Abstract: The United States Fish and Wildlife Service (Service) proposes to provide expanded hunting opportunities on the Shiawassee National Wildlife Refuge (Refuge) in Saginaw County, Michigan that are compatible with the purpose of the Refuge. This Draft Environmental Assessment outlines compatible hunting opportunities while providing non-hunting visitors with other priority public use opportunities (i.e., wildlife observation, wildlife photography, and environmental education and interpretation). Hunting opportunities for persons with disabilities would be provided through use of non-permanent specialized blinds to be located at pre-scouted and appropriate locations for such use. Parking lots and dead end roads provide appropriate access and distribute use across the Refuge. The general goals of the Refuge hunting program are to:

1. Provide the public with safe and enjoyable hunts that are compatible with the Refuge purpose.
2. Provide quality hunting opportunities that minimize conflict with other public use activities.
3. Provide the public with opportunities to hunt wildlife species allowed by the State of Michigan. Hunts will not adversely affect localized wildlife populations and will be consistent with the 1997 National Wildlife Refuge System Improvement Act and State of Michigan regulations.
4. Provide special opportunities for persons with disabilities and youth.

The Draft Environmental Assessment evaluates a No Action Alternative (current Hunt Program), a Preferred Alternative (expanded hunting opportunities to hunt deer, waterfowl, waterbirds, small game, turkey and furbearers) and a Modified Preferred Alternative (expanded hunting opportunities to hunt deer, waterfowl and waterbirds).

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

1.1 Background
The Shiawassee National Wildlife Refuge (NWR, Refuge) was established in 1953 under the legal authority of the Migratory Bird Conservation Commission under the Migratory Bird Conservation Act (16 U.S.C. § 715 - 715s) “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” Additional purposes designated under the Refuge Recreation Act (16 U.S.C. § 460k-l) are “... (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, [and] (3) the conservation of endangered and threatened species.”

The Refuge was established as a place where waterfowl from the Saginaw Bay, Michigan area could be held longer before migrating to southern Illinois. The Refuge is important for migrating waterfowl, including the Southern James Bay population of Canada goose and American black ducks; the production of waterfowl such as wood ducks, mallards and blue-winged teal; and for other wildlife. Previously, the Refuge allowed goose and deer hunting. Over the last 5 years, the Refuge received approximately 148 goose hunter visits and 1,076 deer hunter visits. The Refuge works with the Michigan Department of Natural Resources (DNR) to administer the hunts. The Refuge also hosted Youth Deer Hunts and Non-Ambulatory Deer Hunts.

1.2 Purpose
The United States Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to evaluate the effects associated with proposed changes to the current hunting regulations at the Shiawassee National Wildlife Refuge (Refuge). This EA is an update to the EA prepared for the 2001 Refuge Comprehensive Conservation Plan (CCP). This EA complies with the National Environmental Policy Act (NEPA) in accordance with the Council on Environmental Quality regulations (40 CFR 100-1509) and Department of Interior (516 DM 8) and Service (550 FW 3) policies.

The purpose of this EA is to evaluate the feasibility and potential impacts of implementing the Draft Shiawassee NWR Hunt Plan which would:

1. Continue to provide annual archery and firearms deer hunting opportunities within the framework of DNR and Refuge-specific regulations.
2. Continue to provide youth deer hunts.
3. Continue to provide non-ambulatory deer hunts.
4. Expand waterfowl hunting opportunities from “Canada goose only” to include other commonly hunted waterfowl species (as regulated by DNR), and shift the waterfowl hunting locations from former agricultural fields and Moist Soil Units to the rivers that flow through the Refuge and designated Refuge land on the periphery of the Refuge.
5. Provide youth waterfowl hunts.
6. Expand hunting opportunities to include small game (eastern fox squirrel, eastern gray squirrel, eastern cottontail, ring-necked pheasant, and American crow).
7. Expand hunting opportunities to include furbearers (raccoon, coyote, and red fox).
9. Expand hunting opportunities to include spring wild turkey.
10. Provide youth turkey hunts.
11. Permit feral hogs to be taken incidental to any refuge hunt by legal means for the target hunt species.

These expanded hunting regulations are described under the Draft Shiawassee NWR Hunt Plan. This EA is being completed to evaluate alternatives and assess the impacts of expanding hunting opportunities on the Refuge.

1.3 Need

The National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd et seq.) provides authority for the Service to manage the Refuge and its wildlife populations. In addition it declares that compatible wildlife-dependent public uses are legitimate and appropriate uses of the Refuge System that are to receive priority consideration in planning and management. There are six wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. It directs Refuge Managers to increase recreational opportunities including hunting on National Wildlife Refuges when compatible with the purposes for which the Refuge was established and the mission of the National Wildlife Refuge System.

In addition, the National Wildlife Refuge Administration Act of 1966 as amended in the Refuge Improvement Act of 1997 states in Section 2, "When managed in accordance with principles of sound fish and wildlife management and administration, fishing, hunting, wildlife observation and environmental education in national wildlife refuges have been and are expected to continue to be generally compatible uses.” Further, one of the goals of the National Wildlife Refuge System is to provide refuge visitors with high quality, safe, wholesome and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the refuge was established.

The Secretary of the Interior released Secretary Order 3347 (3/2/2017) and 3356 (9/15/2017) which both aim to increase outdoor recreation opportunities, including hunting. Specifically in Secretary Order 3356, bureaus were asked to amend management plans to include or expand hunting to the extent practicable under law.

The expansion of hunting opportunities at Shiawassee NWR will allow Refuge staff to manage wildlife populations at acceptable levels, provide enhanced wildlife-dependent recreational opportunities for the public, and promote a better understanding and appreciation of Refuge habitats and their associated wildlife resources. Implementation of the proposed actions will be consistent and compatible with the Refuge Recreation Act, Refuge Administration Act, and the Environmental Assessment for the Shiawassee NWR CCP.
1.4 Decisions That Need To Be Made
This EA is being prepared to evaluate the alternatives and environmental consequences associated with expanding hunting opportunities at Shiawassee NWR. Three alternatives are presented in this document:

- **Alternative 1 - No Action Alternative**
  Allow Refuge areas to be hunted using existing regulations and locations. Continue annual hunting opportunities for white-tailed deer and Canada goose in current hunting zones.

  Expand hunting on the Refuge to include new species (e.g., ducks, coot, wild turkey, small game, furbearers, feral hog) and new zones as described in the 2017 Draft Shiawassee NWR Hunt Plan.

- **Alternative 3 – Modified Preferred Alternative**
  Expand hunting on the Refuge to include new waterfowl species, waterbirds and feral hog and new hunting zones, but excludes the hunting of small game species, furbearers and turkey as proposed in the 2017 Draft Shiawassee NWR Hunt Plan.

The Regional Director, U. S. Fish and Wildlife Service, Bloomington, Minnesota, is the official responsible for determining the action to be taken in the proposal by choosing a proposed action (preferred alternative). The Regional Director must also determine whether the selected alternative has a significant impact on the quality of the human environment, thus requiring the preparation of an Environmental Impact Statement (EIS).

CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES
This section describes how the alternatives were formulated and eliminated from further study, describes each alternative, and identifies the preferred alternative. The remainder of the EA will evaluate the environmental consequences of the three proposed alternatives on the Refuge.

