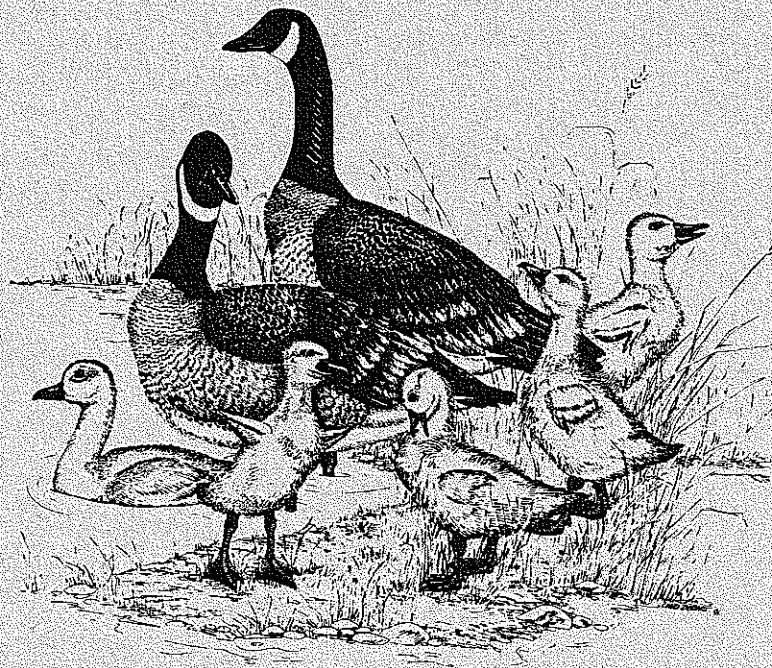


WILDLIFE HABITAT PLAN

City of Novi, Michigan

A QUALITY OF LIFE FOR THE 21ST CENTURY



June 1993

Prepared by:

**Wildlife Management Services
Brandon M. Rogers and Associates, P.C.
JCK & Associates, Inc.**

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PREFACE

At the heart of all living things, whether plants or human beings, is the desire to grow. The fact is that not all growth has desirable results. While there is a societal need for housing and development, the negative impact on wildlife resulting from such development can be reduced or eliminated with proper planning. The City of Novi has taken a major step forward in recognizing the importance of including a wildlife habitat plan in the decision making process.

We can no longer afford the luxury of species by species and case by case emergencies before taking action. Both state and federal mandates for the preservation of biotic diversity and the maintenance of viable populations of all wildlife imply that we should go beyond the endangered species approach and put a greater emphasis on entire communities. A conservation policy is called for which explicitly recognizes the need for animals to move, the need for the maintenance and the re-establishment of natural movement corridors, and the consolidation of areas large enough to maintain viable populations. Positive interaction of humans and wildlife can occur with a management policy and an educational approach.



"I don't want to live in a city that has just crows, sparrows and starlings. I want a city with bald eagles, peregrine falcons, barred owls, great blue herons, and a diversity of species. Having diversity means having a livable city. Urban wildlife is the most effective tool we have to educate new generations to respect and appreciate the wonders of nature".

--Robert Kildall, President, Friends of Discovery Park, Seattle.

These surveys are discussed in detail in reference to the Sections which were surveyed. Future recommendations for preservation and enhancement where appropriate are given. These areas and summaries are indicated on the Wildlife Habitat Map as Map 1. (In addition, a 4' by 5' full color mounted map is available in the City of Novi's Department of Planning and Community Development).

Walled Lake Core Reserve - Detailed Study

A more detailed field study was conducted in the Core Reserve Area, which was divided into three Sections. This area included over 300 acres. Ranked as a the highest quality habitat, since it was determined to have the highest diversity of all of the areas surveyed for the study. (Map 2).

Section 1 centered in the Core Reserve, and was found to be the area of highest quality and biodiversity, with having the highest number of species. Section 1 was also important as a corridor connecting Section 3 to Section 2. Based on the field survey and observations, it was determined which continuation of high human activity and development in this area would degrade the habitat quality and reduce biodiversity. However, proper management of this area could result in a productive coexistence. By regulating and limiting human uses in this area, habitat quality would remain stable or possibly increase, and thus support successful wildlife populations.

Section 2 species were found to consist of mainly of those dependant on wetland and lake systems for genetic success. Many trails exist throughout which are having an impact on the Wildlife. Increased restrictions on trails in this Section, could allow recreational demands to be met.

Species in Section 3 consist of woodland, wetland, meadow and transient species. Corridors are provided by the railroad tracks and the river bordering Section 1. Because of this movement and high recreational opportunities to the east, Section 3 is proposed as a wildlife refuge, with limited human intrusion. Some habitat alterations may be necessary to maintain biodiversity in Section 3 to levels comparable to Section 1 and Section 2. In the industrial property west of the railroad tracks effects of pollution should be considered. Low biodiversity to the west of the railroad tracks may be a result of this type of human intrusion, as well as the isolation of this Section by the railroad itself.

Guidelines To Ecological Landscape Planning and Wildlife Conservation

Guidelines for ecosystem planning include site level design and review, regional level design and review, and the development of continuous wildlife reserves and corridor/linkage systems. Mechanisms for implementation are included. Two sample supplemental ordinances for possible amending the existing Novi Woodlands and Wetland Ordinances are provided. These utilize a ranking of Type A, B, C with delineations for wetland/woodland type in regards to acreage and buffer retained. Recommendations by wildlife biologists would be based on this method with provisions for endangered species and movement corridors.

Mechanisms For Greater Protection

A number of methods for the acquisition and protection of these land areas which contain sensitive habitat areas are presented. They include purchase, donation, trade, voluntary registration agreements, management agreements, conservation easements, and mitigation, to name a few. Development and lot sizes are discussed in regards to the City's Ordinance options regarding the effect on wildlife habitat.

Wildlife Management Plan

Inevitable conflicts with humans and wildlife will increase as habitat is preserved and allowed to function intact adjacent to development. With that in mind a detailed discussion of the methods of interacting with wildlife is included. Items included are nuisance wildlife, hunting and trapping in damage control, methods of control and disposition, disposition of sick animals, wildlife tips, animal entry exclusion, animals which have been bitten by other animals or handled by humans, and sick animals.

Education

In order to achieve recognition of the City's valuable habitat and implementation of preservation, enhancement and management, various types of exposure and teaching methods will need to be utilized. Various strategies are suggested ranging from cable television and Town Meeting presentations to development of easily read brochures.

Next Steps

Steps which will aid in the implementation of the results of this study are given. Foremost is to incorporate and establish provisions for review of wildlife habitats into the City of Novi's existing Woodlands and Wetlands Ordinances and devise a review method utilizing wildlife biologists as part of the City's consultant team. Also identify corridors and linkages where the landscape enhancement or creation is necessary and desirable. To initiate a program to revegetate linkage areas which have been disturbed is recommended. The addition of provisions for native and natural plant materials in the Landscape and Subdivision Ordinances to allow for revegetation and to promote landscaping with wildlife value is another recommendation. recommended.

Appendices

There are references in the Appendices which add valuable resource materials. Detailed lists of plants and animals found in Woodland and Wetland areas are included in this document. Other valuable information on plants which have habitat value, the Species Inventory Sheets and a list of additional sources can be obtained from the document file at the City of Novi in the Department of Planning and Community Development.

WILDLIFE HABITAT MANAGEMENT PLAN THE CITY OF NOVI - A QUALITY OF LIFE FOR THE 21ST CENTURY

FRAGMENTATION OF NATURAL RESOURCES

Formerly expansive natural resources are becoming fragmented into isolated habitat islands. Fragmentation restricts wildlife access to basic life requirements and other members of the species. By themselves the fragments are not large enough to maintain viable populations of many species, including threatened and endangered species, of vertebrates which occur in these forests. Habitat fragmentation caused by urbanization and development of natural areas severely hinders this mobility with negative consequences to our environment.

The effectiveness of an isolated tract of natural resources to provide wildlife habitat should be judged by considering overall community integrity and the ecosystem processes which maintain it. The smaller the habitat island, the quicker the wildlife community will decay. Throughout the United States rapid human population growth and urbanization will lead to the continued loss of natural habitat.

Consequences

The consequences of habitat fragmentation are measurable in many ways but the direct effect on wildlife species occur in four principal categories:

- 1) Increasing restriction and isolation of wide ranging species.
- 2) Loss of genetic integrity and viability from within the species.
- 3) Loss of area sensitive or forest interior species. These are species which depend upon a specific habitat area for breeding success and existence.
- 4) Increase in less desirable species, such as the parasitic brown-headed cow bird.

Less desirable species are usually more tolerant to development leading to the takeover by backyard habitat species, i.e., skunks, squirrels, raccoons, which can use populated areas as habitat thus leading to human/wildlife conflicts. Breeding bird surveys of northern hardwood forest fragments as large as 75 acres in size reveal the absence of 21 species known to occur in hardwood forest. That is 47% of the species known to breed in hardwood forest habitat are not found in any of the isolated fragments. More importantly, seven, or 54% of the bird species which are restricted to hardwood forest, did not occur in any of the forest fragments. Because of their dependency upon hardwood forest habitats for survival, their absence should be considered more serious than if they inhabited widely different habitat types.

Most of the widest ranging species are carnivores which must live on prey populations distributed throughout the landscape. Many are also fur-bearers which live or travel along the waters edge. Most of this movement is associated with the need for adults to interact during the reproductive season, the need for young animals to disperse, or the need to use different habitat during different seasons. Not uncommonly, this is because the upland environments provide the richest habitat during the summer and fall, while lowland swamps provide food and refuge during the winter months.

United States federal wildlife legislation began with attention to migration and migrant species and is still very much hinged upon these principles of movement. The location and nature of bird migration corridors and corridor management policies are so fundamental which they are taught in elementary wildlife conservation and water fowl management courses throughout the United States.

Effects Of Forest Fragmentation

Edges are a universal phenomenon associated with forest fragmentation. Edges can be broadly defined as the places where two ecosystems come together. They are never a perfectly sharp line. There is always a transition area or zone from one set of environmental conditions to another, from one set of plants and animals to another. Ranney et al. (1981) showed that forest edges are about 49 feet (15 m) wide and affect the species composition, structure, and dynamics of forests. In general, the creation of a new edge, or disturbance of a mature edge, causes a regression from mesic (mature) conditions to dry (pioneer) conditions in the forests interior. This regression occurs in response to increased light, which affects shade tolerant and intolerant species differently, and increased wind. Wind buffers edge trees, enhances seed dispersal, and changes soil moisture by increasing evapotranspiration. The interaction of edges with interiors is a function of forest island size. Edges increase the proportion of shade intolerant species in the interior. When circular forest islands are reduced to less than 13 acres (about 5 ha), or forest corridors (e.g. stream valleys) are reduced to less than about 330 feet (100 m) wide, forest composition will shift toward less mesic and more shade intolerant species (Ranney).

Forest fragmentation frequently results in a **reduction of habitat space**. Space is an important life requisite need for animals, and this need varies among species. Stewart and Robbins (1958) reported that the average territory sizes for a pair of tufted titmice (*Parus bicolor*) and barred owls (*Strix varia*) were 10 acres (4 ha) and 200 acres (81 ha), respectively, in central Maryland floodplain forests. (Much of Novi's largest woodlots and wetlands are floodplain forests.) This data can be used to illustrate two points. First, a park cannot provide space for even a single pair of individuals if the available habitat area is less than the critical home range or territory size of the target species. Obviously, one pair does not constitute a minimum viable population. Scientists who have worked with real management situations suggest a minimum of several hundred genetically effective individuals (Soule and Simberloff, 1986). Therefore, in order to maintain large communities, it is often times necessary to manage species with a system of smaller landscape linkages which are connected with suitable travel corridors (Harris 1984).

Habitat fragmentation, resulting in the increase in of edge habitat and also the reduction of large areas of habitat are a few of the ecological issues associated with development. While it may not be practical to consider the effect of development on all species beyond a particular site or City boundary, Planners should be aware of effects on all common plant species as well as rare and endangered plants. Specifically awareness of plants associated with mesic shaded sites and forest interior birds and mammals should be recognized. An effective development policy for dealing with these issues would be to site recreational and development facilities on a forest and/or wetland periphery, and thereby minimize impacts on the interior.

Critical areas need to be managed to maximize biodiversity. Design alternatives need to be considered which encourage healthy populations of species in the broad context.

SPECIES SAMPLING TECHNIQUES

Methodology

Wildlife Management Services conducted sampling techniques to determine the general location and movement of local native wildlife populations in the City of Novi. Recommendations were based on the field surveys conducted of habitat, relating to specific needs of local native wildlife populations. Species sampling techniques utilized point count methodology for mammal and bird populations from typical wetland and woodland areas. Critical wildlife corridors, i.e., landscape linkages and movement corridors were identified through ground and aerial observations and photography flown in May of 1993. The actual survey work was done during the winter and early spring of 1993. The City of Novi Woodlands and Wetlands maps were also used to determine acreage and apparent connections of habitat areas.

Species sampling was performed within woodlands and wetlands of specific sizes (> 100, 50-99, and 10-49 acres) using a time/per unit formula of 2.5 minutes per acre. This method was developed in consideration of the limited time and resources available, and was meant to obtain two complementary censusing requirements:

- 1) To obtain preliminary results in a short time to permit the counting of birds and mammals (both visual, audible, and through other identifiable signs).
- 2) To be able to sample birds in flooded forests where line transects are difficult to perform. (see Appendices in the document file at the City of Novi's Department of Planning and Community Development for Survey Sheets)

The "Aves" bird check-list by Eco-System Software is included as Figure 1, and was used to identify the presence of potential species in the City of Novi in specific habitat types - wetlands and woodlands (also see Appendices in the document file at the City of Novi's Department of Planning and Community Development for Survey Sheets).

