Avian Data Center are both web-based applications that are already providing services to working groups like the Midwest Migration Monitoring Network, Midwest Grassland Bird Conservation Group, Secretive Marshbird Monitoring Program and Nocturnal Bird Monitoring Program. An Urban Bird Monitoring group would be unique in that it is location specific rather than species or habitat specific. An Urban Bird Group could not only coordinate efforts within metro areas but also between urban areas facing similar challenges.

Monitoring and Research Actions

- Develop an Urban Bird Group within the Midwest Coordinated Bird Monitoring Partnership
- Decide how to coordinate and implement bird conservation efforts throughout the metro area
  - Iterative process, requires funding and adaptive management
- Use the Midwest Avian Data Center for managing and sharing data on metro area birds and their habitats

Conclusion

The Twin Cities metro area has been formally recognized for the important role it plays in urban bird conservation. The *Guide to Urban Bird Conservation for the Twin Cities and Surrounding Seven County Area* is intended as a catalyst for more comprehensive and strategic action. By prioritizing important habitat types, target species and conservation actions the *Guide* describes a qualitative and quantitative approach to conserving birds in an urban setting.

This guide is aimed at a broad audience; from natural resource professionals in agencies and non-government organizations alike, to private companies, concerned citizens and community members, recognizing that everyone has a role to play. Together we can enhance the overall quality of life in the metro area; socially, economically and environmentally, by providing a better home for birds.

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