Factors considered in the development of the alternatives were:
1. Compatibility with the purpose of the Refuge and mission of the National Wildlife Refuge System.
2. Protecting the natural resources of the Refuge (maintaining healthy populations of wildlife, maintaining healthy habitats and reducing potential disturbance of wildlife).
3. Balancing the demands and expectations of public use with concerns for safety.
4. Adhering to the requirements and guidance provided in establishing legislation, such as the Migratory Bird Conservation Act.

2.1 Alternatives Eliminated From Detailed Study

2.1.1 No Hunting
An alternative that would have closed the Refuge to all hunting was not considered for detailed analysis because:
a) The Refuge Comprehensive Conservation Plan (CCP) and Finding of No Significant Impact (FONSI) determined hunting was a compatible and appropriate future use of the Refuge.

b) A No Hunting Alternative would conflict with the 1997 National Wildlife Refuge System Improvement Act which mandates hunting opportunities be provided when feasible and compatible.

c) Hunting is a tradition in Saginaw County and Michigan.

d) Hunting is a useful wildlife management tool and is carefully regulated.

2.2 Alternatives Carried Forward for Detailed Analysis

2.2.1 Alternative 1 – No Action:

Allow areas to be hunted using existing regulations and locations.

Continue annual hunting opportunities of white-tailed deer across approximately 9,895 acres of the Refuge (excluding administrative sites and the Green Point Area within the City of Saginaw) and goose hunting across approximately 200 acres of managed wetlands and a scramble area along the Shiawassee River from the mouth of the Cass River to the Flint River. All hunting must be in accordance with the laws of Michigan, Federal regulations and Refuge-specific regulations. Species hunted (deer and geese) would be those allowed by the current regulations and in areas currently open to hunting; that is, there would be no change in the Shiawassee NWR Hunt Plan.

2.2.2 Alternative 2 - Preferred Alternative:

Expand species and areas to be hunted on the Refuge.

This Alternative would open the Refuge to hunting of new species and new zones as described in the 2017 Draft Shiawassee NWR Hunt Plan. Deer hunting would be allowed on approximately 9,895 acres of the Refuge's 9,935 acres and on lands acquired since the previous hunt plan (Figure 2-1). Waterfowl and waterbird hunting would be allowed on approximately 1,318 acres that comprise the Shiawassee, Flint, Cass, and Tittabawassee Rivers flowing through the Refuge (Figure 2-2). Wild turkey, American woodcock, small game, and furbearer hunting would be allowed on 4,353 acres in the area of the Refuge east of the Spaulding Drain and south of the Shiawassee River and the area south of Hart Road and north of the Shiawassee River (Figure 2-3). Feral hogs would be allowed to be hunted across the Refuge incidental to other lawful hunting.

Specifically, this Alternative proposes to:

1. Continue to provide annual archery and firearms deer hunting opportunities within the framework of DNR and refuge-specific regulations (Figure 2-1).
2. Continue to provide youth deer hunts (Figure 2-1).
3. Continue to provide non-ambulatory deer hunts (Figure 2-1).
4. Expand waterfowl hunting opportunities from “Canada goose only” to include other commonly hunted waterfowl species (as regulated by DNR), and shift the waterfowl hunting locations from former agricultural fields and Moist Soil Units to the rivers that flow through the Refuge and designated Refuge land on the periphery of the Refuge (Figure 2-2).
5. Provide youth waterfowl hunts (Figure 2-2).
6. Expand hunting opportunities to include small game (eastern fox squirrel, eastern gray squirrel, eastern cottontail, ring-necked pheasant, and American crow) (Figure 2-3).
7. Expand hunting opportunities to include furbearers (raccoon, coyote, and red fox) (Figure 2-3).
8. Expand migratory bird hunting opportunities (American coot, common gallinule, sora, Virginia rail, American woodcock, and Wilson's snipe) (Figure 2-2).
9. Expand hunting opportunities to include spring wild turkey (Figure 2-3).
10. Provide youth turkey hunts (Figure 2-3).
11. Permit feral hogs to be taken incidental to any refuge hunt by legal means for the target hunt species (Figure 2-1).

The above hunts would be conducted in a manner consistent with all applicable laws and regulations and with the following Refuge-specific provisions:

**Deer Hunt Area**
1. Open for deer hunting during fall archery and firearms DNR seasons (Figure 2-1).
   a. Open to lottery hunts.
      i. Applicants selected randomly through State of Michigan Retail Sales System.
   b. Number of hunts and hunters dependent on deer population objectives.
   c. Number of hunts, types of hunts, number of individuals, and dates to be determined before the start of the season.
   d. Stands or blinds may not be left overnight.
   e. Parking allowed only in designated areas.

2. Incidental take of feral hogs will be allowed during Refuge hunts.

**Waterfowl Hunt Area**
1. Open for ducks and geese during DNR seasons after September 30th (Figure 2-2).
   a. Non-toxic shot only.
   b. Hunts allowed four days per week (Saturday, Sunday, Tuesday, and Thursday) during regular goose season after September 30th.
   c. Authorized hunter access allowed 1½ hours before legal shooting time.
   d. Authorized shooting hours are ½ hour before legal sunrise until 12:00 p.m.(noon)
   e. Use of hunting dogs is permitted.
   f. Parking allowed only in designated areas.
   g. 25 shell limit.

2. Open for American coot, common gallinule, sora, Virginia rail, and Wilson's snipe.
   a. Concurrent with Refuge duck and goose hunting season and regulations.

3. Incidental take of feral hogs will be allowed during Refuge hunts.

**Turkey and Small Game Hunt Area**
1. Open for wild turkey during spring DNR season (Figure 2-3).
   a. Authorized hunter access for spring wild turkey is 1½ hour before shooting time.
b. Parking allowed only in designated areas.

2. Open for small game, including eastern fox squirrel, eastern gray squirrel, eastern cottontail, ring-necked pheasant, and American crow during DNR seasons except during deer hunt (Figure 2-3).
   a. Use of dogs is permitted.
   b. Authorized hunter access for small game is ½ hour before legal shooting time to ½ hour after legal shooting time.
   c. Parking allowed only in designated parking areas.
   d. Small game hunts must occur outside of the deer season.

3. Open for American woodcock during DNR season except during deer hunt (Figure 2-3).
   a. Concurrent with refuge small game season and regulations.
   b. Parking allowed only in designated areas.
   c. American woodcock hunts must occur outside of the deer season.

4. Open for furbearers, including raccoon, coyote, and red fox during DNR seasons except during deer hunt (Figure 2-3).
   a. Hunting with dogs allowed.
      i. Training is not allowed; kill is required.
      ii. GPS or radio collars on dogs required.
   b. Parking allowed only in designated areas.
   c. Furbearer hunts must occur outside of the deer season.
   d. Furbearer hunts must occur during daylight hours.

5) Incidental take of feral hogs allowed during Refuge hunt.
A summary of Alternative 2 – the Preferred Alternative is presented in Table 2-1.