Figure 1: "AVES" BIRD CHECKLIST

Copyright (c) 1993 by Ecosystem Software. All rights reserved.
Registered user: AveSoft

| | | |
|---|---|--------------------------|
| 42N 83W | Novi Wetland and Woodland Inventory | Season: Winter |
| Habitat: | Freshwater Wetland, Marsh, or Swamp Freshwater Lake or Pond (includes Wide Slow River) Brook, Stream, or River (includes Riparian Habitat) Deciduous or Broadleaf Woodland Coniferous Forest or Mixed Coniferous-Deciduous Woodland | |
| SPECIES | AUDOBON EAST '77 | PETERSON EAST '80 |
| | PAGE No. | PAGE No. |
| ORDER GAVIIFORMES | | |
| Family Gaviidae: Loons | | |
| <input type="checkbox"/> Common Loon | 466P188;190 | 32M1 |
| ORDER ANSERIFORMES | | |
| Family Anatidae: Whistling-Ducks, Swans, Geese, Ducks | | |
| <input type="checkbox"/> American Black Duck | 387P133 | 48;68M23 |
| <input checked="" type="checkbox"/> Mallard | 454P107;137 | 48;68M26 |
| <input type="checkbox"/> Gadwall | 420P135;139 | 48;66M25 |
| <input type="checkbox"/> Canvasback | 455P110;154 | 58;72M40 |
| <input type="checkbox"/> Redhead | 455P109;153 | 58;72M41 |
| <input type="checkbox"/> Lesser Scaup | 460P123;157 | 58;72M43 |
| <input type="checkbox"/> Common Goldeneye | 356P126;150 | 60;72M45 |
| <input type="checkbox"/> Bufflehead | 357P127;151 | 60;72M47 |
| <input type="checkbox"/> Common Merganser | 456P114;161 | 62;68M49 |
| ORDER FALCONIFORMES | | |
| Family Accipitriidae: Eagles, Osprey, Kites, Hawks | | |
| <input type="checkbox"/> Bald Eagle | 468P305;307 | 158;166M173 |
| <input type="checkbox"/> Northern Harrier | 437P309;310 | 152;164M166 |
| <input checked="" type="checkbox"/> Sharp-shinned Hawk | 680P294 | 152;170M163 |
| <input type="checkbox"/> Cooper's Hawk | 636P293 | 152;170M164 |
| <input type="checkbox"/> Northern Goshawk | 681P296* | 152;170M165 |
| <input checked="" type="checkbox"/> Red-tailed Hawk | 638P300 | 154;164M167 |
| <input checked="" type="checkbox"/> Rough-legged Hawk | 501P295 | 156;164;168M169 |
| ORDER GALLIFORMES | | |
| Family Phasianidae: Partridge, Pheasant, Grouse, Turkeys, Quail | | |
| <input type="checkbox"/> Ruffed Grouse | 630P268 | 144M152 |
| ORDER CHARADRIIFORMES | | |
| Family Laridae: Jaegers, Skuas, Gulls, Terns, Skimmers | | |
| <input type="checkbox"/> Ring-billed Gull | 446P38;52 | 86;90M71 |
| <input checked="" type="checkbox"/> Herring Gull | 445P37;50 | 86;90M70 |
| ORDER STRIGIFORMES | | |
| Family Strigidae: Owls | | |
| <input type="checkbox"/> Eastern Screech-Owl | 634P279;280* | 172M184* |

| | | |
|--|----------|----------|
| <input checked="" type="checkbox"/> Great Horned Owl | 677P282 | 172M186 |
| <input type="checkbox"/> Barred Owl | 634P285 | 174M187 |
| <input type="checkbox"/> Long-eared Owl | 676P281 | 172M185 |
| <input type="checkbox"/> Short-eared Owl | 436P284 | 172M183 |
| <input type="checkbox"/> Northern Saw-whet Owl | 635P289* | 176M192* |

ORDER PICIFORMES

Family Picidae: Woodpeckers

| | | |
|--|-------------|----------|
| <input checked="" type="checkbox"/> Downy Woodpecker | 643P337P339 | 192M212 |
| <input checked="" type="checkbox"/> Hairy Woodpecker | 643P338;340 | 192M213 |
| <input checked="" type="checkbox"/> Northern Flicker | 546P348 | 190M208* |
| <input type="checkbox"/> Pileated Woodpecker | 646P352 | 188M207 |

ORDER PASSERIFORMES

Family Corvidae: Jays, Magpies, Crows

| | | |
|---|----------|---------|
| <input checked="" type="checkbox"/> Blue Jay | 552P435 | 208M242 |
| <input checked="" type="checkbox"/> American Crow | 565P579* | 206M240 |

Family Paridae: Chickadees, Titmice

| | | |
|--|-----------------|---------|
| <input checked="" type="checkbox"/> Black-capped Chickadee | 657P428 | 210M246 |
| <input checked="" type="checkbox"/> Tufted Titmouse | 432;431P613;658 | 210M249 |

Family Sittidae: Nuthatches

| | | |
|---|---------|---------|
| <input type="checkbox"/> Red-breasted Nuthatch | 685P353 | 212M251 |
| <input checked="" type="checkbox"/> White-breasted Nuthatch | 646P354 | 212M250 |

Family Muscicapidae: Kinglets, Gnatcatchers, Old World Flycatchers, Bluebirds, Solitaires, Thrushes, Wren Tit, Thrashers

| | | |
|---|---------|---------|
| <input type="checkbox"/> Golden-crowned Kinglet | 704P458 | 216M260 |
| <input type="checkbox"/> Eastern Bluebird | 516P440 | 220M266 |

Family Bombycillidae: Waxwings

| | | |
|--|---------|---------|
| <input type="checkbox"/> Cedar Waxwing | 558P506 | 224M277 |
|--|---------|---------|

Family Laniidae: Shrikes

| | | |
|--|---------|---------|
| <input type="checkbox"/> Northern Shrike | 514P421 | 224M274 |
|--|---------|---------|

Family Emberizidae: Blackbirds, Orioles, Tanagers, Grosbeaks, Sparrows, Buntings, Warblers

| | | |
|---|-------------|---------|
| <input checked="" type="checkbox"/> Northern Cardinal | 578P406;407 | 268M351 |
| <input type="checkbox"/> American Tree Sparrow | 522P531* | 280M373 |
| <input type="checkbox"/> Song Sparrow | 562P542 | 284M379 |
| <input type="checkbox"/> White-throated Sparrow | 591P539 | 278M367 |
| <input type="checkbox"/> Snow Bunting | 530P547 | 266M350 |
| <input type="checkbox"/> Rusty Blackbird | 715P569 | 254M327 |
| <input checked="" type="checkbox"/> Common Grackle | 564P572;573 | 254M329 |
| <input type="checkbox"/> Brown-headed Cowbird | 559P516;571 | 252M326 |

Family Fringillidae: Finches

| | | |
|--|-------------|-------------|
| <input checked="" type="checkbox"/> Purple Finch | 696P409;558 | 270;285M357 |
| <input checked="" type="checkbox"/> House Finch | 549P410;559 | 270;285M356 |
| <input type="checkbox"/> Pine Siskin | 713P557 | 272M361 |
| <input type="checkbox"/> American Goldfinch | 510P385;386 | 272M360 |
| <input type="checkbox"/> Evening Grosbeak | 693P384 | 272M359 |

This Checklist contains 53 species of birds in 8 orders and 15 families

The field data gathered in this study were used to calculate a simple index to determine differences in levels of populations on different areas. Because of limiting factors for sensitive species, keynote species were recorded to assist in indicating species richness and diversity. Some species have more restrictive and limiting factors than others. By identifying one of these more restricted species in an area the assumption can be made that species with less restrictive but similar limiting factors can occur in the same area. These more restricted species are therefore considered "keynote" species. The fact that certain species are more noticeable than others was a factor - i.e., wide ranging species would be recorded more frequently than species with a small radius of mobility. Data from this study cannot be used to determine actual population densities because the findings are based on a qualitative study, not an in-depth quantitative study.

Survey Targets

Two major habitat types were included. "Wetland Habitat" means any type of ecosystem components found in a wetland area which would differentiate that wetland from another. Types of Wetland habitat include but are not limited to the following:

1. Lake and Pond Habitat
2. Rivers and Stream Habitat
3. Cattail Marsh Habitat
4. Sedge Meadow Habitat
5. Shrub Swamp Habitat
6. Bog and Bog Forest Habitat
7. Northern Floodplain Forest Habitat

"Woodlands Habitat" are the type of plants commonly found in a woodland area. A detailed list of the common types of plants which are associated with woodlands is included in the Appendices. These plants are found in the overstory, understory and on the groundplane. Major woodland types found in the City of Novi are:

1. Upland Beech-Maple Woodlands
2. Upland Oak-Hickory Woodlands
3. Wooded Wetlands
4. Pioneer Woodlands

"Animal Species" are any type of animal commonly found in a wetlands and/or woodland area, and which use these components for survival. A list of commonly found animal species is found in the Appendices in the back of this document. These types are:

1. "Mammals"
2. "Birds"
3. "Reptiles & Amphibians"

"Meadows" were also considered but not surveyed directly. Since they abut and are important breeding and food sources for many wildlife species they are an integral part of any review of woodland or wetland habitats. Many important meadow wildlife species and many species with meadow limiting factors utilize neighboring woodlands and wetlands.

Ranking System

A ranking system was developed to categorize habitats by size, species diversity, richness, etc. It is from these surveys, research and studies, supplemented and supported by research from the National Institute for Urban Wildlife, which the findings are based on.

Type A - High quality with greater species diversification

Type B - Medium quality with average species representation

Type C - Low quality with poor species representation

Core Reserves are areas of unusually high conservation values which span the entire range of the biological hierarchy, as well as particular physical habitats. They contain a diversity of species which are interdependent upon large tracts particularly during the breeding season. Some species also utilize the Core Reserve as a base and move by linkages (Wildlife Movement Corridors) between other smaller areas sometimes miles away. The habitat within can be varied including such habitats as edge, meadow, forest and or wetlands habitats. A conceptual schematic of a Core Reserve can be seen in Figure 2.

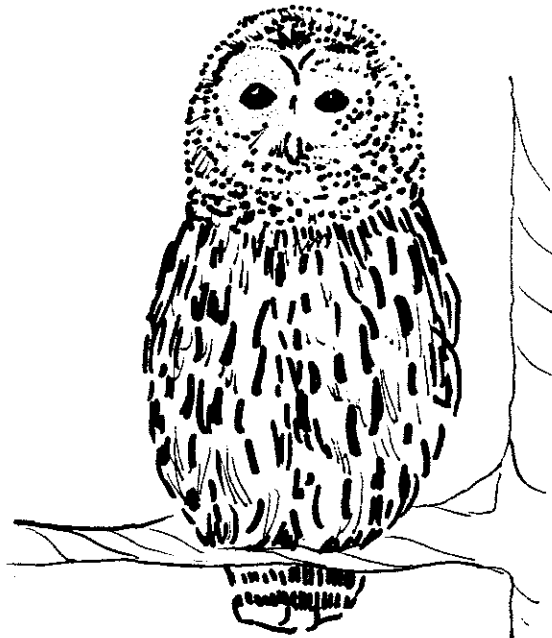
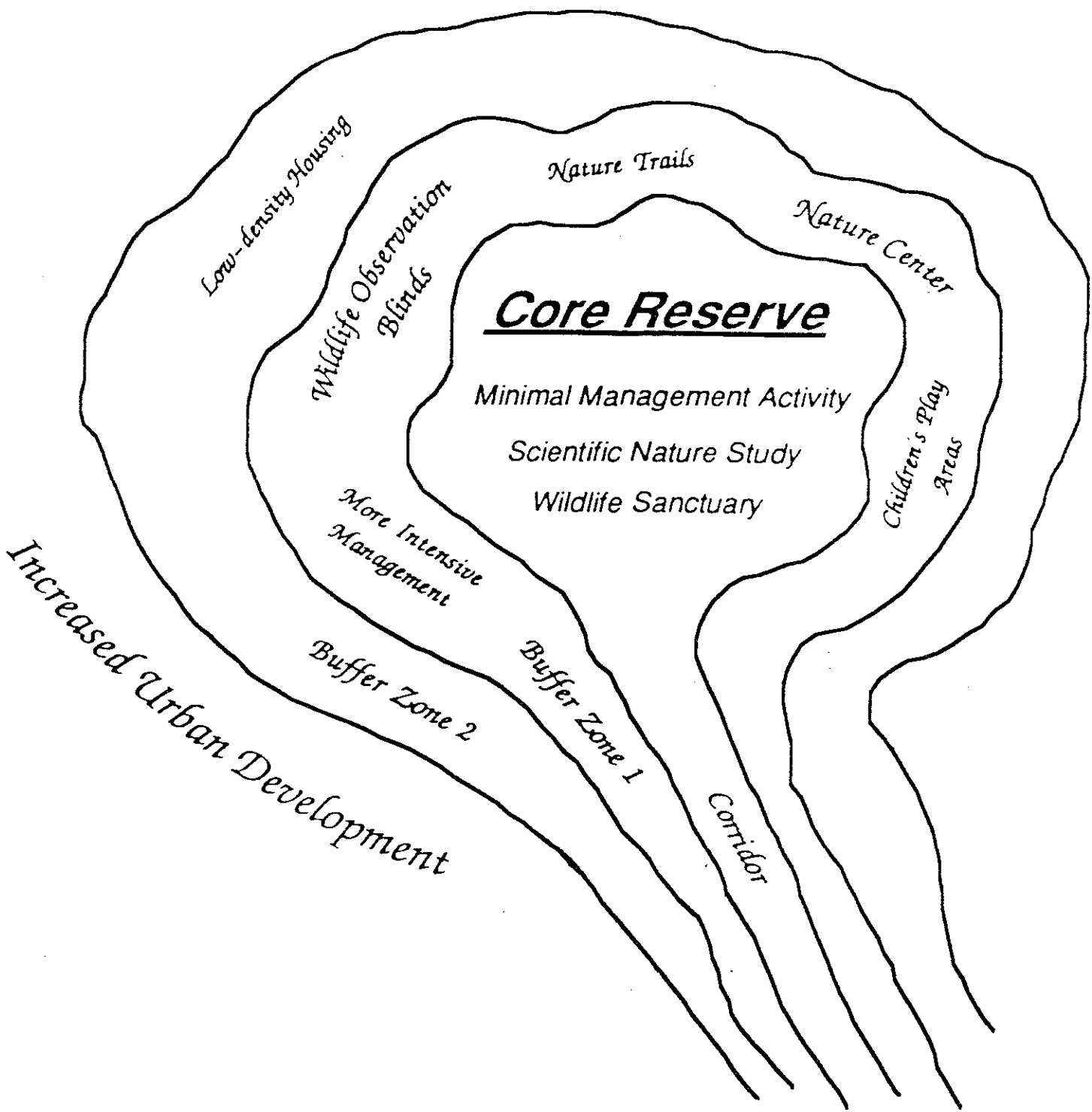


Figure 2: Core Reserve area (Adams, Dove 1989).



Wildlife Movement Corridor is a linear habitat whose primary wildlife function is to connect two or more significant, related or dependent habitat areas. They also can serve as useful habitat in their own right, depending upon width, habitat type, nature of surrounding habitat and human use patterns. Linear habitats (such as fencerows, railroad corridors, hedgerows, wetland buffers, etc.) are valued primarily or solely as habitat. Corridors may also have intrinsic habitat value in which they connect more substantive patches of habitat. They are generally used to connect current or formerly contiguous natural areas. **Apparent Linkages** and **Possible Linkages** are used to delineate these corridors. **Apparent Linkages** are wildlife corridors in which evidence of wildlife usage or movement was observed by a field researcher. **Possible Linkages** are those areas including all characteristics of a wildlife corridor with no direct observation of wildlife use. It is important to recognize that the Core Reserves and Corridors are interconnected and interdependent. Together they can provide species which are diverse and rich.

FIELD SURVEY RESULTS AND RECOMMENDATIONS

Analysis Results

Analysis of the size frequency distribution of the largest natural areas in the City of Novi show that:

- 1) There are two Core Reserves of contiguous wetland and woodland areas larger than 300 acres in size, those in Sections 29, 30 and Sections 3, 9, 10.
- 2) There are approximately a dozen areas which are 100 acres or more.
- 3) There are over a 100 areas between 10 and 99 acres in size.

The areas larger than 300 acres in size should be recognized as **Core Reserves**, and the areas from 100 - 300 acres as **Valuable Wildlife Habitat**. These reserves should receive top priority for protection. To function in perpetuity, sites must be buffered, interconnected by corridors, and permitted to interact with surrounding natural habitats.

Findings and Recommendations

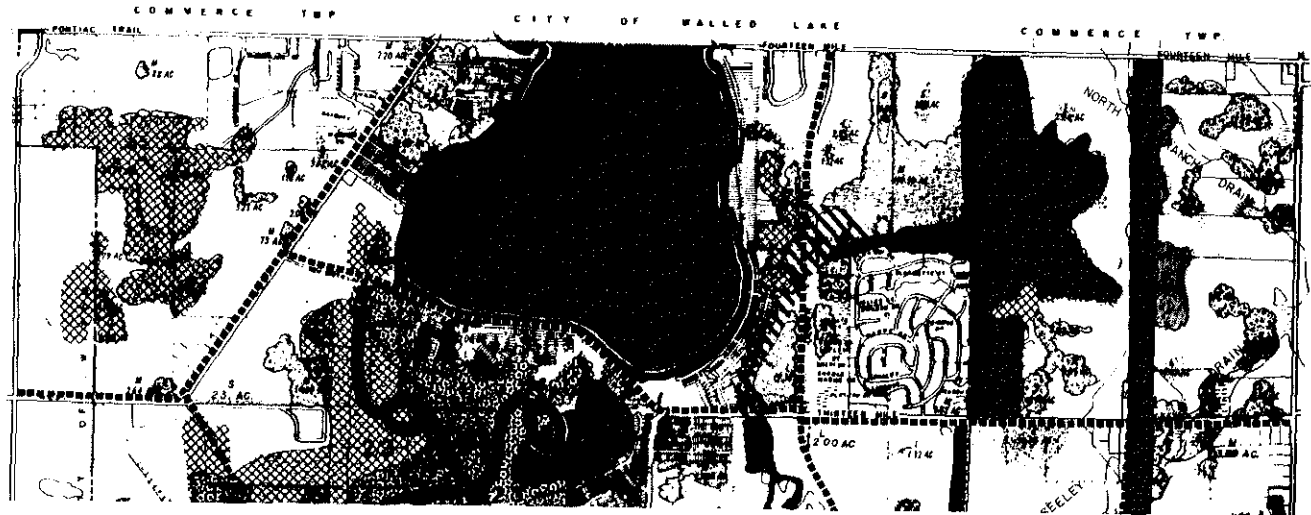
The following is a list of findings and recommendations by surveyed Section. These areas are also found on the Wildlife Habitat Map included as Map 1. In addition, key areas have been highlighted on aerial photos as Figures 3 to 7. In addition a 4' x 5' full color mounted Habitat Map is available in the City of Novi Department of Planning and Community Development.