**Table 2-1. Alternative 2 - Refuge hunt opportunities identified in the 2017 Draft Hunt Plan.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Hunt opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td>Refuge-wide except for administrative areas and within the City of Saginaw. Daylight hours.</td>
</tr>
<tr>
<td>Ducks and Geese</td>
<td>All areas of the rivers running through the Refuge, including the Shiawassee, Flint, Cass and Tittabawassee Rivers. Half-hour before sunrise until noon. After September 30th.</td>
</tr>
<tr>
<td>Coot, Gallinule, Rails, Snipe</td>
<td>All areas of the rivers running through the Refuge, including the Shiawassee, Flint, Cass and Tittabawassee Rivers. Half-hour before sunrise to noon. After September 30th.</td>
</tr>
<tr>
<td>Spring Wild Turkey</td>
<td>Refuge areas east of Spaulding Drain and south of Shiawassee River. Refug areas south of Hart Road and north of the Shiawassee River. Half-hour before sunrise to noon.</td>
</tr>
<tr>
<td>Eastern Fox Squirrel, Eastern Gray squirrel, Cottontail, Pheasant, Crow</td>
<td>Refuge areas east of Spaulding Drain and south of Shiawassee River. Refug areas south of Hart Road and north of the Shiawassee River. Daylight hours. Closed during archery and firearms deer season.</td>
</tr>
<tr>
<td>Woodcock</td>
<td>Refuge areas east of Spaulding Drain and south of Shiawassee River. Refug areas south of Hart Road and north of the Shiawassee River. Daylight hours. Closed during archery and firearms deer season.</td>
</tr>
<tr>
<td>Raccoon, Coyote, Fox</td>
<td>Refuge areas east of Spaulding Drain and south of Shiawassee River. Refug areas south of Hart Road and north of the Shiawassee River. Daylight hours. Closed during archery and firearms deer season.</td>
</tr>
<tr>
<td>Feral Swine</td>
<td>Anytime, by any legal method, while hunting any other game species open on the Refuge, until the daily bag limit for that game species is taken.</td>
</tr>
</tbody>
</table>
Figure 2- 1. Shiawassee National Wildlife Refuge White-tailed Deer and Feral Hog Hunt Areas, Saginaw County, Michigan.
Figure 2-2. Shiawassee National Wildlife Refuge Waterfowl and Waterbird Hunt Areas, Saginaw County, Michigan.
2.2.3 Alternative 3 – Modified Preferred Alternative:

**Permit hunting for white-tailed deer, waterfowl, waterbirds and feral hog.**

This Alternative would allow hunting of white-tailed deer, waterfowl, waterbirds and feral hog as described in Alternative 2 the Preferred Alternative, but would not include the hunting of turkey, small game, American woodcock and furbearers as described in Alternative 2. In summary, Alternative 3 would allow the following hunts as described in Alternative 2:

**Deer Hunt Area** (Figure 2-1).

1) Open for deer hunting during fall archery and firearms DNR seasons.
   a. Open to lottery hunts.
      i. Applicants selected randomly through State of Michigan Retail Sales System.
   b. Number of hunts and hunters dependent on deer population objectives.
   c. Number of hunts, types of hunts, number of individuals, and dates to be determined before the start of the season.
d. Stands or blinds may not be left overnight.

2) Incidental take of feral hogs will be allowed during Refuge hunts.

**Waterfowl Hunt Area (Figure 2-2)**

1) Open for ducks and geese during DNR seasons after September 30th.
   a. Non-toxic shot only.
   b. Hunts allowed four days per week (Saturday, Sunday, Tuesday, and Thursday) during regular goose season after September 30th.
   c. Authorized hunter access allowed 1½ hours before legal shooting time.
   d. Authorized shooting hours are ½ hour before legal sunrise until 12:00 p.m.
   e. Use of hunting dogs is permitted.
   f. Parking allowed only in designated areas.
   g. 25 shell limit.

2) Open for American coot, common gallinule, sora, Virginia rail, and Wilson's snipe.
   a. Concurrent with refuge duck and goose hunting season and regulations.

3) Incidental take of feral hogs will be allowed during Refuge hunts.

**CHAPTER 3. AFFECTED ENVIRONMENT**

**Introduction**

This chapter describes the current and historic physical, biological, and socioeconomic landscape of Shiawassee NWR. Included are descriptions of the physical landscape, the regional context and its history, and the Refuge environment, including its history, programs, and specific Refuge resources. A detailed description of these resources are described in the Hydrogeomorphic Evaluation of Ecosystem Restoration and Management Options of Shiawassee National Wildlife Refuge (Heitmeyer et al. 2013) and are incorporated by reference.

**Physical Environment**

Shiawassee NWR lies within the Great Lakes Basin Ecosystem, a system shared with Canada and eight states. This ecosystem is made up of the world’s largest freshwater body, which holds 18 percent of the world’s supply of freshwater, covers 95,000 square miles, has 9,000 miles of shoreline, includes more than 5,000 tributaries, and has a drainage basin of 288,000 square miles. The Great Lakes Basin Ecosystem is divided into seven focus areas. The Saginaw Bay and Watershed focus area contains the Saginaw Bay Watershed, the largest in Michigan, which covers more than 8,000 square miles in 22 counties. The Saginaw River and its four major tributaries (Cass, Flint, Shiawassee, and Tittabawassee) drain nearly 75 percent of the watershed. The Refuge lies in the heart of the watershed, and these four rivers flow through the Refuge and affect its habitats and wildlife. This area is historically referred to as the Shiawassee Flats wetland area. The Shiawassee Flats area historically contained floodplain forest types, emergent marshes, and wetland prairie habitats.
The Shiawassee Flats area was shaped by the advance and retreat of glaciers. Lake Saginaw formed from glacial meltwater and drained to the southwest through the proglacial Grand River that connected what is now Lakes Huron and Michigan. The Lake Saginaw system deposited lacustrine sediments of thick clay and sand in the Shiawassee Flats region. The Shiawassee Flats river watershed ultimately created the confluence where the four rivers converged to form the Saginaw River (Heitmeyer et al. 2013).

Soils
Soils in the Shiawassee Flats area reflect the historical glacier lake plain deposits and are mainly poorly drained clay and silt-clay types. Approximately 48 distinct soil types are present at the Shiawassee NWR (Figure 3 - 1). The Sloan-Zilwaukee-Misteguay soil-land association comprises the majority of the Refuge. It is typically characterized by deep, dark textured soils that are commonly flooded in the spring and typically form under mixed shrub, emergent, and forest wetland vegetation (Heitmeyer et al., 2013). These soils are severely limited in their ability to support buildings, recreational facilities, and agriculture in an unaltered state. Only when they are tiled, drained, and diked are they suitable for these uses.

Figure 3 - 1. Soil series in the Shiawassee Flats region (USDA soil datamart, SSURGO)

Hydrology and Water Quality
Historically, the Shiawassee Flats area received surface water from the four major rivers and tributaries in the Saginaw Valley; Flint, Cass, Shiawassee and Tittabawassee. Flows in all four of the rivers are seasonally dynamic and high flow events, causing regular overbank and backwater flooding. These river systems are flashy, meaning that water levels can rise and fall rapidly relative to local/regional precipitation and runoff. Despite the flashy system in which the Refuge
resides, its wetland units are able to hold a substantial amount of water; thus protecting neighboring communities from flooding. In fact, the Refuge was established as part of a cooperative agreement with the Michigan Department of Conservation State Game Area to jointly protect and manage remaining wetlands in the Shiawassee Flats area and to help protect the City of Saginaw from flooding.

Ditching in the Shiawassee Flats area began in the late 1800’s mainly to drain wetlands for agricultural purposes. The Spaulding Drain, a man-made drain that diverts part of the Flint River north through the Refuge to Shiawassee River was constructed in the 1920’s (Reed, 1927). Changes in regional land use along with changes in drainage led to altered flooding conditions throughout the Shiawassee Flats area. Prior to Refuge establishment, the open areas were predominantly croplands, meaning that many of them contained subsurface drain tile systems and pumps to assist with draining and drawing down water levels. Once the Refuge was established, managers began upgrading ditches and water control structures to provide for improved water management. Water management has changed over time from extensive cropland management to providing permanent native wetland habitat (Heitmeyer et al. 2013).

According to well records, static groundwater levels in the area range from 5 feet to 26 feet below the surface. Groundwater is generally hard and high in dissolved solids. Many wells encounter high salt concentrations and are unsuitable for drinking purposes. Water quality in the rivers and streams varies widely. Dissolved oxygen levels are generally well above the minimum standard set by the State while nutrient levels (phosphorus and nitrogen) are often high enough to cause algae blooms. Hardness and dissolved solids often reach levels close to the Michigan Water Quality Standards. Chloride and fecal coliform levels have exceeded the standard.

Climate
Regionally the Great lakes are affected by air masses from the Gulf of Mexico, Canada, and Northern Pacific. The Shiawassee Flats is influenced by the Saginaw Bay and Lake Huron that can create a highly variable local climate. This area typically receives a range of 30 to 35 inches of precipitation per year, including an annual average of 36 inches of snowfall. Mean annual low temperatures are 24°F while mean annual high temperatures are 68°F.

Habitats
Water and the effects of water dominate the ecological processes on the Refuge. A variety of vegetative communities that are associated with large rivers and their floodplains are found within the authorized boundaries of the Refuge. These communities include some of the last remaining bottomland hardwood forests in Saginaw County (Figure 3 - 2). Specifically, General Land Office surveys in the Shiawassee Flats area during the early-1800s found a large amount of shrub-scrub/emergent marsh surrounded by diverse black ash and mixed hardwood swamp forest (Heitmeyer et al. 2013). These communities are characterized by extensive lateral flooding during times of heavy precipitation.
Another dominant community type is emergent marsh habitat, which consists of cattail, bulrush, sedges, reed canary grass, cut-grass, cord grass, water plantain, smartweed and millet. A scrub-shrub and grass habitat type is often found along the edges of the marsh community. The brush species are usually buttonbush, willow, ash, dogwood, and cottonwood. Wet prairie habitat was noted in some locations in the north part of the Flats area (Heitmeyer et al. 2013). The Refuge also contains many managed wetland units. Specifically, there are 21 wetland management impoundments that are managed using pumps, water control structures, and dikes. Additionally, the Refuge contains seven moist soil units that are typically flooded in the fall and then drawn down in the spring to promote the germination of moist soil plant species.

There is also still a small (26 acre) portion of the Refuge in croplands. This field will remain as cropland until 2019 when it will be converted to native habitat.

**Birds**

The Refuge’s array of habitats satisfies the requirements of diverse birds. More than 280 species of birds use the Shiawassee Flats area. The Tittabawassee, Shiawassee, Flint and Cass River bottoms are important stopover habitats for migrating waterfowl. Portions of the waterfowl flights from both the Mississippi and Atlantic flyways use this area each spring and fall. Two notable species that are common on the Refuge in the fall, winter, and early spring are the American black duck and Canada geese from the Southern James Bay Population. Refuge wetlands provide food, nesting, and roosting areas for more than 40 species of shore and wading birds. The bottomland forests in the Refuge are important habitats for many neo-tropical migrants along with wood ducks, raptors and many marsh and waterbirds. Refuge prairies...
provide food, nesting, and cover for more than 20 species of passerines. The Refuge supports at least 15 species of raptors on a seasonal or permanent basis.

**Mammals**

More than 30 mammals have been recorded in or near the Refuge by staff, interns, volunteers, and literature research. White-tailed deer are abundant in the area because of the mix of forested lands, wetlands, and prairie. Coyotes and fox are among the large mammals that are common to the area. The wetlands provide excellent fur bearer habitat for such species as the muskrat, beaver, opossum, raccoon, mink, and otter. The forested and upland areas support rabbit, mice, voles, shrews, and squirrels.

**Reptiles and Amphibians**

Surveys have recorded 18 species of reptiles and amphibians on the Refuge and its expansion area. This list includes one state-listed threaten species (eastern fox snake) and one Federal candidate species (Blanding’s turtle).

**Threatened and Endangered Species**

The following federally-listed, proposed, and candidate species may occur within the Refuge area: Red Knot, Indiana Bat, Northern Long-eared Bat, and Eastern Massasauga. Refuge surveys have indicated that these species do not likely occur on the Refuge.

Integrated Waterbird Monitoring and Management (IWMM) surveys are conducted on the Refuge on a weekly basis and to date Red knot have not been identified during these surveys. Therefore, this species will not be evaluated in this EA as there would be no effect to this species.

A survey on the Refuge in 2013 found no evidence of the presence of either listed bat species on the Refuge. Indiana and Northern-long eared bats are uncommon throughout the Saginaw Bay Watershed (Kurta 2008). The distance from the Refuge to the potential hibernacula for Northern long-eared bats (Upper Peninsula or Ontario) is close to, and possibly above, the maximum for this species to migrate. Therefore, it is unlikely to encounter this species at the Refuge in the summer. Nearly all of the Indiana bats that summer in Michigan hibernate in Indiana and Kentucky and the Refuge is already 40-50 miles north of the northernmost records of Indiana bats in summer in Michigan. Therefore, it is highly unlikely that this species of bat would fly to the Refuge for the summer when there is high-quality habitat located closer to their hibernacula (Kurta 2013). Even if a few Northern Long-eared or Indiana bats were to be encountered at the Refuge, this action would not pose a risk to their habitat as no habitat would be affected by this action. The Refuge will remain in contact with bat experts in the region and if there are any changes to the range or presence of Northern long-eared or Indiana bats on the Refuge.

According to the Michigan Herp Atlas, Eastern Massasauga have not been identified in Saginaw County, nor have any been detected on the Refuge during other management activities or from public users.
The Refuge initiated a project in the summer 2016 to try and introduce eastern prairie fringed orchid to the Refuge; surveys in 2017 indicate the plugs may not have been successful in being established.

Although no federally-listed species are known to occur at the Refuge, there is one state-listed threatened species (eastern fox snake) and one Federal candidate species (Blanding’s turtle).

Fish
The Refuge’s sloughs, rivers, and marshes support more than 50 species of forage and game fish. Because of the Refuge’s location at the junction of all the major tributaries forming the Saginaw River and its connection with Saginaw Bay, its wetland habitats are integral for life stages to many of the fish using the bay. These habitats are critical, particularly as spawning and nursery areas. With diminishing wetland resources throughout the Great Lakes, the Refuge has a unique role in protecting fish habitat and valuable fish resources.