WILDLIFE HABITAT MAP

CITY OF NOVI, MICHIGAN

MAP 1



LEGEND

-  **CORE RESERVE**
-  **TYPE A: HIGH QUALITY WITH GREATER SPECIES DIVERSITY**
-  **TYPE B: MODERATE QUALITY WITH AVERAGE SPECIES EXPECTED**
-  **TYPE C: LOW QUALITY WITH POOR SPECIES REPRESENTATION**
-  **APPARENT LINKAGES**
-  **POSSIBLE LINKAGES**
-  **NATURAL RESOURCES TRAIL SYSTEM**

JUNE 1993

PREPARED BY: **JCK & Associates, Inc.**
Wildlife Management Services
Brandon M. Rogers and Associates, P.C.

Section 1: East (29.09 acres), south of Fourteen Mile Road, East of Haggerty Road, west of Haggerty Connector - M-5, north of Thirteen Mile Road - Type C habitat with low quality. Will be isolated by the Haggerty Connector- M-5.

Section 1: West (164.85 acres) south of Fourteen Mile Road, east of Haggerty Road Connector - M5, north of Thirteen Mile Road - Type A and B habitat. Fairly high diversity with wetland and woodland species. Permanent wetlands, flooded forest, upland highlands. Quality may be lowered by development to the west. Proximity to development is detrimental. Additional development will drastically reduce habitat quality.

Section 2: East (37.17 acres), south of Fourteen Mile Road, north of Thirteen Mile Road, west of Decker Road - Type B and C habitat with moderate diversity, due to linkage to Section 1 and Section 11, and proximity to lake. Despite close development high habitat quality exists in nearby backyards of residents.

Section 4: Central (> 100 acres), west of West Road, south of Pontiac Trail - Type B habitat with moderate diversity due to development on north side. Large enough to be stable in spite of isolation, however may lose size advantage due to development.

Sections 3, 9, 10: **Core Reserve (>300 acres)** south of Walled Lake, west of Novi Road, north of Twelve Mile Road - Type A habitat, high diversity, with high stability and variability. This area has high habitat diversity and quality due to its large size and its multitude of habitat types present. Because of high juxtaposition and interspersion of habitat requirements and limiting factors, the stability of this area is high. Recreational use is high in this area but does not greatly effect the habitat quality or diversity due to the quality of habitats present. If human intrusion increases in one area wildlife can translocate to similar habitats without leaving the Core Reserve. This area would be appropriate for such recreational uses as walking paths with viewing sites of particular habitats (Also See Rhythms, A Linear Greenway System and the Walled Lake Sector Study, City of Novi - for detailed recommendations for Segments 2 & 3). A detailed study of the habitat in this area follows this section). The Core Reserve area can be seen in the areal photograph included as Figure 3.



FIGURE 3



CORE RESERVE - Sections 3.9.10

Section 11: (> 100 acres), east of Novi Road, south of Thirteen Mile Road, west of Meadowbrook Road and north of Twelve Mile Road - Type A and B habitat with fairly high diversity due to large size and linkage to Core Reserve (Section 10). Linked to Section 12 by low to moderate quality woodlot.

Section 12: East (> 50 acres), east of Meadowbrook Road, south of Thirteen Mile Road, west of Haggerty Connector - M-5, north of Twelve Mile Road - Type C habitat with low diversity despite size. Will be isolated by new Haggerty Connector - M-5 construction.

Section 12: West (> 50 acres), east of Haggerty Connector - M-5, south of Thirteen Mile Road, north of Twelve Mile Road, west of Haggerty Road - Type B habitat with moderate diversity. Linked to Section 11, linkage east dissected by M-5 construction reducing quality.

Section 13: (30 acre & 40 acre parcels), west of Haggerty Road, south of Twelve Mile Road, north of I-275, east of Meadowbrook Road - Type C with low diversity. Will be isolated by M-5 construction and connection to I-275, reduction in size and isolation.

Section 14: (> 25 acres), west of Meadowbrook Road, south of Twelve Mile Road, north of I-275, east of Novi Road - Type B and C habitat with moderate diversity. Will be affected adversely by M-5 construction reducing size and creating isolation.

Section 16: South (24.83 and 45 acre parcels), south of Twelve Mile Road, north of Grand River Avenue, east of Beck Road, west of Taft Road - Type C habitat, with low diversity due to close proximity to development, small size and isolation.

Section 17: Found south of Grand River Avenue, east of Wixom Road, north of Eleven Mile Road, west of Beck Road - Irregular woodlots (various sizes) - Type B and C, moderate quality due to linkage to Section 18, and by powerlines which continue south to link Section 20. A heron rookery is located southwest of Providence Hospital.

Section 18: Northeast (58 acres) east of Wixom Road, south of Twelve Mile Road, west of Wixom Road - Type B habitat, with moderate quality due to linkage with Section 17. West (28 acres) - Type C habitat with low quality due to small size and isolation.

Section 19: North (> 100 acres, including south part of Section 18), east of Napier Road, north of Ten Mile Road, west of Wixom Road - Type B and C. Surprisingly low diversity, possibly due to development to the west, seasonal flooding, and isolation.

Section 20: South (50.69 acres), east of Wixom Road, south of Eleven Mile Road, west of Beck Road - Type A habitat with high diversity due to hedgerow and powerline linkages North and South to Core Reserve.

Section 20: North (33.79 acres), east of Eleven Mile Road, west of Beck Road, north of Ten Mile Road - Type B habitat with moderate diversity due to secondary linkage to Core Reserve and small size.

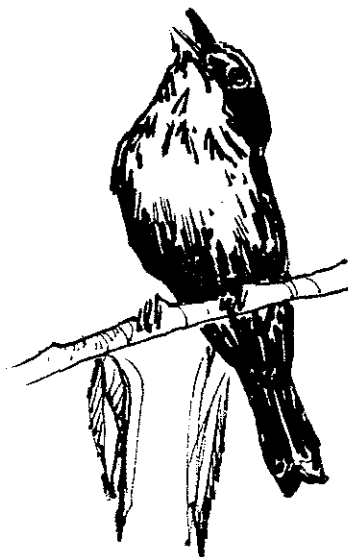
Section 26: East-central area (42.6 acres) south of Ten Mile Road, east of Novi Road, west of Meadowbrook Road - Type B habitat with fairly high quality, despite size and adjacent development, due to the Rouge River running through parcel. Possible linkage to Section 27.

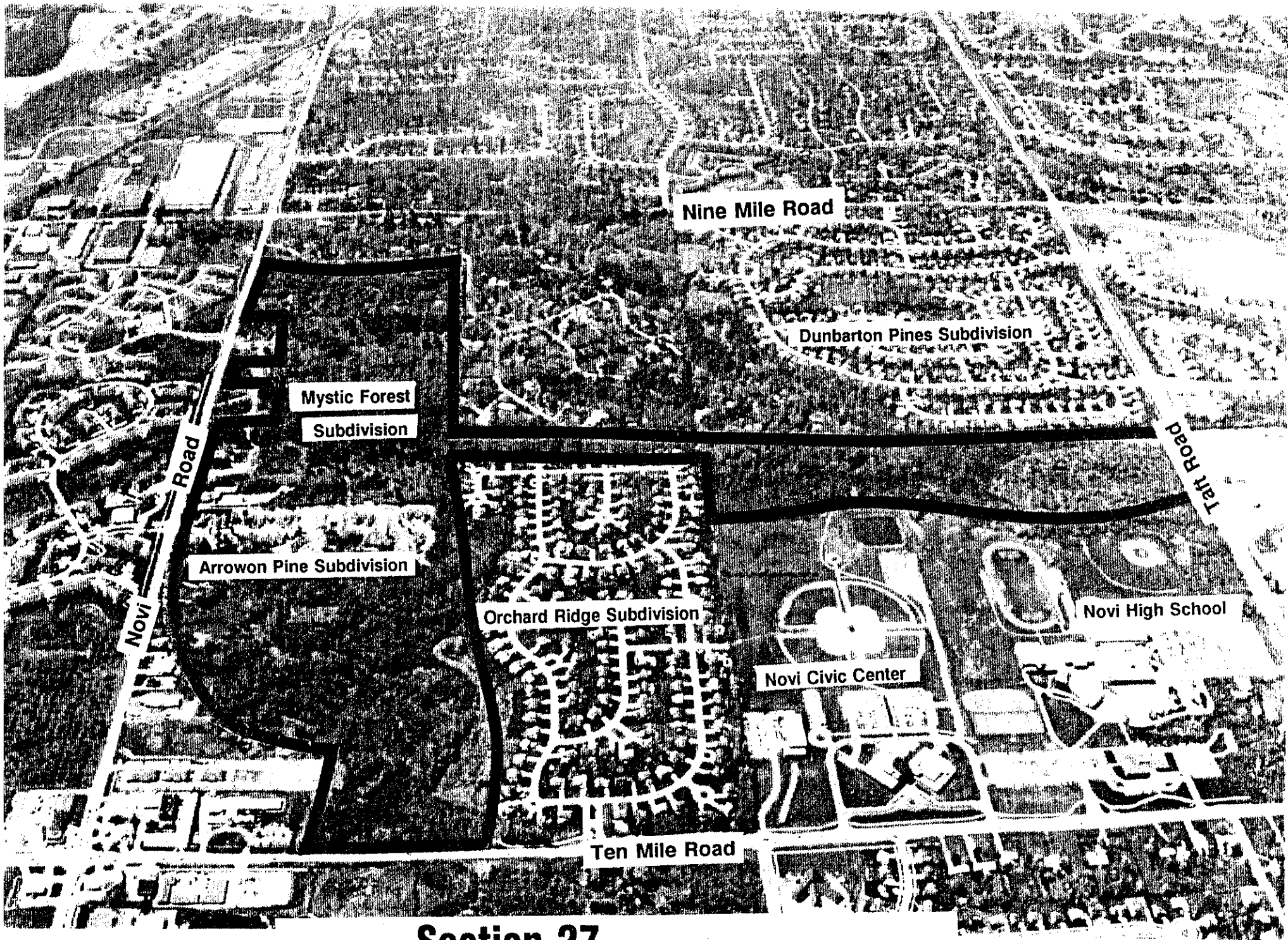
Section 27: Northern area (38.93 acres), south of Ten Mile Road, east of Taft Road, west of Novi Road - Type B habitat with moderate quality and diversity.

Section 27: Southeast area (**114.31 acres**), north of Nine Mile Road, west of Novi Road, east of Taft Road, is Type A habitat, and is connected to the movement corridor, a high quality linkage, in Section 28. SE half - high diversity/multiple habitats, flooded forests and open meadows. NW half - high diversity due to corridor and linkage to Section 28, otherwise low quality due to small size. This important Corridor can be seen on the aerial photograph included as Figure 4.

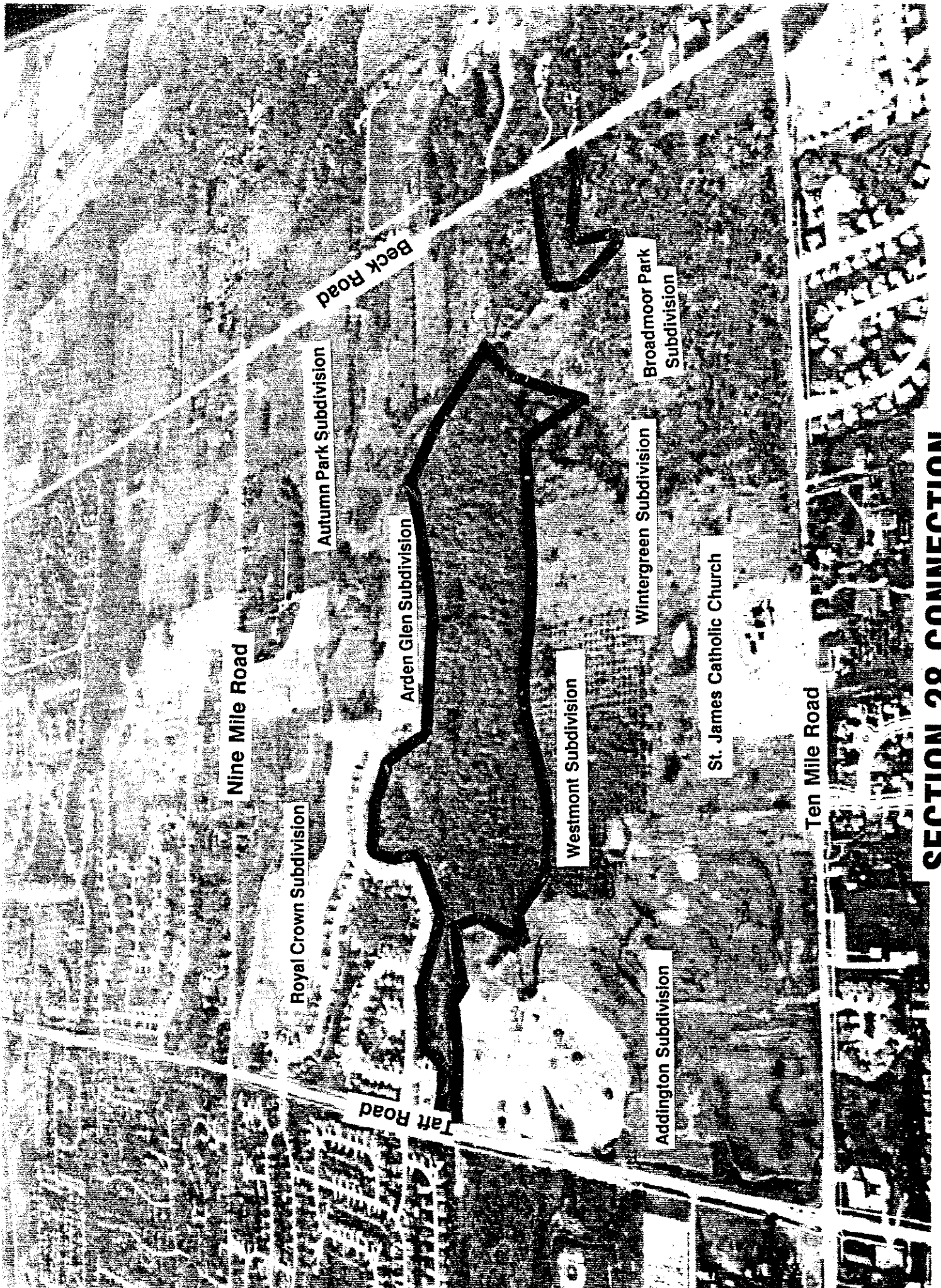
Section 28: East-west woodlands (95.5 acres), south of Ten Mile Road, east of Beck Road, west of Taft Road - Type A habitat, with high diversity and low human activity. Important linkage to Core Reserve in Section 29. Possibility for interior species. Quality may lower due to progressing development on NE side. This important linkage area can be seen on the aerial photograph included as Figure 5.