Land Use
The area within the authorized boundary of the Refuge totals 9,935 acres. Portions of the Refuge are adjacent to the Saginaw metropolitan area, with residential developments bordering several sections of the Refuge. Overall trends in the Saginaw area are toward continued development and movement from urban to rural areas. Agriculture lands are being altered by urban sprawl and development.

Cultural Resources
Shiawassee National Wildlife Refuge has 31 reported archeological sites on Refuge land. The land on which Shiawassee National Wildlife Refuge is located appears to have been empty of human occupation during the late prehistoric and proto-historic periods, although hunting parties from several tribes traversed it. Thus, determining an association between prehistoric cultures that created the archeological sites and modern Indian tribes is problematic. The Refuge Manager considers potential impacts of management activities on historic properties, archeological sites, traditional cultural properties, sacred sites, human remains and cultural materials in consultation with the Regional Archaeologist.

Public Use
Public use at Shiawassee NWR has grown steadily over the last decade. Approximately 70,000 Refuge visits occur each year. Primary uses include hunting, fishing, hiking, bicycling, cross country skiing, wildlife observation, photography, environmental education and interpretation. See Figure 3 - 3 for a map of the Refuge’s public use facilities.

Visitor Facilities

_Headquarters/Visitor Contact Station_
Visitors acquire most of their information about public use opportunities at the Refuge at the Refuge’s Headquarters/Visitor Contact Station. Currently, Refuge staff is available to serve the public during the open hours of 7:30AM – 4:00PM, Monday – Friday, except during Federal holidays. This facility has a few small exhibits, including a freshwater aquarium with species native to Refuge waters. A wide variety of brochures, maps, and leaflets about the Refuge, the
Fish and Wildlife Service, and local outdoors topics are available as well as free items such as educational posters and bookmarks.

**Green Point Environmental Learning Center**

Green Point Nature Center was officially opened in 1978 by the City of Saginaw with support from the Michigan DNR, the Federal Land and Water Conservation Fund, and the City of Saginaw. In a spending cut, the City of Saginaw closed Green Point Nature Center in 1988. In September 1993, the Service agreed to lease the center from the City. In the following years, the Service continued to lease and operate the center as the Green Point Environmental Learning Center (ELC). In 1998, the Service received two 99-year leases for the center from the City as a part of the General Motors Natural Resource Damage Assessment settlement. This building provides the Refuge with a central location for conducting environmental education and interpretation programs for the youth and adults of Saginaw and surrounding communities.

**Trails**

The Refuge has three main trail systems on the Refuge, ranging in length and difficulty. The Refuge maintains 2.5 miles of trails within the 76-acre area adjacent to the Green Point ELC. These rustic trails wind through floodplain forest toward the Tittabawassee River. Trails immediately adjacent to Green Point ELC wrap around a small prairie restoration site and a small wetland with interpretive panels. You can hike, cross-country ski or snowshoe on this trail.

The Ferguson Bayou Trail, located at the west end of Curtis Road on the south side of the Refuge, offers over 4.5 miles of trails. This trail follows graveled roads on the tops of dikes and offers views of sloughs, forests, fields, wetlands, and pools. Two observation towers, equipped with spotting scopes, are located along this trail to observe ducks, geese, deer, and other wildlife. This trail is popular with hikers, skiers, and casual bicyclers.

The Woodland Trail, located off of Center and Stroebel Roads on the north side of the Refuge, offers over 4.5 miles of trails. These rather primitive trails wind through bottomland hardwood forest and take you past historic landmarks left from the coal mining industry in the early 1900s. This trail is popular with mountain bikers, hikers and cross-country skiers.

**Wildlife Drive**

This 6.5-mile self-guided auto tour route meanders past forests, grasslands, marshes, open water pools, and the Shiawassee River and enhances the ability of visitors to see waterfowl, herons, eagles and a great diversity of other wildlife. Further, visitors are able to see the management practices of the Refuge that is used to attract an abundance of wildlife. The Wildlife Drive is open from June 1st – September 30th and receives approximately 16,000 visits each year.

**Cass River Boat Launch:**

Is the most popular bank fishing site on the Refuge. Anglers here seek channel catfish, smallmouth bass, northern pike, suckers, and crappie. It is also heavily used by boaters hunting and fishing on the rivers that flow through the Refuge. It is also popular among deer hunters who want to access the interior portions of the refuge. This launch site is also becoming used more and more by canoeists and kayakers and is a designated put-in and take-out site associated with the proposed Cass River National Water Trail.
Figure 3 - 3. Public facilities at Shiawassee National Wildlife Refuge
Hunting
Public goose hunting and deer hunting are permitted on the Refuge as compatible recreational uses. Limited hunt seasons are scheduled concurrent with the State seasons. The goose hunt is available concurrently with the beginning of the general waterfowl season for Saginaw County Goose Management Unit in the Southern Goose Zone as designated by the Michigan DNR. Refuge goose hunting takes place on Tuesdays, Thursdays, Saturdays, and Sundays. The Refuge provides approximately six zones (including river, mudflat, and corn field zones) for morning hunts only. A lottery drawing is held for zone selection each morning of the hunt. Approximately 100-150 goose hunters take part in the annual hunt.

Anywhere from 14 to 20 archery, shotgun, muzzleloader, youth, and special non-ambulatory deer hunts take place for deer from about Mid-September through the end of December. Altogether around 500-600 hunters take part in these hunts. The Refuge works with the Michigan DNR to handle the lottery system for the entire Deer Management Unit (DMU) 273 which includes the Refuge and the Shiawassee River State Game Area. Applicants can apply for only one hunt at one location (e.g., Refuge or State Game Area). Leftover permits are issued on a first-come first-served basis. Deer hunters fill out harvest surveys at the end of their hunts. Refuge biologists evaluate wildlife populations and hunting harvest using science based monitoring and populations analysis.

Fishing
Fishing is permitted year-round on the navigable waterways that flow through the Refuge concurrent with State seasons and regulations. Bank fishing is allowed on the Tittabawassee River at the Woodland Trail and Green Point ELC. A boat launch and bank fishing site is also available on the Cass River. In addition, Green Point ELC has a pond where children may borrow fishing equipment and learn to fish. This is a catch and release site only. Possible fish species include: walleye, bluegill, yellow perch, smallmouth bass, black bullhead, channel catfish, freshwater drum and white sucker.

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES
This chapter describes the foreseeable environmental consequences of implementing the three alternatives described above. When detailed information is available, a scientific and analytic comparison between alternatives and their anticipated consequences is presented, which is described as “impacts” or “effects.” When detailed information is not available, those comparisons are based on the professional judgment and experience of Refuge staff and Service and State biologists.

4.1 Alternative 1 – No Action

Allow areas to be hunted using existing regulations and locations. Continue annual hunting opportunities of white-tailed deer across approximately 9,895 acres of the Refuge (excluding administrative sites and the Green Point Area within the City of Saginaw) and goose hunting across approximately 200 acres of managed wetlands and a scramble area along the Shiawassee River from the mouth of the Cass River to the Flint River. Species hunted
would be those allowed by the current regulations and in areas currently open to hunting; that is, there would be no change in the Shiawassee NWR Hunt Plan.