Section 29, 30, 31, 32: **Core Reserve (>750 acres)**, south of Ten Mile Road, east of Napier Road, west of Beck Road, north of Eight Mile Road - Type A habitat with high diversity and quality due to its large size and isolated interior. Because of the low juxtaposition and interspersed of habitat requirements, i.e., limiting factors for interior sensitive species, the stability of the area is moderate. There is a possible linkage north to Section 19 and power line linkage to Section 20 is a significant wildlife movement corridor. This Core Reserve area could not sustain intensive human intrusion without some loss to diversity and quality. Intensive intrusion or development in this area would reduce the chances of the presence of interior sensitive species. This Core Reserve area can be seen in the aerial photographs in Figures 6 and 7.

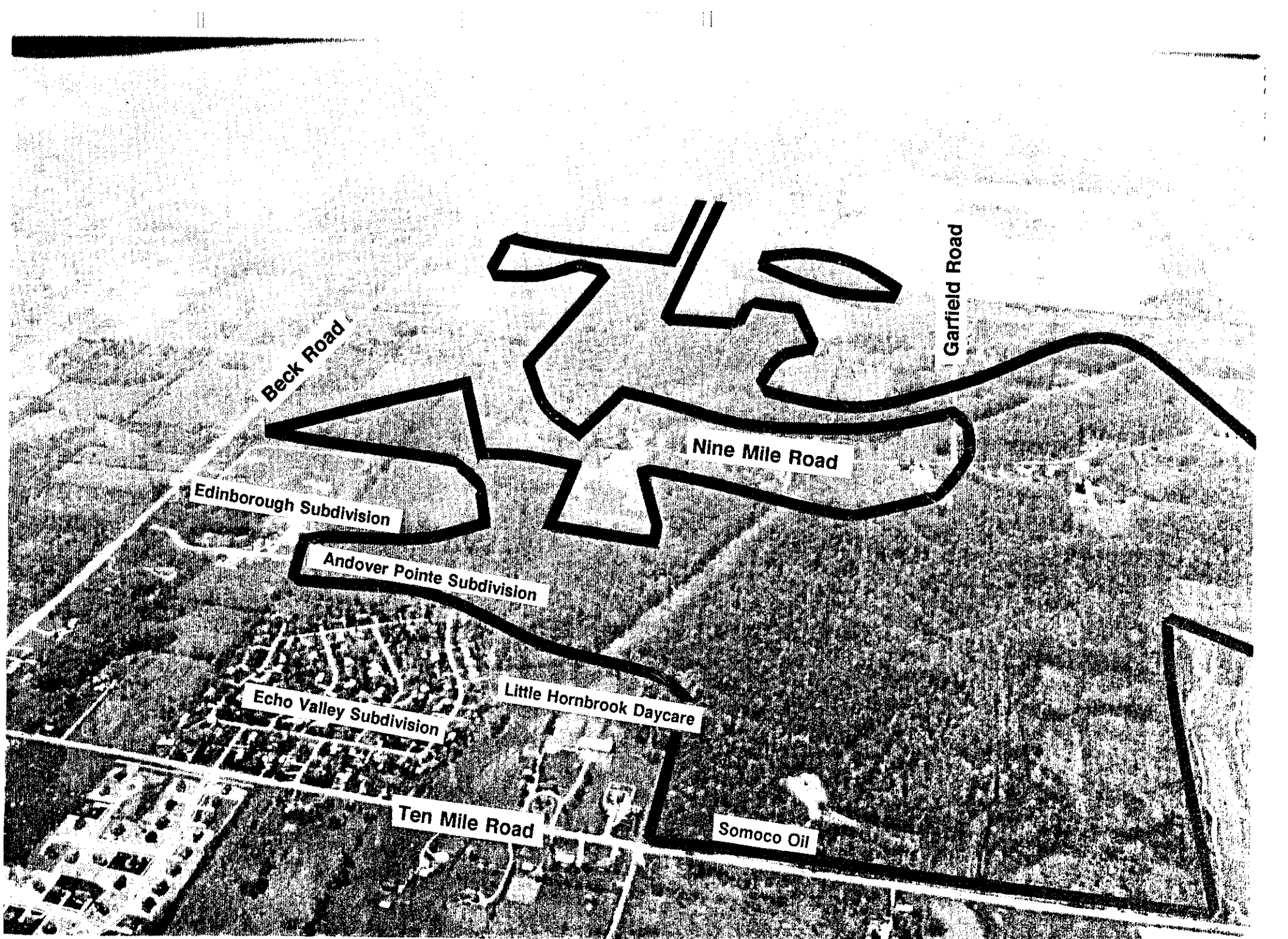




Section 27
Wildlife Corridor/High Quality Habitat

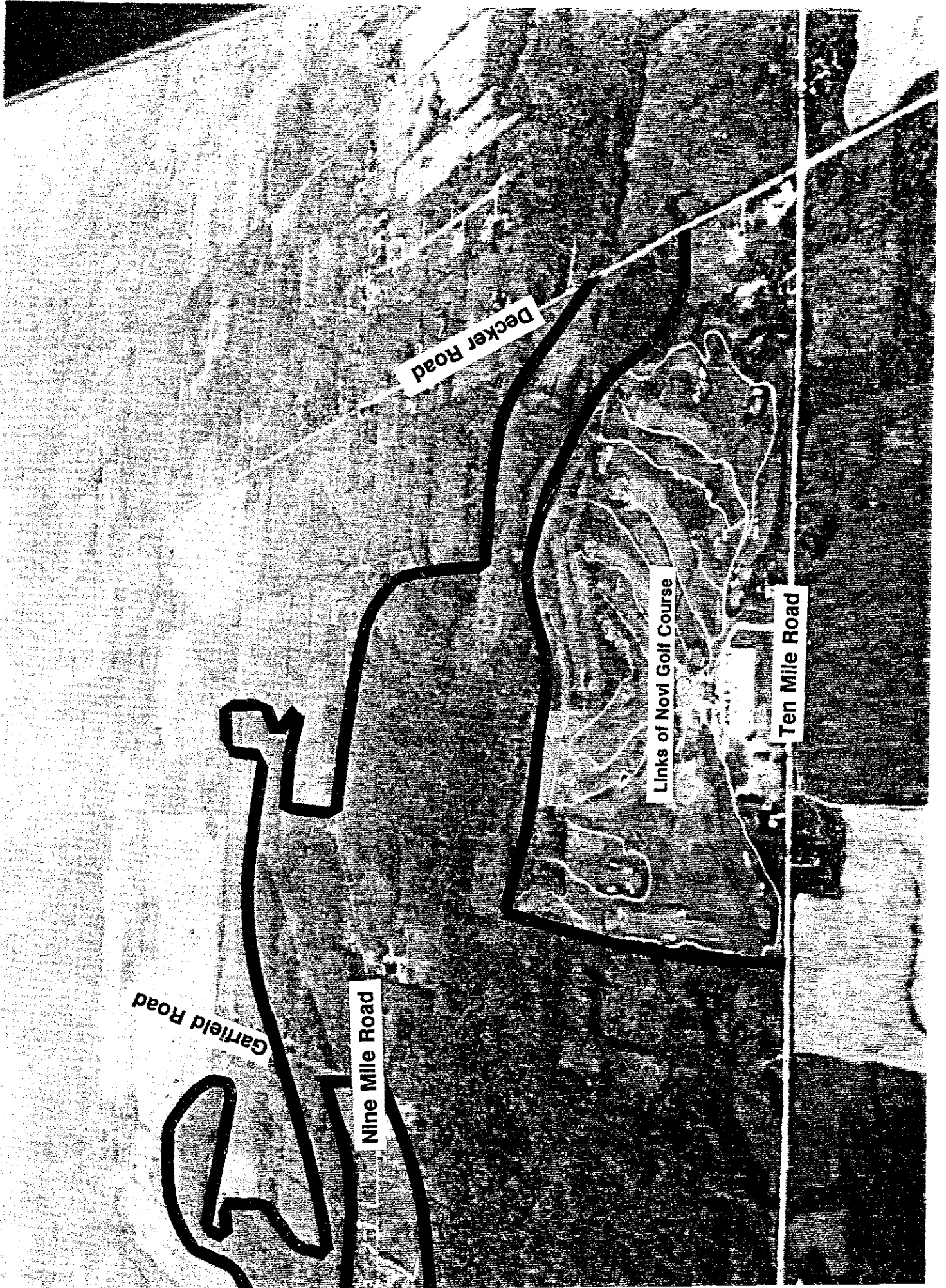


SECTION 28 CONNECTION
Dick On...
L...
L...



CORE RESERVE - Sections 29.30.31.32

FIGURE 7



CORE RESERVE - Sections 29.30.31.32

Woodlots in the northeast corner of Section 29 serve as a wildlife corridor connecting the Core Reserve to Section 28. The importance of these woodlots may not be obvious due to the small size, however, as a Linkage they help to increase diversity in Section 28 and subsequently in Section 27. Due to linkages such as this, wildlife can travel from the Core Reserve east to Sections 27 and 28. Possible corridors also exist from Section 27 to 26. At this point, the CSX railroad tracks and the Rouge River both serve to connect this area to Section 35.

Linkages are also apparent to the north of the Core Reserve into Section 19 and 20. Powerlines extending from the Core Reserve north can be considered a wildlife corridor connecting woodlots from as far as Section 17 to the Core Reserve.

Section 35: Central woodlot (49.07 acres) - Type B or C habitat. Formerly high diversity with multiple habitats, including hedgerows to the north and the Rouge River habitat to the west. Quality has been recently diminished due to extensive new development. Potential to enhance linkages to stream with large woodlot which may increase habitat value.

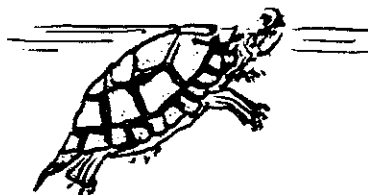
Section 36: Central woodlot (52.01 acres), east of Meadowbrook, west of Haggerty Road, north of Eight Mile Road - Type C habitat, low quality due to isolation and size.

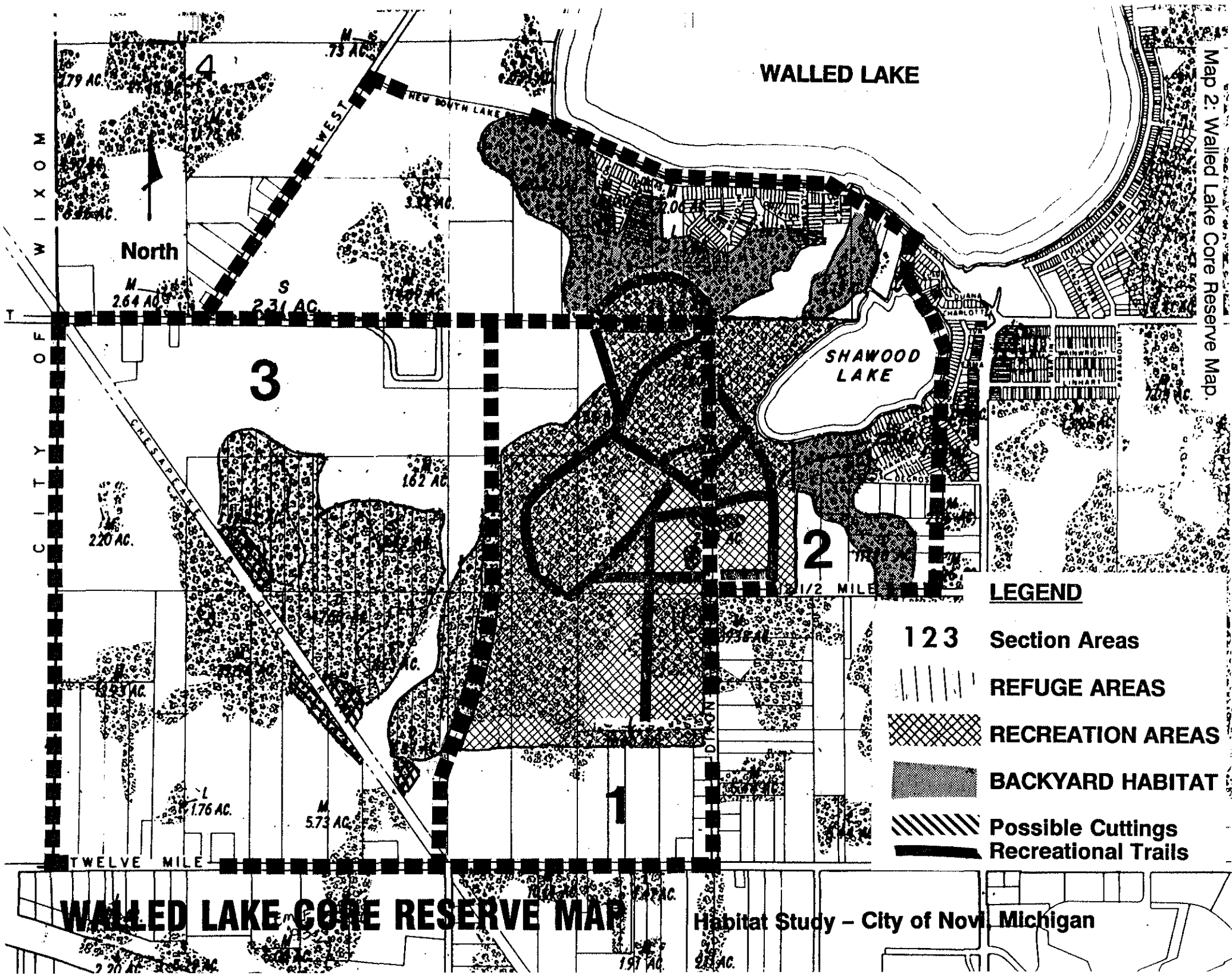
Four (4) Sandhill Cranes (2 adults and 2 chicks), an endangered species, were observed within four miles of the northwest corner of Novi on May 25, 1993. The sighting occurred in habitat which is very similar to that found in the City of Novi's Core Reserves.

These recommendations are based on limited field study and should be considered as opinions of the researcher, not scientifically conclusive, however, the study serves the purposes for which it was commissioned.

WALLED LAKE CORE RESERVE - DETAILED STUDY

A more detailed field study was conducted in the Core Reserve Area, previously discussed in this study as Sections 3, 9 and 10. This area includes over 300 acres, in which the Walled Lake Core Reserve Map is included as Map 2. Ranked as a Type A habitat it has the highest diversity of all of the areas surveyed for the study.





WALLED LAKE

SHAWOOD LAKE

W I L L I A M S
C I T Y O F

North

3

2

1

LEGEND

- 1 2 3 Section Areas
- REFUGE AREAS
- RECREATION AREAS
- BACKYARD HABITAT
- Possible Cuttings
- Recreational Trails

WALLED LAKE CORE RESERVE MAP

Habitat Study - City of Novi Michigan

The major consideration for the high diversity in this Core Reserve is its large size. Other factors are also pertinent. A multitude of habitat types present throughout the Core Reserve results in the highest stability and variability in all of Novi's undeveloped parcels surveyed.

Because of the high level of variability of habitat types present, if one necessary habitat factor for a species is somehow effected, that species can translocate to an area with a similar habitat factor without leaving the Core Reserve. A "Habitat Factor" is anything which is necessary or basic for the animal to live, for example: food, water and cover. This freedom of mobility can enhance range while also ensuring the genetic viability of specific populations.

The presence of a wide variety of habitat types which are highly interspersed allows for successful intermixing of wetland, woodland and meadow species. This provides a stable, well represented environment with high biodiversity.

Whether or not all habitat factors necessary for a species to survive occur within the home range of which species is referred to as "juxtaposition". "Interspersion" is the mixing of these factors, or how many times they occur separately within the home range. In the initial survey interspersion and juxtaposition were found to be very high in this area for species with restrictive limiting factors. "Limiting factors" are those requirements which an animal has to have to live, i.e, nesting sites, low cover, etc. These species can be considered "keynote species" because their success in this area provides evidence that other species which are native to the region, with similar habitat requirements but less restrictive limiting factors, will also be successful in this same area.