4.1.1 Habitat Impacts
Except for the non-ambulatory deer hunts, deer hunting access would be non-motorized, with parking restricted to designated parking areas. Non-ambulatory hunters and their assistants would be allowed motor vehicle access only on established roadways during the 4-day hunt and in designated parking locations specifically identified to avoid impacts to sensitive vegetation. Goose hunts on land would similarly be by non-motorized access or by boat access on the Shiawassee River. Therefore, impacts on vegetation from land-based hunters would be inconsequential (i.e., the existing natural communities would not be appreciably disrupted by low to moderate pedestrian traffic as evidence from past experience, because most hunting activities will occur during the vegetative dormant season and activities would be distributed throughout the Refuge). In addition, the majority of goose hunting would occur on the Shiawassee River during the dormant season and would have little to no impact to Refuge habitat. Under this Alternative, each year an estimated 600 deer hunters would utilize approximately 9,895 acres open to deer hunting (99% of the Refuge area), and 100 to 150 goose hunters would hunt approximately 200 acres of land and the Shiawassee River from the Cass River to the Flint River that is currently open to goose hunting.

The Refuge under the legal authority of the Migratory Bird Conservation Commission and the Migratory Bird Conservation Act (16 U.S.C. § 715 - 715s) is “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” The Refuge’s CCP further refines those purposes and identifies goals and strategies that would enable the Refuge to fulfill its mission. In implementing the CCP, the Refuge conducts habitat management actions that favor healthy and functional ecological communities on Refuge lands. This approach benefits all native fish and wildlife species, including species traditionally hunted. Habitats are not managed to favor hunted species over other species, but are managed to maintain healthy populations of the appropriate species for the type of habitat available on the Refuge. Because of this approach, implementation of this Alternative will not result in significant direct, indirect, or cumulative effects to habitats at any scale due to hunting activities. Refuge surveys and monitoring affirms this conclusion.

4.1.2 Biological Impacts
Other wildlife not being harvested (including birds, mammals, reptiles, amphibians and invertebrates) may be temporarily disturbed by hunters approaching an animal’s site and the animals may flush or move to avoid human contact. Deer and goose hunts occur in the fall when most if not all of these animals are not breeding or nesting and when young are highly mobile. Because of the nature of the hunters (quiet, slow moving and camouflaged) and because of the time of year and dispersed nature of hunting activities across a large area, disturbance to non-hunted animals is expected to be minimal, of short duration and localized. Because other public uses are restricted to existing trails and roads and sensitive areas are closed during critical times of year for wildlife, such as the closing of the Wildlife Drive to protect nesting bald eagles and migratory waterfowl, there are no anticipated significant direct, indirect, or cumulative effects to non-hunted wildlife from this Alternative.
Mortality/harvest of game animals (geese and deer) would occur under this Alternative. The harvest of Refuge wildlife species will be in accordance with Refuge-specific regulations, Federal regulations and Michigan State regulations and bag limits. Because these species are regulated and monitored, there will be no long-term population impacts locally or regionally. Migratory species such as geese are under Federal regulation and are managed and monitored at a flyway level, and harvest regulations are set on an annual basis. If changes in populations are detected and reach a level where the species could no longer be harvested, those regulations would be stepped down from the flyway level to State level. Since this Alternative would follow all Federal and State regulations, any changes in regulations such as season and bag limits would be implemented at the Refuge level. Additionally, game animals such as deer are managed under the authority of the State and are managed at State and regional levels. If the State implemented regulation changes, we would ensure that those changes are reflected in the species hunted on the Refuge, in this case white-tailed deer. Disturbance to other wildlife during hunts is described above.

4.1.3 Listed Species
There are currently no known federally threatened or endangered species on the Refuge. No activity under this Alternative would impact potential habitat for threatened and endangered species that may occur within the Refuge. Potential disturbance, if the species were present, is highly unlikely do to 1) a remote chance of co-occurrence of the species and hunters, 2) the lack of potential presence of listed bats during the hunt season, and 3) the likely hibernation/lack of inactivity and secretive nature of the eastern massasuga during the hunts. Therefore, we conclude there would be no effect to federally listed species from this Alternative.

4.1.4 Historic Properties and Cultural Resources
This Alternative will result in no additional ground disturbance or disturbance to standing structures. Therefore, this Alternative would have no effect on any historic properties or cultural resources.

4.1.5 Cumulative Impact Analysis

4.1.5.A Anticipated Direct and Indirect Impact of No Action Alternative on Wildlife Species
The State of Michigan has administered and monitored hunting programs on nearby State Game Areas for decades. During this time, the Michigan DNR has not documented any significant adverse effects of regulated hunting programs throughout the State on populations of wildlife species. The hunting program for Shiawassee NWR will be managed consistent with the programs administered by the State.

White-tailed deer
Projected harvest of deer on the Refuge is based on past white-tailed deer hunts on the Refuge. In 2016, we received 994 applications for 596 permits; all of the permits were issued through a lottery system managed by Michigan DNR’s retail sale system. Hunters reported harvesting 107 deer in 2016 (the 5-year average is 118 deer harvested), which varied by gender 30% male (buck) and 70% female ( doe) deer. Hunter success in 2016 averaged 18%, which was below the 5-year average of 21%. Under this Alternative the deer hunt will essentially be unchanged from the 2016 (and past years) hunt, with the exception of opening a few newly acquired tracts of
Refuge land to deer hunting. The white-tailed deer hunt area includes approximately 9,895 acres (99% of the refuge area).

The Michigan DNR evaluates periodic white-tailed deer population surveys, hunter check stations, vehicle collision reports, crop damage complaints, and mail-in surveys from hunters in the area. In addition, the DNR flies a winter aerial deer survey covering Shiawassee River State Game Area and Shiawassee NWR. The resulting data are intended to assess trends in the deer herd. This is requisite to appropriately adjusting harvest quotas to reach a scientifically defensible and socially acceptable deer population goal. Michigan’s deer herd is managed by means of Deer Management Units (DMU) that covers specific geographic boundaries throughout the State. Shiawassee NWR and Shiawassee River SGA are designated collectively as DMU 273. The deer management goal for DMU 273 is to manage the white-tailed deer herd at 600-800 deer. Over the last 5 years deer populations have estimated to be within management goals under existing deer hunt framework and therefore continuing this framework there are no anticipated cumulative impacts on white-tailed deer.

Goose
The majority of goose hunting conducted on the Refuge is targeted at Canada goose hunting, although other species of geese (e.g., snow geese, Ross’s geese, white-fronted geese, etc.) are allowed to be harvested if the season corresponds with the Refuge hunt. Other species of geese generally do not occur on the Refuge or occur in very low abundance due to the migration patterns of those species. Currently, there are approximately 100 to 150 total annual goose hunter trips to the Refuge and annual harvest varies from approximately 50 to 150 geese per year. According to Frawley (2017a) there were 50,868 (6,813, 95%CL) geese harvested in the southern lower peninsula of Michigan during the 2014 regular waterfowl season. Thus, goose harvest on the Refuge is less than 1% of the harvest in Michigan and much less in the flyway. Because migratory species such as geese are under Federal regulation and are managed and monitored at a flyway level, harvest on the Refuge consistent with harvest regulations are not anticipated to have cumulative impacts on local, state of flyway-level populations.

4.1.5.B Anticipated Direct and Indirect Impact of No Action on Refuge Programs, Facilities, and Cultural Resources.
This Alternative will have no additional impact upon Refuge programs, facilities, or cultural resources as no ground disturbing activities would occur, and this level of activity has been successfully managed and implemented at similar levels with similar facilities, budgets and personnel successfully.

Activities that might cause an effect to a historic property would be subject to a case-by-case Section 106 review.

4.1.5.C Anticipated Direct and Indirect Impact of No Action on Refuge Environment and Community
The No Action Alternative will have no additional impact on soils, air quality, water quality, solitude or the local community as no ground disturbing activities would occur, and this level of activity has been successfully managed and implemented at similar levels with similar facilities, budgets and personnel successfully. The community is generally supportive of hunting on the
Refuge. Some public users are temporarily displaced when trails are closed for hunts, but this occurs during the low use period of our trail system.

4.1.5.D Other Past, Present, Proposed, and Reasonably Foreseeable Hunts and Anticipated Impacts

Under this Alternative, there would be no other reasonably foreseeable future hunts other than that proposed in this Alternative. If additional hunts are proposed in the future, it would require an amendment to the Hunt Plan and all applicable procedures, including a revised or amended EA. Therefore, there would be no anticipated impacts on other past, present, proposed, and reasonably foreseeable hunts.

4.1.5.E Anticipated Impacts If Individual Hunts are Allowed to Accumulate

This Alternative would not expand hunting and, therefore, there would be no anticipated impacts.

4.1.6 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment. This Alternative will not disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.


4.2 Alternative 2 – Preferred Alternative

Expand species and areas to be hunted on the Refuge.

This Alternative would open the Refuge to hunting of new species and new zones as described in the 2017 Draft Shiawassee NWR Hunt Plan. Deer hunting would be allowed on approximately 9,895 acres of the Refuge's 9,935 acres, including newly acquired lands since the last Hunt Plan (Figure 2-1). Waterfowl and waterbird hunting would be allowed on approximately 1,318 acres that comprise the Shiawassee, Flint, Cass, and Tittabawassee Rivers flowing through the Refuge (Figure 2-2). Wild turkey, small game, American woodcock and furbearer hunting would be
allowed on 4,353 acres in the area of the Refuge east of the Spaulding Drain and south of the Shiawassee River and the area south of Hart Road and north of the Shiawassee River (Figure 2-3). Hunting of feral hog would be allowed incidental to the lawful hunting of other species.

The following hunts would be conducted in a manner consistent with all applicable laws and regulations and with the following Refuge specific provisions:

**Deer Hunt Area**
Open for deer hunting during fall archery and firearms DNR seasons (Figure 2-1).
   a. Open to lottery hunts.
      i. Applicants selected randomly through State of Michigan Retail Sales System.
   b. Number of hunts and hunters dependent on deer population objectives.
   c. Number of hunts, types of hunts, number of individuals, and dates to be determined before the start of the season.
   d. Stands or blinds may not be left overnight.
   e. Parking allowed only in designated areas.

Incidental take of feral hogs will be allowed during Refuge hunts.

**Waterfowl Hunt Area**
Open for ducks and geese during DNR seasons after September 30th (Figure 2-2).
   a. Non-toxic shot only.
   b. Hunts allowed four days per week (Saturday, Sunday, Tuesday, and Thursday) during regular goose season after September 30th.
   c. Authorized hunter access allowed 1 ½ hours before legal shooting time.
   d. Authorized shooting hours are ½ hour before legal sunrise until 12:00 p.m.
   e. Use of hunting dogs is permitted.
   f. Parking allowed only in designated areas.
   g. 25 shell limit.

Open for American coot, common gallinule, sora, Virginia rail, and Wilson's snipe.
   h. Concurrent with refuge duck and goose hunting season and regulations.

Incidental take of feral hogs will be allowed during refuge hunts.

**Turkey and Small Game Hunt Area**
Open for wild turkey during spring DNR season (Figure 2-3).
   a. Authorized hunter access for spring wild turkey is 1 ½ hour before shooting time.
   b. Parking allowed only in designated areas.

Open for small game, including eastern fox squirrel, eastern gray squirrel, eastern cottontail, ring-necked pheasant, and American crow during DNR seasons except during deer hunt (Figure 2-3).
   a. Use of dogs is permitted.
b. Authorized hunter access for small game is ½ hour before legal shooting time to ½ hour after legal shooting time.
c. Parking allowed only in designated parking areas.
d. Small game hunts must occur outside of the deer season.

Open for American woodcock during DNR season except during deer hunt (Figure 2-3).
e. Concurrent with refuge small game season and regulations.
f. Parking allowed only in designated areas.
g. American woodcock hunts must occur outside of the deer season.

Open for furbearers, including raccoon, coyote, and red fox during MDNR seasons except during deer hunt (Figure 2-3).
h. Hunting with dogs allowed.
   i. Training is not allowed; kill is required.
   ii. GPS or radio collars on dogs required.
i. Parking allowed only in designated areas.
j. Furbearer hunts must occur outside of the deer season.
k. Furbearer hunts must occur during daylight hours.

Incidental take of feral hogs allowed during Refuge hunt.

A summary of Alternative 2 is presented in Table 2-1.

4.2.1 Habitat Impacts
Except for the non-ambulatory deer hunts, on-land hunting access would be non-motorized, with parking restricted to designated parking areas. Non-ambulatory hunters and their assistants would be allowed motor vehicle access only on established roadways during the 4-day hunt and in designated parking locations specifically identified to avoid impacts to sensitive vegetation. Waterfowl/waterbird (ducks, geese, coots, rails, etc.) hunting along the Shiawassee, Tittabawassee, Cass and Flint Rivers would be predominately by boat. Therefore, impacts on vegetation from land-based hunters would be inconsequential (i.e., the existing natural communities would not be appreciably disrupted by low to moderate pedestrian traffic as evidence from past experience, because most hunting activities will occur during the vegetative dormant season and activities would be distributed throughout the Refuge). In addition, the majority of waterfowl/waterbird hunting would occur on the rivers during the dormant season and therefore would have little to no impact to Refuge habitat.

Under this Alternative, each year an estimated 600 deer hunters would utilize approximately 9,895 acres open to deer hunting (99% of the Refuge area); 1,020 migratory bird hunters would utilize approximately 1,318 acres open to migratory bird hunting (13% of the Refuge area); and 350 turkey, small game, American woodcock and furbearer hunters would utilize approximately 4,353 acres (44% of the Refuge area). Under this Alternative, the number of deer hunters is anticipated to be relatively the same as under the No Action Alternative (current condition). The number of waterfowl/waterbird hunters would be expected to increase over current conditions; however, the vast majority of these hunters would hunt from boats as very limited lands would be open to waterfowl/waterbird hunting thus the impact of these hunters on land is anticipated to
be less than under current conditions. The small number of turkey, small game, American woodcock and furbearer hunters (350) spread over 4,353 acres is not expected to have any appreciable impact on vegetation over that anticipated in the No Action Alternative.