Evidence of considerable human activity was found throughout the Core Reserve. Shotgun shells, dirt-bike tracks, newly trod paths, empty cans and fire pits are all examples of the types of activity detected. Although this area appears to have higher human recreational use than the Core Reserve in Section 29, 30, 31, and 32, it also has higher stability and thus viability of habitats and extensive interspersion of these factors. Therefore the Walled Lake Core Reserve would benefit from careful management and planning of the selected recreational uses allowed.

Results and Recommendations

The Core Reserve was divided for purposes of discussion into three Sections. These areas are indicated on the Walled Lake Core Reserve Map. These divisions are not intentional segregation of any area of the Core Reserve and were created only to assist in the field research. The Core Reserve should be looked at and considered as one unit. All three Sections are interrelated.

A total of 20 hours of field research was performed by two researchers and was divided between the three Sections. Initial research time was divided equally by area to allow an overall assessment of the resources present. As research progressed, additional hours were spent in the areas which had previously been determined to have

the highest biodiversity, thus providing a more concentrated inspection of the higher quality areas of interest.

Research included observation of habitat factors, interspersed and juxtaposition of these factors, and species sampling. This allowed for direct identification of species, secondary identifications through such observations as tracks, and indirect identifications through observations of habitat factors suitable to sustain populations of species known to be native to the region.

Direct evidence of reproduction (identification of juvenile animals) and secondary evidence of reproduction (nests, dens, etc.) were observed. This research provided a general indication of the success of populations through numbers and observed health of species directly identified.

Quality of habitat was assessed including such factors as amounts and types of vegetation, ease of movement between habitat characteristics and presence of limiting factors such as amount of available cover and number of snags present.

Section 1

Centered in the Core Reserve, this Section was found to be the area of highest quality and biodiversity. Including woodlots contiguous to Shawood Lake in the northeast corner, meadow contiguous to wetlands in the northwest portion, meadow in the central area contiguous to the Christmas Tree Farm property, with stands of older conifers and pond systems present, and wetlands to the southwest leading to flooded forest, Section 1 is the area of highest juxtaposition and interspersed of habitat types.

The size of these habitat types allows for some interior species while the interspersed of these factors provides ample habitat for most native edge species. The presence of a pond system surrounded by a forest system allows for intense intermixing of species with different habitat requirements.

The highest number of species were observed in Section 1. Observations include wetland, meadow, old growth, low canopy, predator and scavenger species. The highest number of mammal and avian species were identified here with much evidence of reproduction and population success. (See Appendices in a document file at the City of Novi's Department of Planning and Community Development for worksheets, species inventories and wildlife sighting lists.)

Section 1 was also important as a corridor connecting Section 3 to Section 2. With the CSX railroad tracks and river leading to Section 3, animals have ample opportunity for movement through Section 1 to the lake systems of Section 2. Even though Section 1 is bordered only to the south by development, extensive human intrusion was observed. Trails exist throughout the area and are large enough to be used by off road recreational vehicles. Evidence of hunting and camping are also present.

Trails found in the northeast of this Section provide opportunities to observe wetland, woodland and meadow species of birds. Trails leading north from the meadow through the areas of shrub scrub with low cover and no true canopy, to woodlots stretching east to Shawood Lake could provide optimum birding activities if restricted to hikers alone.

In the central meadow, trails extending from the Christmas Tree Farm property along older stands of conifers to the pond system would provide observations of species seldom seen in cities or subdivisions. Paths could provide information about species and viewing sites which represent different habitat types.

Continuation of high human activity and development in this area will degrade the habitat quality, reducing biodiversity. However, proper management of this area can result in a productive coexistence. The stability of this area is apparent in the high number of species present despite the current intense human intrusion. Because of this stability, Section 1 should be considered as the highest quality area in regards to educational, aesthetic, and recreational humans uses. By regulating and limiting human uses in this area, habitat quality will remain stable or possibly increase, supporting successful wildlife populations.

Section 2

Species of Section 2 consist mainly of those dependant on wetland and lake systems for genetic success. Woodlots in the northeast of this Section contain trails leading from the Lakeshore Park in the northeast corner, south and west to Section 1. Attempts have been made to restrict motorcycle use leading from the Park in the form of brush piles obstructing trail entrances. Also apparent are hunting activities due to the presence of tree stands in the flooded forest areas near the Park.

With increased restrictions on trails in this Section, recreational demands could be met. Looping path systems of different lengths could provide park visitors with an educational and healthy alternative. By intermixing exercise as well as wildlife viewing opportunities, appreciation for these natural resources can reach individuals normally overlooked.

Development to the north and south of Section 2 has resulted in transforming most of the remaining woodlots into backyard habitat. By educating homeowners on simple steps which can be taken to optimize backyard quality, those wildlife species which are tolerant of humans can flourish.

By incorporating bird feeders and houses as well as nesting boxes and salt blocks to name a few, into backyard habitat areas could make bird and wildlife species rarely seen a normal occurrence. Alternative landscaping could also provide key plant species for food and cover and would greatly increase the habitat. Even slight changes, such as providing a source of water can increase backyard wildlife by allowing the woodlots to be used as movement corridors.

Section 3

Species in Section 3 consist of woodland, wetland, meadow and transient species due to corridors provided by the railroad tracks and the river bordering Section 1 to the east. Because of this movement and high recreational opportunities to the east, Section 3 may be best served as a wildlife refuge, with limited human intrusion.

Some secluded trails exist between the streams east of the CSX railroad tracks. By restricting human uses, wildlife can translocate to this Section during critical times such as mating season. Because of the multitude of similar habitat types between this and other Sections, wildlife translocation is possible without loss of preferred habitat. Providing refuge areas for wildlife is essential if the stability of the Core Reserve is to be maintained.

Some habitat alterations may be necessary to maintain biodiversity in Section 3 to levels comparable to Section 1 and Section 2. One keynote species identified here is the brown headed cowbird (*Molothrus ater*). This parasitic edge species is often an indicator to habitat degradation. The presence of this species in the treelines adjacent to the railroad tracks and the stream to the north, suggests necessary alternatives such as cuttings in isolated areas and plantings in areas to form contiguous woodlots and reduce the edge. This is one method which could improve habitat quality for the more desirable species.

Another area of consideration in Section 3 is the industrial property west of the railroad tracks. Effects of pollution should be considered, including soil, air, water and noise. Low biodiversity to the west of the railroad tracks may be a result of this type of human intrusion, as well as the isolation of this Section by the railroad itself. While movement here is possible, the size of the woodlot and human activity around it does not provide for interior species and may contribute to the success of detrimental species such as the cowbird.

GUIDELINES TO ECOLOGICAL LANDSCAPE PLANNING AND WILDLIFE CONSERVATION

There is a growing interest in the United States for wildlife conservation within both the Landscape Architecture and the Planning professions. Providing suitable conditions for plant and animal communities is a goal for landscapes which is now being pursued at every level of environmental planning and design. Ideally, every regional plan, urban general plan, and design for a city park or a backyard should included specific provisions for wildlife habitat. If Planners and Designers are to respond to this challenge there is a need to establish some approaches and a broad, useful conceptual basis for planning and design for wildlife (Lyle, 1987). As such there are various ways to utilize the information from the habitat surveys in Novi to achieve ecosystem management and integrated planning or these resources. Guidelines for ecosystem planning include:

1. **Site Level Design** and review (in sequential order).
 - a. Identify habitats and their relative value.
 - b. Identify habitats of threatened and endangered species.
 - c. Identify areas of important wildlife plant foods.

2. **Regional Level Design** and review (with above criteria).
 - a. Analyze adjacent land uses to individual project within City of Novi.
 - b. Analyze adjacent land uses in adjacent communities.

Mechanisms For Implementation

One such strategy is the **development of landscape linkages and wildlife corridors** in order to maintain the remaining natural movement passages and reconnect the major habitat islands as they formally occurred in the natural landscape. This can be accomplished by two methods:

1. The recognition of those vital linkages per the field work of this study.

2. The preservation and enhancement of these areas.
 - a. By review and preservation during proposed development.
 - b. By the purchase of these areas in easements.
 - c. Enhancement by plant materials to buffer and supplement existing natural vegetation.
 - 1.) Incorporate provisions for credit for landscape requirements and woodlands and wetlands replacements in existing ordinances.
 - 2.) Add lists of plant materials to those Ordinances which could be used in these instances. (See Appendices)

The most expedient means to accomplish individual site-level design and review and incorporate a reasonable regional-level design and review is by **modifying existing ordinances**. Specifically the City of Novi's existing Woodlands and Wetlands Ordinances.

SUPPLEMENTS TO EXISTING ORDINANCES

Provisions could be adapted to current Ordinances for the City of Novi. Specifically the Wetlands and Woodlands Ordinances could be modified using the following information.

Wetland Habitat Rating System

When an application for a permit is filed, the wetland being considered should be surveyed and placed in the appropriate classification. This classification shall be set as

Type A, Type B or Type C. Type A wetland shall be considered highly valuable, with type C being of lesser importance. The categories from Table 1 of the Wildlife Reserves and Corridors in the Urban Environment, the National Institute for Urban Wildlife, are defined as follows:

Type A (high quality with greater species diversification)

Type A wetland consist of two (2) or more of the following:

1. Five (5) or more types of wetland habitat,
2. Thirty (30) or more types of wetland plant species known as hydrophytes,
3. Fifteen (15) or more types of wetland animal species,
4. A wetland containing an endangered species as defined in the Endangered Species Act of 1974 (Act 203 Public Acts 1974, as amended) enforced by the Michigan Department of Natural Resources.

Type B (moderate quality with average species representation)

Type B wetland consist of two (2) or more of the following:

1. Two (2) to four (4) types of wetland habitat,
2. Fifteen (15) to twenty-nine (29) types of wetland plant species known as hydrophytes,
3. Five (5) to fourteen (14) types of wetland animal species.

Type C (low quality with poor species representation)

Type C wetland consist of two (2) or more of the following:

1. One (1) type of wetland habitat,
2. Fourteen (14) or less types of wetland plant species known as hydrophytes,
3. Four (4) or less types of wetland animal species.

The rating system and survey shall also take into consideration wildlife reserves and movement corridors in determining wildlife habitat value. The survey shall use current research and data in determining sizes and habitat types relating to the biological diversity needed to maintain viable wildlife populations.

After the survey is conducted and the wetland rating is determined, the wetland type category is used to establish the **wetland retention percentage** which shall be undisturbed and what buffer zones are to be maintained. The following minimum requirements for the categories listed in Section 1-8.

A. CRITICAL CORE RESERVES - Wetlands of 200 acres or more.

1. Type A wetlands 100 percent retained with a 100 foot buffer.
2. Type B wetlands 100 percent retained with a 50 foot buffer.
3. Type C wetlands 100 percent retained with a 25 foot buffer.

B. CORE RESERVES - Wetlands of 100 acres to 199 acres.

1. Type A wetlands 100 percent retained with a 75 foot buffer.
2. Type B wetlands 100 percent retained with a 50 foot buffer.
3. Type C wetlands 100 percent retained with a 25 foot buffer.



C. Wetlands of 50 acres to 99 acres.

1. Type A wetlands 100 percent retained with a 60 foot buffer.
2. Type B wetlands 100 percent retained with a 40 foot buffer.
3. Type C wetlands 100 percent retained with a 20 foot buffer.

D. Wetlands of 20 to 49 acres.

1. Type A wetlands 100 percent retained with a 50 foot buffer.
2. Type B wetlands 100 percent retained with a 35 foot buffer.
3. Type C wetlands 100 percent retained with a 20 foot buffer.

E. Wetlands of 10 to 19 acres.

1. Type A wetlands 100 percent retained with a 40 foot buffer.
2. Type B wetlands 100 percent retained with a 30 foot buffer.
3. Type C wetlands 100 percent retained with a 20 foot buffer.

F. Wetlands of 5 to 9 acres.

1. Type A wetlands 100 percent retained with a 30 foot buffer.
2. Type B wetlands 100 percent retained with a 25 foot buffer.
3. Type C wetlands 100 percent retained with a 20 foot buffer.

G. Wetlands of 2 to 5 acres.

1. Type A wetlands 100 percent retained with a 20 foot buffer.
2. Type B wetlands 50 - 100 percent retained with a 10 foot buffer.
3. Type C wetlands 0 - 100 percent retained with zero buffer.

Woodland Habitat Rating System

When an application for a permit is filed, the woodland being considered should be surveyed and placed in the appropriate classification. This classification shall be set

as Type A (high quality with greater species diversification); Type B (moderate quality with average species representation); or Type C (low quality with poor species representation). Type A woodland shall be considered highly valuable, with Type C being of lesser importance.

After the survey is conducted and the woodland rating is determined the woodland type category is used to establish the Woodlands retention percentage. This is the percentage of woodland which shall be undisturbed and what buffer zones are to be maintained. The categories are defined from Table 1 of Wildlife Reserves and Corridors in the Urban Environment, the National Institute for Urban Wildlife, and the following minimum requirements for the categories listed need to be met as follows:

A. CRITICAL CORE RESERVES - Woodlands of 200 acres or more.

1. Type A woodlands 100 percent retained with a 100 foot buffer.
2. Type B woodlands 100 percent retained with a 75 foot buffer.
3. Type C woodlands 100 percent retained with a 50 foot buffer.

B. CORE RESERVES - Woodlands of 100 to 199 acres.

1. Type A woodlands 100 percent retained with a 75 foot buffer.
2. Type B woodlands 75 - 100 percent retained with a 50 foot buffer.
3. Type C woodlands 50 - 100 percent retained with a 25 foot buffer.

C. Woodlands of 50 - 99 acres.

1. Type A woodlands 100 percent retained with a 60 foot buffer.
2. Type B woodlands 50 - 100 percent retained with a 40 foot buffer.
3. Type C woodlands 0 - 50 percent retained with a 20 foot buffer.

D. Woodlands of 20 to 49 acres.

1. Type A woodlands 75 - 100 percent retained with a 50 foot buffer.
2. Type B woodlands 50 - 75 percent retained with a 30 foot buffer.
3. Type C woodlands 0 - 50 percent retained with a 10 foot buffer.

E. Woodlands of 10 to 19 acres.

1. Type A woodlands 50 - 100 percent retained with a 20 foot buffer.
2. Type B woodlands 25 - 50 percent retained with a 10 foot buffer.
3. Type C woodlands 0 - 25 percent retained with zero buffer.

F. Woodlands of 5 to 9 acres.

1. Type A woodlands 25 - 75 percent retained with a 20 foot buffer.
2. Type B woodlands 25 - 50 percent retained with a 10 foot buffer.
3. Type C woodlands 0 - 25 percent retained with zero buffer.



G. Woodlands of less than 5 acres.

1. Type A woodlands 25 - 50 percent retained with a 20 foot buffer.
2. Type B woodlands 0 - 50 percent retained with a 10 foot buffer.
3. Type C woodlands 0 - 25 percent retained with zero buffer.

A woodland containing an endangered species as defined in the Endangered Species Act of 1974 (Act 203 Public Acts 1974, as amended) enforced by the Michigan Department of Natural Resources, shall be given a Type A classification.

The rating system and survey shall also take into consideration wildlife reserves and movement corridors in determining wildlife habitat value. The survey shall use current research and data in determining sizes and habitat types relating to the biological diversity needed to maintain viable wildlife populations.

Method of Review of Use Permit Application for both wetland habitat and woodlands habitat review:

- A. Whenever a wetland or woodland permit is required, a wildlife habitat inspection shall be conducted by the City's "Wildlife Consultant" to determine the quality of habitat, species diversity and densities, and associated wildlife movement corridors, to review the proposed activity in light of the purposes of this Ordinance.
- B. After it is determined by the Planning Director which the application is complete, the Planning Director will authorize a field investigation by the City's Wildlife Consultant to verify and identify the wildlife habitat and related movement corridors, and review the proposal in light of the purpose and review standards of this Ordinance, and report on the impact of the project. The receipt of the application shall constitute permission from the owner to complete an on-site investigation. Petitioner will pay fees as established in Section _____ . (fees for the wildlife habitat inspection would be similar to those charged for wetland and woodland inspections, and passed on to the applicant)

Fees

Applications for a wetlands or woodland use permit under this Ordinance shall be accompanied by a non-refundable administrative application fee in an amount specified by the resolution of the City Council. In addition, if required, an applicant shall pay an additional escrow fee in an amount determined by the Department of Planning and Community Development to pay for the cost of outside consultant(s) who will be retained by the City in connection with the review of the application. In the event the cost of the services exceeds the amount of the escrow fee, the applicant shall pay the deficiency to the City prior to the issuance of a use permit. A denial of an application for a use permit

shall not affect the applicant's obligation to pay the escrow fee provided for in this Section.

Use Permit Conditions of Issuance

- A. *Attach any reasonable conditions considered necessary to ensure which the intent of this Ordinance will be fulfilled, to minimize or mitigate damage or impairment to, encroachment upon, or interference with the natural resources and processes within the protected wetlands, woodlands, wildlife movement corridors, or buffer areas.*

MECHANISMS FOR GREATER PROTECTION

Additional means are needed to preserve those areas of importance to the City of Novi's Wildlife habitat. Those areas being the Core Reserves, large acreage parcels and Linkages. Some of these which involve the obtainment of these key areas although they have been previously mentioned in other studies for the City of Novi deserve to be brought forward once more.

Innovative Approaches To Providing Wildlife Reserves

A number of methods are available for individuals, private and public organizations to acquire and protect natural areas which may be valuable as corridors and reserves in the urban environment. In many instances there are tax incentives to encourage the landowner to set aside tracts of land for conservation purposes, particularly when the land which is preserved is recognized as having value for the public. Among the approaches which have been used to establish corridors and reserves in metropolitan areas:

- 1) Purchase land outright;
- 2) Obtain land as a donation by the owner;
- 3) Trade for more ecologically-desirable land;
- 4) Protect the land through a voluntary registration agreement with the owner;
- 5) Protect the land with a legally-binding management agreement with the owner;
- 6) Secure land as a conservation easement;
- 7) Protect the land by law for its ecological importance, such as critical habitat for threatened or endangered species, or those protected by wetland ordinances;

- 8) Protect the land by law for its historical or aesthetic significance;
- 9) Obtain land as mitigation for development elsewhere;
- 10) Set aside as open space as a requirement of development;
- 11) Regulate the land with zoning requirements; and
- 12) Obtain land by other means (e.g., purchase with monies from a real estate transfer tax).

Development and Lot Sizes

Analysis has shown (Goldstein et al., 1981) that, by altering the shape of building lots (rectangular to triangular, cluster development, adjusted lot size, etc.) larger patches of woody vegetation more favorable to wildlife can be effectively clumped on private lots. Cluster development offers greater flexibility for maintaining some of the natural land features and habitats than does traditional type development. Lot sizes, setback requirements, and road rights-of-way are typically reduced, and development is grouped on the most buildable portions of a site with the remainder preserved as open space. Compared to traditional lot development, clustering generally allows the same overall building density on a site while preserving additional valuable habitat.

The City of Novi's options within the Zoning Ordinance such as adjusted lot size, cluster and preservation serve to prevent the loss of wildlife habitat by grouping development areas together and leaving large contiguous areas of habitat undeveloped. Research shows that development and intrusion into natural areas has a detrimental effect on wildlife numbers which multiplies the loss as the areas become smaller. Identification of core reserves (critical habitats), and the development of landscape linkages and wildlife corridors to and from these areas will help eliminate the consequences of habitat fragmentation. The use of these options recognizing where the critical habitat areas are within the City is a needed and necessary part of wildlife preservation.

WILDLIFE MANAGEMENT PLAN

The Problem

Social trends, such as increased urbanization, increased population of certain wildlife species, and the progressive loss of woodlands and farmlands to development is increasing the chance for conflicts between humans and wildlife. As development occurs:

1. Less land is available to wildlife. Natural habitat, like older woodlots with hollow trees, may not be readily available for wild animals. The lack of traditional den sites may cause wild animals to use chimneys and attics as alternate shelter or den sites (this is common for species such as squirrels and raccoons.)

2. Reclusive species lose habitat, while opportunistic species, such as raccoons, build populations to unnaturally high densities.
3. Many people move from the city out into the country or a newly developed area, often bringing with them an unfamiliarity with wild animals and their habits.

These consequences of development have combined to make the problem of "nuisance" wildlife a major concern of wildlife management personnel.

"Nuisance" Wildlife

The term "nuisance" means different things to different people. For some, the mere presence of a red fox in the woods behind their house constitutes an intolerable situation. For others, glimpsing the same animal would be a thrilling and rewarding experience. However, a perfect balance between man and nature is seldom attainable. As long as man wishes to coexist in an area with wild animals, conflicts (some real and some unfounded) will arise.

Education can play an important role in nuisance recognition and resolution. A wild animal which poses no real threat to the safety of the public, livestock, crops or property should not be viewed as a nuisance simply because it exists. A public which is knowledgeable about the habits and life history of wild animals is better equipped to recognize and solve nuisance problems.

The Role Of Hunting And Trapping In Nuisance Control

Many nuisance situations are the result of high populations of a particular species. In the City of Novi, regulated harvest during the hunting and trapping seasons is not a practical or desirable method to reduce populations to a level at which animal-caused damage is tolerable. Hunting and trapping alone do not represent adequate solutions under the following circumstances:

1. If damage is extensive and occurs well outside of the normal hunting or trapping seasons.
2. If damage is the result of an individual animal rather than the overabundance of an entire population.
3. If problems are being caused by species that are normally not harvested during hunting and trapping season, either due to lack of harvest pressure (i.e. skunk), or the fact that no open season exists (i.e. bats).
4. If problems are occurring in highly urbanized areas where hunting and/or trapping are not practical or permitted.

In such situations where regular season harvests are not a practical means of controlling animal damage, a more structured approach to the problem is required.

The Michigan Department of Natural Resources (DNR) Wildlife Bureau receives literally thousands of calls each year from residents who have problems with wild animals. Some of these complaints can be resolved over the telephone, but the number of those that cannot exceeds the capabilities of the DNR's staff.

Figure 8 contains a checklist by Wildlife Management Services and Figure 9 is a diagram of a typical yard and how to protect it from "nuisance" animals. (Also by Wildlife Management Services). The following recommendations on wildlife damage control prevention can help eliminate or reduce the likelihood of nuisance animal problems:



Typical problem areas:

1. Pipes, cables and wires that enter walls
 - use caulk, steel wool, sheet metal or cement to seal.
2. Chimney covers should meet NFPA 211 and BOCA codes.
3. Screen vents, holes and other construction gaps with hardware clothe.
4. Cover garbage cans.
5. Keep outbuildings closed.
6. Stack firewood off ground and away from buildings.
7. Thin or remove ivy from buildings or other dense vegetation that is adjacent to the building.
8. Pick up fruits and nuts.
9. Do not leave pet food out.
10. Do not accumulate trash.
11. Provide tight covers for crawl space, repair damaged ventilation screens.
12. Look for holes wherever roofs overlap.
13. Weatherstrip all doors.
14. Check storage areas for evidence of rodents.
15. Close all openings larger than 1/4 inch.

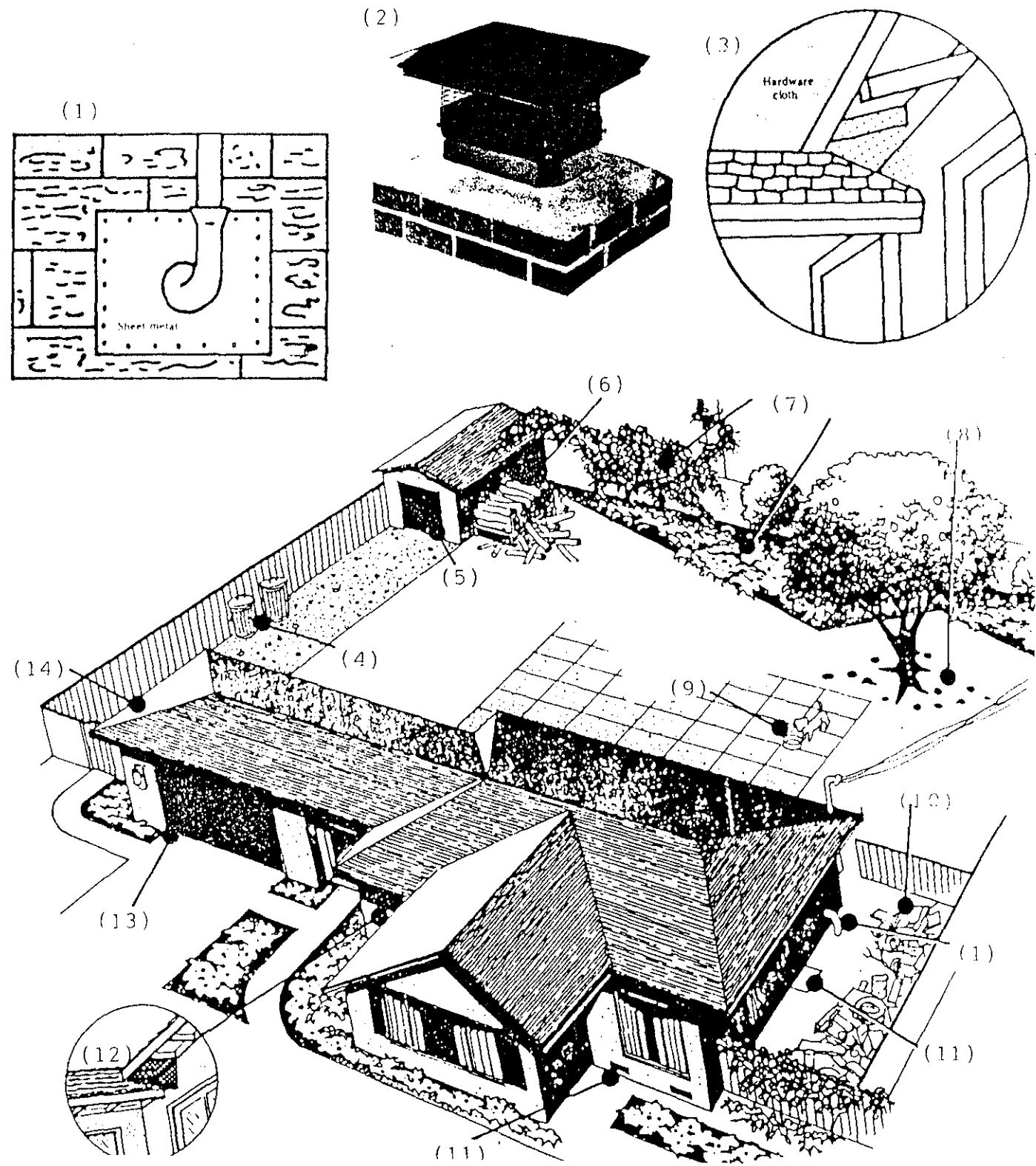


Figure 8: Wildlife Damage Prevention Tips by Wildlife Management Services.

Figure 9: Exclusion and Prevention of Animal Entry diagram by Wildlife Management Services.

WILDLIFE DAMAGE PREVENTION TIPS

- Use sturdy metal or tough plastic garbage cans with tight lids. Secure the cans so that they cannot be knocked over. Put your garbage out the morning of pick-up. Do not put trash out in plastic garbage bags.
- Do not leave pet food outdoor at night. Do not feed wild animals - they are not pets.
- screen all exterior accesses to buildings, including attic fans, and areas around soffits and vents. Use 1/2 inch mesh hardware clothe to exclude most animals, 1/4 inch mesh for mice or bats.
- Screen or cap chimneys with approved covers. Check the flue and smoke shelf with a flash light to make sure no animals are trapped inside before installing.
- Fill holes around foundations. Screen crawl spaces and cover window wells.
- Trim vegetation to prevent it from covering foundation walls. Allow two feet between the vegetation and building to lessen cover.
- Trim tree limbs away from roof to limit access. Reduce attractions - pick up fruits and nuts that have fallen from nearby trees.
- Be sure there are no animals "locked in" when you secure openings. Be aware of the times of year when young animals may be present.

- * Use sturdy metal or tough plastic garbage cans with tight lids. Secure the cans so that they cannot be knocked over. Put your garbage out the morning of trash pick-up whenever possible. Do not put trash out in plastic garbage bags. If you must use plastic bags and are experiencing problems with animals tearing the bags, pour in 1/4 cup of ammonia before tying the bags shut. Don't accumulate trash.
- * Do not leave pet food outdoors at night. Do not feed wild animals - they are not pets.
- * Screen all exterior accesses to buildings, including attic fans, and areas around soffits and vents. Use 1/2 inch mesh hardware-cloth to exclude most animals, 1/4 inch mesh for mice or bats.
- * Screen or cap chimneys with approved covers (should meet NFPA 211 and BOCA codes). Check the flue and smoke-shelf with a flashlight to make sure no animals are trapped before installing.
- * Fill in holes around foundation walls. Screen crawl spaces and cover window wells.
- * Trim vegetation to prevent it from covering foundation walls. Allow two feet between the vegetation and buildings to lessen cover. Thin or remove ivy and dense vegetation.
- * Trim tree limbs away from the roof to limit access. Reduce attractions - pick up fruit and nuts which have fallen from trees.
- * Be sure there are no animals "locked-in" when you secure openings. Be aware of the times of year when young animals may be present (usually April through July).
- * Pipes, cables and wires which enter walls sometimes have small gaps around them. Use caulk, steel wool, sheet metal or cement to seal openings.
- * Stack firewood off the ground and away from buildings.
- * Look for holes wherever roofs overlap.
- * Weatherstrip all doors.

Populations of the following species which are not in danger of over exploitation, may be trapped and relocated, or trapped and destroyed, with the proper permit, when such action is called for by a nuisance situation. These species are: fox, weasels, raccoons, skunks, opossums, woodchucks, muskrats, squirrels, gophers, English

sparrows, starlings, crows and feral pigeons. Control of damage by other wildlife should be undertaken only as authorized by a conservation officer.

The species for which permits are required cause relatively few nuisance problems which cannot be addressed during the regular hunting and trapping seasons. Included in this category are some of the more economically valuable furbearers (i.e., fox, muskrat, mink and beaver) and other species, such as coyote which may require specialized trapping techniques.

On the permit, the DNR conservation officer will specify which methods, if any, may be used to control the offending animal. In some cases the officer may wish to visit the site with the permittee before issuing a special permit.

Conservation officers may not issue permits for some species. Problems caused by protected species (i.e., deer) or migratory birds (i.e., ducks, Canada geese) will be handled on a case by case basis by the DNR personnel. Statutes and regulations are currently in place which govern the DNR's deer damage control policy.

Methods Of Control and Disposition

When faced with a nuisance wildlife situation the permittee and the landowner must decide upon one of the following courses of action:

1. Live with the problem. Many calls come from people who regard certain animals as nuisances even though the "offending" animal has not caused any damage. The most common reason for these calls is a concern over potential damage to property, crops, livestock, or a potential threat to the safety of humans and pets. In many situations, education and reassurance will alleviate unwarranted concerns.
2. Eliminating the offending animal's habitat. Man's activities often create habitat for animals which eventually become a problem. Piles of brush, wood, rocks, dense tall grassy and shrub areas provide cover for many species of wildlife. Better management of these areas often reduces their attractiveness to wildlife.
3. Alter the situation so that the potential for damage is reduced. In many cases this option will provide the best long-term solution to a nuisance problem. Exclusions, such as fencing, screening and repairs to existing vents, woodwork, chimneys or foundations are very effective at keeping wild animals away from areas in which they are unwanted.
4. Remove the offending animal. For most of the species which can be handled with a DNR permit, box or cage type live traps are the devices recommended for capture, particularly in urban and suburban areas. The permittees should live trap and release nuisance animals unless the DNR determines that specific species be euthanized for health reasons.

If you have a problem which cannot be handled, consult your local telephone Yellow Pages directory under the "Pest Control" heading for companies that specialize in wildlife control.

The following recommendations should be followed when relocating captured animals:

1. The captured animal should be relocated in suitable habitat at least five miles, but within 10 miles, of the original capture site.
2. The animals should not be liberated in an area close to human dwellings which would result in a transfer of, rather than a solution to, the nuisance problem.
3. Animals should not be released upon private lands without the permittee first obtaining the landowner's permission.

Disposition Of Sick Animals

Many wildlife diseases are readily transmissible to a wide range of species, including humans and their pets. Because different diseases may exhibit similar symptoms, it is usually not possible to diagnose a disease simply by observing an animal's condition or behavior. Common symptoms of disease may include:

- 1) Lack of coordination
- 2) Lack of aggressiveness
- 3) Secretions from the nose, eyes or mouth
- 4) Weak, rapid or uneven respiration
- 5) Malnourishment
- 6) Local or general loss of muscle control
- 7) Loss of large patches of hair

Potential causes of these symptoms could include viral infections (i.e., distemper, rabies), bacterial infections (i.e., tularemia, leptospirosis) or parasite infestations (i.e., mange, roundworms). Poisoning or starvation may also cause animals to behave abnormally. Because the permittee often will know little more than which the animal is sick, he should handle such animals as little as possible, and then only with elbow-length rubber or disposable plastic gloves.

Any animal that exhibits symptoms of illness or disease should be taken to a licensed veterinarian or animal welfare agency for treatment, or shall be humanely euthanized. Sick animals shall not be released, furthering the spread of disease.

Animals Which Have Bitten

Any wild animal which has bitten any person must be submitted to the local county health department, or the Michigan Department of Public Health. The virology lab must receive the head of the animal intact and as fresh as possible. If the head cannot be

transported immediately, it should be refrigerated temporarily or packed in ice (not frozen). Under No Circumstances Should An Animal Which Has Bitten Someone, Or Is Suspected Of Having Rabies, Be Shot In The Head Or Relocated.

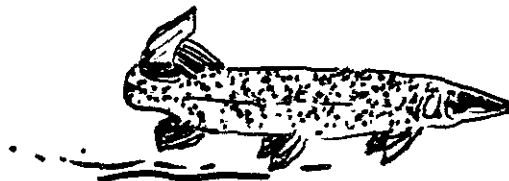
Other Sick Animals

Animals which are obviously sick, but have not bitten or been handled by humans, should be destroyed. Carcasses should be deposited in a licensed public landfill or buried deep enough to ensure that they will not be excavated by scavengers. Animals deposited in dumpsters for transport to landfills shall be double bagged in plastic.

EDUCATION

The education of the residents of the City of Novi as well as those which seek to develop within the City regarding the wealth of habitats and linkages in the City is important if an ecological system approach to wildlife and their habitat is to occur. Also education on the management and points delineated in the previous section need to be brought to the residents of Novi. A focus on the ecological data can breath new life into any conservation decisions. Some ideas for furthering wildlife education are as follows:

1. Volunteer monitoring of habitat could provide more detailed species lists of both plant and animal and deter and monitor vandalism.
2. Education of neighboring owners of the Core Reserve Areas, Key Linkages and the large acreage parcels. Included should be individual owners as well as Subdivision Associations.
3. Develop a easily understood brochure on wildlife management and steps residents can take to understand and mange conflicts with local wild life.
4. Present in a Town Meeting format and on Cable Television the findings of this study.
5. Utilize local groups such as the Girl Scouts and 4-H Clubs as a educational out reach.
6. Utilize various groups such as the Watershed Council and local High School groups, and the Lakes Area Residents Association to monitor these high quality areas. Utilize such groups for water quality testing, aquatic insect surveys, monitor quality and effects from areas which are developed.

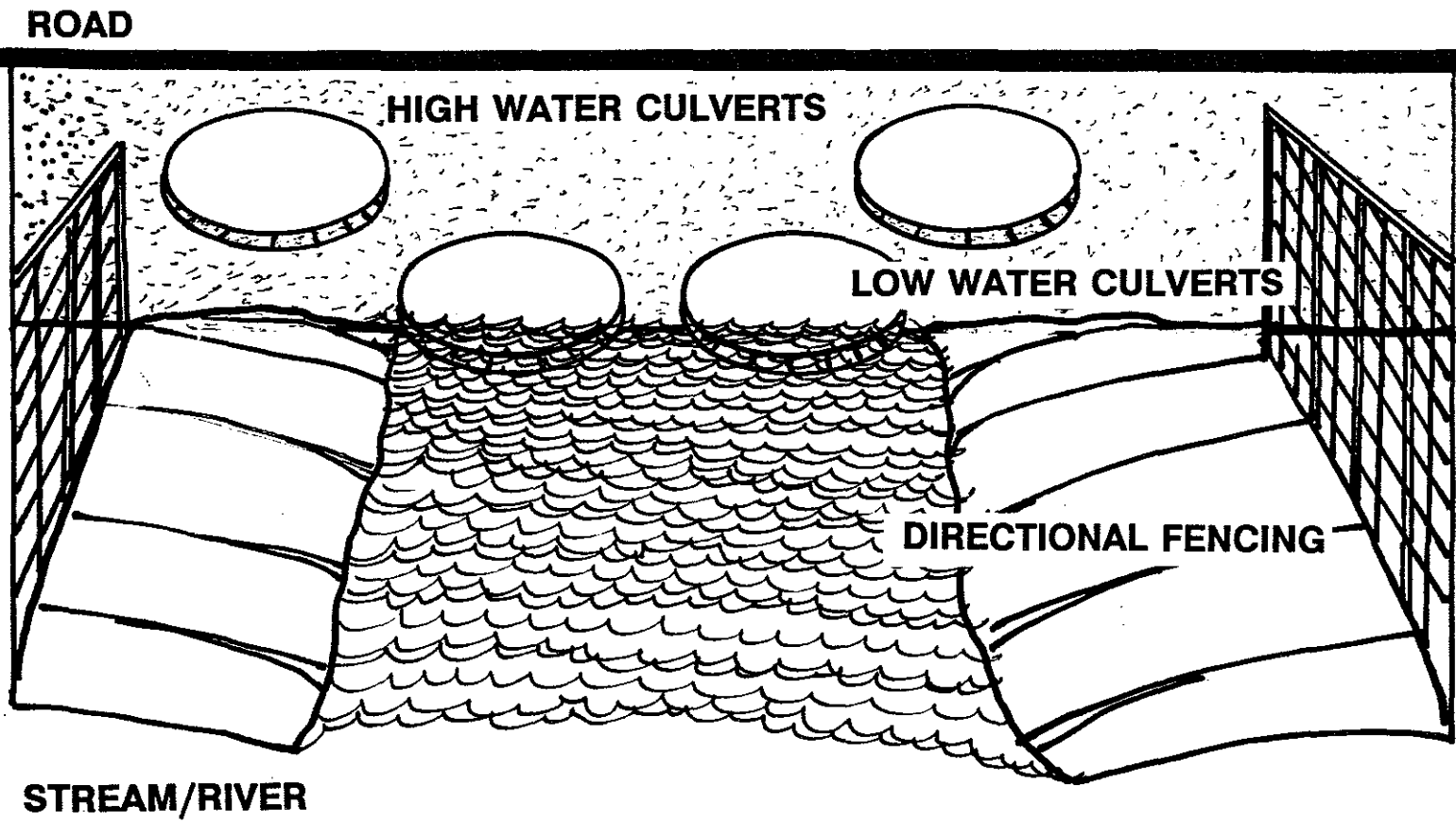


NEXT STEPS

While there are many areas which could be explored and encouraged as the next phase of this study, the following items are those which are recommended as "next steps":

- Include provisions for review of wildlife habitats into existing City of Novi's Woodlands and Wetlands Ordinances. Establish a method of review utilizing wildlife biologists as part of the City's consultant team.
- Identify those corridors and linkages where the enhancement and creation is necessary and desirable in an overall master plan which delineates within a set time-frame. Also include standards for signage and wildlife facilitative devices such as animal culverts.
- Produce specific landscape habitat plans for the corridors and linkages identified in an overall phased plan to revegetate and upgrade linkage areas which have been disturbed.
- Develop an implementation program to realize the landscape habitat plans the placement of signage indicating these areas of linkage and core reserves; "Wildlife Corridor Connections".
- Add provisions for the use of native plant materials which would support various wildlife species in the City's Landscape and Subdivision Ordinances to allow for revegetation and to promote landscaping with wildlife value in the specific areas identified as well as throughout the City.
- Add to the use and standards of existing Ordinances where applicable animal facilitative devices such as animal culverts (Figure 10), require these type of devices in all projects in areas designated as high quality, core reserve and main linkage areas.
- Provide standards for mitigation or any intrusion allowed into key areas.
- Proceed to establish Natural Resources Design Plan trails into areas of linkages and core reserves to provide a controlled means of access to and through these sensitive habitats.
- Produce a guide for residents to design their own wildlife-sensitive landscape.
- Put together a brochure and a poster presenting the conceptual results for the survey and final overall plan.

Figure 10: Wildlife Culvert, to make it safe for animals to cross under roadways.



WILDLIFE CULVERT

SUMMARY

The real issue at hand is whether the choice is made for these animals to survive, and whether the actions are taken necessary to alleviate the problems these animals face during their movement. These are the choices: allow these populations to dwindle away and accept the problems when they are not planned for, or develop strategies of conservation planning in concert with growth planning. Wildlife resources are barometers which reflect the health of the overall environment. It is crucial that steps be taken today to insure the environmental quality of tomorrow. The facts speak for themselves.

"If we expect future generations to take pride in America's natural heritage, we must act now to preserve this heritage while we still have the opportunity to do so. Creating and preserving these landscape linkages and wildlife corridors will greatly enhance the preservation of America's wildlife for the enjoyment of generations to come." (Harris, 1988).

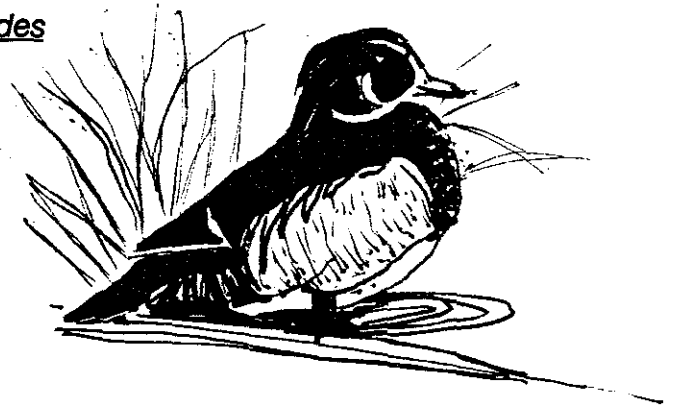
It is the hope of this study that having recognized the critical habitat areas within the City of Novi, which means to preserve, enhance and manage these areas and the wildlife within are implemented and that the future holds a place for wildlife as well as humans.



APPENDICES (Complete appendices are in a document file at the City of Novi in the Department of Planning and Community Development.)

Types of wetland plant species found in this region include but are not limited to the following:

American Elm, *Ulmus americana*
Angelica, *Angelica atropurpurea*
Arrowhead, *Sagittaria latifolia*
Arrow Arum, *Peltandra virginica*
Arrowwood, *Viburnum dentatum*
Balsam Fir, *Abies balsamea*
Bedstraw Bellflower, *Campanula aparinoides*
Birches, *Betula*
Bladderworts, *Utricularia*
Black Ash, *Fraxinus nigra*
Black Grass, *Juncus gerardi*
Blue Flag, *Iris versicolor*
Blue-joint, *Calamagrostis canadensis*
Bog Rosemary, *Andromeda gaucophylla*
Boxelder, *Acer negundo*
Bulrush, *Scirpus*
Burreed, *Sparganium*
Buttonbush, *Cephalanthus occidentalis*
Cardinal Flower, *Lobelia cardinalis*
Cattails, *Typha*
Cinnamon Fern, *Osmunda cinnamomea*
Common Pipewort, *Eriocaulon septangulare*
Common Winterberry, *Ilex verticillata*
Dwarf Raspberry, *Rubus pubescens*
Duckweeds, *Lemna*, *Spirodella*, *Wolffia*
Eastern Hemlock, *Tsuga canadensis*
Elderberry, *Sambucus pubens, canadensis*
Featherfoil, *Hottonia inflata*
Filamentous Algae, *Cladophora*
Fragrant Water Lily, *Nymphaea odorata*
Golden Club, *Orontium aquaticum*
Hackberry, *Celtis occidentalis*
Shagbark Hickory, *Carya ovata*
Highbrush Blueberry, *Vaccinium corymbosum*
Hornwort, *Ceratophyllum demersum*
Horsetails, *Equisetum*
Indian Cucumber Root, *Medeola virginiana*
Jewelweed, *Impatiens capensis*
Labrador Tea, *Ledum groenlandicum*
Lichens, *Cladonia*
Marsh Marigold, *Caltha palustris*



Maple, *Acer rubrum, saccharinum*
 Monkeyflower, *Mimulus ringens*
 Oaks, *Quercus bicolor, palustris*
 Pitcher Plants, *Sarracenia*
 Pickerelweed, *Pontederia cordata*
 Pondweeds, *Potamogeton*
 Purple Loosestrife, *Lythrum salicaria*
 Pussy Willow, *Salix discolor*
 Quillwort, *Isoetes*
 Red-osier Dogwood, *Cornus stolonifera*
 Reed Canary Grass, *Phalaris arundinacea*
 Rice Cut Grass, *Leersia oryzoides*
 River Birch, *Betula nigra*
 Riverweeds, *Podostemum*
 Royal Fern, *Osmunda regalis*
 Rushes, *Juncus*
 Sandbar Willow, *Salix exigua*
 Sawgrass, *Cladium jamaicensis*
 Sedges, *Carex*
 Silverweed, *Potentilla anserina*
 Slippery Elm, *Ulmus rubra*
 Speckled Alder, *Alnus rugosa*
 Spicebrush, *Lindera benzoin*
 Spineleaf Moss, *Atrichum undulatum*
 Stoneworts, *Chara*
 Sweetflag, *Acorus calamus*
 Sweetgum, *Liquidambar styraciflua*
 Tamarack, *Larix laricina*
 Tall Meadow Rue, *Thalictrum polygamum*
 Watercress, *Nasturtium officinale*
 Water Celery, *Vallisneria americana*
 Water Hypnum, *Hypnum*
 Water Milfoils, *Myriophyllum*
 Water Plantain, *Alisma subcordatum, plantago-aquatica*
 Water Smartweed, *Polygonum amphibium*
 Water Shamrock, *Marsilea quadrifolia*
 Water Shield, *Brasenia schreberi*
 Water Willow, *Justicia americana*
 Green Ash, *Fraxinus pennsylvanica*
 Wild Rice, *Zizania aquatica*
 Witch-hazel, *Hamamelis virginiana*
 Yellow Flag, *Iris pseudacorus*
 Yellow Pond Lily, *Nuphar variegatum*
 Yellow Water Buttercup, *Ranunculus flabellaris*

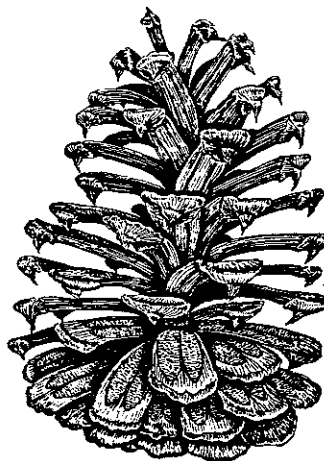
For detailed list of Wetland Vegetation see National List of Plant Species That Occur In Wetlands For USF & WS Region 3 by Resource Management Group, Inc. P.O. Box 487 Grand Haven , Michigan 49417.

Types of Woodland species found in this region include but are not limited to (from Brewer 1991 and Harker 1993):

UPLAND BEECH MAPLE WOODLANDS

TREES;

Sugar Maple, *Acer saccharum*
American Beech, *Fagus americana*
Northern Red Oak, *Quercus rubra*
Tuliptree, *Liriodendron tulipifera*
Basswood, *Tilia americana*
Black Cherry, *Prunus serotina*
White Ash, *Fraxinus americana*
White Pine, *Pinus strobus*
Shagbark Hickory, *Carya ovata*
Burr Oak, *Quercus macocarpa*



SHRUBS;

Canada Honeysuckle, *Lonicera canadensis*
Spicebush, *Lindera benzoin*
Red Elderberry, *Sambucus pubens*
Flowering Dogwood, *Cornus florida*
Eastern Leatherwood, *Dirca palustris*
Eastern Hop-hornbeam, *Ostrya virginiana*
Maple-leaf Viburnum, *Viburnum acerifolium*

HERBACEOUS UNDERSTORY;

Solomon's Seal, *Polygonatum biflorum*
Painted Trillium, *Trillium undulatum*
Wild Sasaparilla, *Aralia nudicaulis*
Lady's Slipper, *Cypripedium spp.*
Spotted Wintergreen, *Gaultheria procumbens*
Jack-in-the-pulpit, *Arisaema triphyllum*
Canada Wild Ginger, *Asarum canadense*
Pennsylvania Sedge, *Carex pennsylvanica*
Broad-leaf Enchanter's Nightshade, *Ciccaea lutiana*
Beechdrops, *Epifagus virginiana*
American Trout-lily, *Erythronium americanum*
May-apple, *Podophyllum peltatum*
Large-flower Wakerobin, *Trillium grandiflorum*

UPLAND OAK HICKORY WOODLANDS

TREES;

Northern Red Oak, *Quercus rubra*
Black Oak, *Quercus velutina*

Northern White Oak, *Quercus alba*
Pignut Hickory, *Carya glabra*
Mockernut Hickory, *Carya alba*
Shagbark Hickory, *Carya ovata*
Burr Oak, *Quercus macrocarpa*
Bitternut Hickory, *Carya cordiformis*
Sassafras, *Sassafras albidum*
Hop-hornbeam, *Ostrya virginiana*
White ash, *Fraxinus americana*
Black Walnut, *Juglans nigra*
Eastern White Pine, *Pinus strobus*
Scarlet Oak, *Quercus coccinea*

SHRUBS;

New Jersey Tea, *Ceanothus americanus*
American Hazelnut, *Corylus americana*
American Whith-hazel, *Hamamelis virginiana*
Blueberry, *Vaccinium corymbosum*
Mapleleaf Viburnum, *Viburnum acerifolia*

HERBACEOUS UNDERSTORY;

White Baneberry, *Actaea pachypoda*
Hairy Woodland Brome, *Bromus pubescens*
White Bear Sedge, *Carex albursina*
Indian Pipe, *Monotropa uniflora*
Downy Yellow Violet, *Viola pubescens*
Wintergreen, *Gaultheria procumbens*
Wild Sasaparilla, *Aralia nudicaulis*
Pink Lady's-slipper, *Cypripedium acaule*

WETLAND WOODLANDS - (FLOODPLAIN AND SWAMP)

TREES;

Silver Maple, *Acer Saccharinum*
Red Ash, *Acer rubrum*
Green Ash, *Fraxinus pennsylvanica*
Eastern Cottonwood, *Populus deltoides*
Black Willow, *Salix nigra*
Eastern Sycamore, *Platanus occidentalis*
American Elm, *Ulmus americana*
Black Ash, *Fraxinus nigra*
River Birch, *Betula nigra*
Butternut, *Juglans cinerea*
Swamp White Oak, *Quercus bicolor*
American Basswood, *Tilia americana*
Pin Oak, *Quercus palustris*

SHRUBS;

American Elderberry, *Sambucus canadensis*
River Grape, *Vitis riparia*
Buttonbush, *Cephalanthus occidentalis*
American Hornbeam, *Carpinus caroliniana*
American Bittersweet, *Celastrus scandens*
Alternate-leaf Dogwood, *Cornus alternifolia*
Silky Dogwood, *Cornus amomum*
Spicebush, *Lindera benzoin*
Sandbar Willow, *Salix exigua*

HERBACEOUS GROUNDCOVER;

Green Dragon, *Arisaema dracontium*
Jewelweed, *Impatiens capensis*
Sweetflag, *Acorus calamus*
Ostrich Fern, *Matteuccia struthiopteris*
Turtlehead, *Chelone glabra*
Virginia Wild Rye, *Elymus virginicus*
Water Horehound, *Lycopus americanus*
Sensitive Fern, *Onoclea sensibilis*
Mad-dog Skullcap, *Scutellaria lateriflora*

PIONEER WOODLANDS

TREES;

Quaking Aspen, *Populus tremuloides*
Big-tooth Aspen, *Populus grandidentata*
Pin Cherry, *Prunus serotina*
White Pine, *Pinus strobus*
American Elm, *Ulmus americana*
Green Ash, *Fraxinus pensylvanica*

SHRUBS;

Chokeberry, *Aronia prunifolia*
Serviceberry, *Amelanchier spp.*
*Buckthorn, *Rhamnus carthartica, frangula*
*Honeysuckle, *Lonicera spp.*
*Privet, *Ligustrum spp.*

HERBACEOUS UNDERSTORY;

Bracken Fern, *Pteridium aquilinum*

* These plants are introduced species.

Types of animal species found in Michigan may include:

MAMMALS

Arctic Shrew, *Sorex arcticus*
Eastern Cottontail, *Sylvilagus floridanus*
Eastern Harvest Mouse, *Reithrodontomys humulis*
Beaver, *Castor canadensis*
Marsh Rabbit, *Sylvilagus palustris*
Marsh Rice Rat, *Oryzomys palustris*
Meadow Jumping Mouse, *Zapus hudsonius*
Meadow Vole, *Microtus pennsylvanicus*
Mink, *Mustela vison*
Muskrat, *Ondatra zibethicus*
Gold Field Mouse, *Peromyscus polionotus*
Pigmy Shrew, *Sorex hoyi*
Raccoon, *Procyon lotor*
Red Fox, *Vulpes fulva*
River Otter, *Lutra canadensis*
Smokey Shrew, *Sorex fumeus*
Snowshoe Hare, *Lepus americanus*
Southern Bog Lemming, *Synaptomys cooperi*
Southern Red-backed Vole, *Clethrionomys gapperi*
Star Nosed Mole, *Condylura cristata*
Striped Skunk, *Mephitis mephitis*
Virginia Opossum, *Didelphis virginiana*
Water Shrew, *Sorex palustris*
White-tailed Deer, *Odocoileus virginianus*
Woodland Jumping Mouse, *Napaeozapus insignis*



BIRDS

Alder Flycatcher, *Empidonax alnorum*
American Black Duck, *Anas rubripes*
American Bittern, *Botaurus lentiginosus*
American Coot, *Fulica americana*
American Crow, *Corvus brachyrhynchos*
American Goldfinch, *Carduelis tristis*
American Tree Sparrow, *Spizella arborea*
American Woodcock, *Philohela minor*
Bald Eagle, *Haliaeetus leucocephalus*
Bank Swallow, *Riparia riparia*
Barn Swallow, *Hirundo rustica*
Barred Owl, *Strix varia*
Belted Kingfisher, *Megaceryle alcyon*
Black-crowned Night-Heron, *Nycticorax nycticorax*

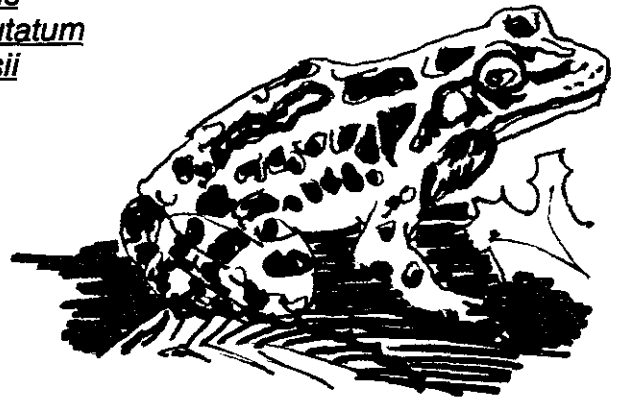
Black Tern, *Chlidonias niger*
 Blue-winged Teal, *Anas discors*
 Blue-winged Warbler, *Vermivora pinus*
 Bobolink, *Dolichonyx oryzivorus*
 Bonaparte's Gull, *Larus philadelphia*
 Brewer's Blackbird, *Euphagus cyanocephalus*
 Bufflehead, *Bucephala albeola*
 Canada Goose, *Branta Canadensis*
 Canada Warbler, *Wilsonia canadensis*
 Canvasback, *Aythya valisineria*
 Clay Colored Sparrow, *Spizella pallida*
 Cliff Swallow, *Petrochelidon pyrrhonota*
 Common Goldeneye, *Bucephala clangula*
 Common Grackle, *Quiscalus quiscula*
 Common Merganser, *Mergus merganser*
 Common Snipe, *Capella gallinago*
 Common Yellowthroat, *Geothlypis trichas*
 Cooper's Hawk, *Accipiter cooperii*
 Dark-eyed Junco, *Junco hyemalis*
 Double-crested Cormorant, *Phalacrocorax auritus*
 Downy Woodpecker, *Picooides pubescens*
 Eastern Bluebird, *Sialia sialis*
 Eastern Screech-Owl, *Otus asio*
 Gadwall, *Anas strepera*
 Glaucous Gull, *Larus hyperboreus*
 Golden-winged Warbler, *Vermivora chrysoptera*
 Great Blue Heron, *Ardea herodias*
 Great Horned Owl, *Bubo virginianus*
 Greater Scaup, *Aythya marila*
 Green-backed Heron, *Butorides striatus*
 Herring Gull, *Larus argentatus*
 Hooded Merganser, *Lophodytes cucullatus*
 Hooded Warbler, *Wilsonia citrina*
 Killdeer, *Charadrius vociferus*
 King Rail, *Rallus elegans*
 Le Conte's Sparrow, *Ammospiza leconteii*
 Least Bittern, *Ixobrychus exilis*
 Lesser Scaup, *Aythya affinis*
 Lincoln's Sparrow, *Melospiza lincolni*
 Loggerhead Shrike, *Lanius ludovicianus*
 Louisiana Waterthrush, *Seiurus motacilla*
 Mallard, *Anas platyrhynchos*
 Marsh Wren, *Cistothorus palustris*
 Merlin, *Falco columbarius*
 Mourning Warbler, *Oporornis philadelphia*
 Mute Swan, *Cygnus Olor*
 Nashville Warbler, *Vermivora ruficapilla*



Northern Cardinal, *Cardinalis cardinalis*
Northern Flicker, *Colaptes auratus*
Northern Harrier, *Circus cyaneus*
Northern Oriole, *Icterus galbula*
Northern Parula Warbler, *Parula americana*
Northern Rough-winged Swallow, *Stelgidopteryx ruficollis*
Northern Shrike, *Lanius excubitor*
Northern Waterthrush, *Seiurus noveboracensis*
Oldsquaw, *Clangula hyemalis*
Osprey, *Pandion haliaetus*
Pied-billed Grebe, *Podilymbus podiceps*
Prothonotary Warbler, *Protonotaria citrea*
Purple Martin, *Progne subis*
Redhead, *Aythya americana*
Red-bellied Woodpecker, *Melanerpes carolinus*
Red-breasted Merganser, *Mergus serrator*
Red-breasted Nuthatch, *Sitta canadensis*
Red-shouldered Hawk, *Buteo platypterus*
Red-winged Blackbird, *Agelaius phoeniceus*
Ring-billed Gull, *Larus delawarensis*
Ring-necked Duck, *Aythya collaris*
Ruddy Duck, *Oxyura jamaicensis*
Rufous-sided Towhee, *Pipilo erythrophthalmus*
Rusty Blackbird, *Euphagus carolinus*
Sandhill Crane, *Grus canadensis*
Savannah Sparrow, *Passerculus sandwichensis*
Sedge Wren, *Cistothorus platensis*
Short-eared Owl, *Asio flammeus*
Snow Bunting, *Plectrophenax nivalis*
Song Sparrow, *Melospiza melodia*
Sora, *Porzana carolina*
Spotted Sandpiper, *Actitis macularia*
Swamp Sparrow, *Melospiza georgiana*
Tufted Titmouse, *Parus bicolor*
Tree Swallow, *Iridoprocne bicolor*
Veery, *Catharus fuscescens*
Virginia Rail, *Rallus limicola*
Warbling Vireo, *Vireo gilvus*
White-throated Sparrow, *Zonotrichia albicollis*
Willow Flycatcher, *Empidonax traillii*
Wood Duck, *Aix sponsa*
Yellow-bellied Flycatcher, *Empidonax flaviventris*
Yellow-billed Cuckoo, *Coccyzus americanus*
Yellow-throated Vireo, *Vireo flavifrons*
Yellow Rail, *Coturnicops noveboracensis*

REPTILES & AMPHIBIANS

Bog Turtle, *Clemmys muhlenbergii*
Bullfrog, *Rana catesbeiana*
Carpenter Frog, *Rana virgatipes*
Central Newt, *Notophthalmus viridescens louisianensis*
Eastern Fence Lizard, *Sceloporus undulatus*
Eastern Garter Snake, *Thamnophis sirtalis sirtalis*
Eastern Hognose Snake, *Heterodon platyrhinos*
Eastern Mud Turtle, *Kinosternon subrubrum*
Eastern Ribbon Snake, *Thamnophis sauritus*
Four Toed Salamander, *Hemidactylium scutatum*
Fowler's Toad, *Bufo woodhousii woodhousii*
Gray Tree Frog, *Hyla versicolor*
Greater Siren, *Siren lacertina*
Green Frog, *Rana clamitans*
Hellbender, *Cryptobranchus alleganiensis*
Map Turtle, *Graptemys geographica*
Massasauga, *Sistrurus catenatus*
Mink Frog, *Rana septentrionalis*
Northern Cricket Frog, *Acris crepitans*
Northern Leopard Frog, *Rana pipiens*
Northern Red Salamander, *Pseudotriton ruber ruber*
Northern Water Snake, *Nerodia sipedon*
Painted Turtle, *Chrysemys picta*
Pickerel Frog, *Rana palustris*
Pig Frog, *Rana grylio*
Queen Snake, *Regina septemvittata*
Red-spotted Newt, *Notophthalmus viridescens viridescens*
River Frog, *Rana heckscheri*
Smooth Green Snake, *Opheodrys vernalis*
Snapping Turtle, *Chelydra serpentina*
Spotted Turtle, *Clemmys guttata*
Spring Peeper, *Hyla crucifer*
Spring Salamander, *Gyrinophilus porphyriticus*
Wood Turtle, *Clemmys insculpta*



Sample List of Plant materials for supplemental or buffer plantings for wildlife corridors and linkages

LITERATURE REVIEW FOR PERTINENT ORDINANCES

THE NATIONAL INSTITUTE FOR URBAN WILDLIFE

The National Institute for Urban Wildlife (NIUW) was organized in 1973 as an effective scientific and educational organization advocating the enhancement of urban wildlife values and habitat, and the wise use of all natural resources for benefit of people where they live, work and play. The NIUW is the only private national conservation organization with programs dealing exclusively with fish and wildlife in urban, suburban and developing areas. The NIUW has sponsored several national urban wildlife symposiums. These conferences are designed to focus the attention of urban planners, architects, wildlife biologists and others on the opportunities and need for wildlife and nature conservation in metropolitan environments.

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