The Refuge under the legal authority of the Migratory Bird Conservation Commission and the Migratory Bird Conservation Act (16 U.S.C. § 715 - 715s) is “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” The Refuge’s CCP further refines those purposes and identifies goals and strategies that would enable the Refuge to fulfill its mission. In implementing the CCP, the Refuge conducts habitat management actions that favor healthy and functional ecological communities on Refuge lands. This approach benefits all native fish and wildlife species, including species traditionally hunted. Habitats are not managed to favor hunted species over other species, but are managed to maintain healthy populations of the appropriate species for the type of habitat available on the Refuge. Because of this approach, implementation of this Alternative will not result in significant direct, indirect, or cumulative effects to habitats at any scale due to proposed hunting activities.

4.2.2 Biological Impacts
Other wildlife not being harvested (including birds, mammals, reptiles, amphibians and invertebrates) may be temporarily disturbed by hunters approaching an animal’s site and the animals may flush or move to avoid human contact. Deer and waterfowl/waterbird hunts would occur in the fall when most if not all of these animals are not breeding or nesting and when young are highly mobile. Turkey hunts would occur in the spring and small game, American woodcock and furbearer hunts would occur in spring and summer (outside of the deer hunts). The small number of turkey, small game, American woodcock and furbearer hunters (350) spread over 4,353 acres over many months of the year is not expected to have any appreciable impact on the disturbance of wildlife. In addition, because of the nature of the hunters (quiet, slow moving and camouflaged) and because of the time of year of most hunts (and hunters) and the dispersed nature of hunting activities across a large area, disturbance to non-hunted animals is expected to be minimal, of short duration and localized. Because other public uses are restricted to existing trails and roads and sensitive areas of the Refuge are closed during critical times of year for wildlife, such as the closing of the Wildlife Drive to protect nesting bald eagles and migratory waterfowl, there are no anticipated significant direct, indirect, or cumulative effects to non-hunted wildlife from this Alternative.

Mortality/harvest of game animals would occur under this Alternative. Specifically this Alternative would allow the harvest of deer and geese (as under the No Action Alternative), but also ducks, coots, gallinule, rails, snipe, turkey, eastern fox squirrel, eastern cottontail, eastern gray squirrel, ring-necked pheasant, American crow, American woodcock, raccoon, coyote, red fox and feral pig (if present). The harvest of Refuge wildlife species will be in accordance with Refuge-specific regulations, Federal regulations and Michigan State regulations and bag limits. Because these species are regulated and monitored, there will be no anticipated long-term population impacts locally or regionally. Migratory species such as ducks and geese are under Federal regulation and are managed and monitored at a flyway level, and harvest regulations are set on an annual basis. If changes in populations are detected and reach a level where the species could no longer be harvested, those regulations would be stepped down from the flyway level to State level. Additionally, game animals such as deer, small game, turkey and furbearers are managed under the authority of the State and are managed at State and regional levels. Since this
Alternative would follow all Federal and State regulations, any changes in regulations such as season and bag limits on game species would be implemented at the Refuge level. Disturbance to other wildlife during hunts is described above.

4.2.3 Listed Species
There are currently no known federally threatened or endangered species on the Refuge. No activity under this Alternative would impact potential habitat for threatened and endangered species that may occur within the Refuge. Potential disturbance, if the species were present, is highly unlikely do to 1) a remote chance of co-occurrence of the species and hunters, 2) the lack of potential presence of listed bats during the deer and waterfowl hunt seasons, 3) the likely hibernation/lack of inactivity and secretive nature of the eastern massasuga during the deer and waterfowl hunts, and 4) lack of nighttime hunts for turkey, small game and furbearers. Therefore, we conclude there would be no effect to federally listed species from this Alternative.

4.2.4 Historic Properties and Cultural Resources
This Alternative will result in no additional ground disturbance or disturbance to standing structures. Therefore, this Alternative would have no effect on any historic properties or cultural resources.

4.2.5 Cumulative Impact Analysis

4.2.5.A Anticipated Direct and Indirect Impact of Proposed Hunt on Wildlife Species
The State of Michigan has administered and monitored hunting programs on nearby State Game Areas for decades. During this time, the Michigan DNR has not documented any significant adverse effects of regulated hunting programs throughout the State on populations of wildlife species. The hunting program for Shiawassee NWR will be managed consistent with the programs administered by the State.

**White-tailed deer**
Projected harvest of deer on the Refuge is based on past white-tailed deer hunts on the Refuge. In 2016, we received 994 applications for 596 permits; all of the permits were issued through a lottery system managed by Michigan DNR’s retail sale system. Hunters reported harvesting 107 deer in 2016 (the 5-year average is 118 deer harvested), which varied by gender 30% male (buck) and 70% female (doe) deer. Hunter success in 2016 averaged 18%, which was below the 5-year average of 21%. Under this Alternative the deer hunt will essentially be unchanged from the 2016 (and past years) hunt, with the exception of opening a few newly acquired tracts of Refuge land to deer hunting. The white-tailed deer hunt area includes approximately 9,895 acres (99% of the refuge area).

The Michigan DNR evaluates periodic white-tailed deer population surveys, hunter check stations, vehicle collision reports, crop damage complaints, and mail-in surveys from hunters in the area. In addition, the DNR flies a winter aerial deer survey covering Shiawassee River State Game Area and Shiawassee NWR. The resulting data are intended to assess trends in the deer herd. This is requisite to appropriately adjusting harvest quotas to reach a scientifically defensible and socially acceptable deer population goal. Michigan’s deer herd is managed by means of Deer Management Units (DMU) that covers specific geographic boundaries throughout the State. Shiawassee NWR and Shiawassee River SGA are designated collectively as DMU.
The deer management goal for DMU 273 is to manage the white-tailed deer herd at 600-800 deer. Over the last 5 years deer populations have estimated to be within management goals under existing deer hunt framework and therefore continuing this framework there are no anticipated cumulative impacts on white-tailed deer.

**Waterfowl**

This Alternative would open duck hunting on the Refuge in addition to the current goose hunting. National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, “Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88–14),” filed with the Environmental Protection Agency on June 9, 1988. The Service published Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment and Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53776), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006 as announced in a March 9, 2006, Federal Register notice (71 FR 12216).

Waterfowl populations throughout the United States are managed through an administrative process known as flyways. The Refuge is located in the Mississippi Flyway. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc.) in which information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment.

Annual waterfowl assessments are based on the distribution, abundance, and flight corridors of migratory birds. An Annual Waterfowl Population Status Report is produced each year and includes the most current breeding population and production information available for waterfowl in North America. The Report is a cooperative effort by the Service, Canadian Wildlife Service, various State and provincial conservation agencies, and private conservation organizations. An Annual Adaptive Harvest Management Report (AHM) provides the most current data, analyses, and decision making protocols. These AHM reports are intended to aid the development of waterfowl harvest regulations in the United States for each hunting season. In Michigan, the Michigan DNR selects season dates, bag limits, shooting hours, and other options using guidance in these reports. Their selections can be more restrictive, but cannot be more liberal than the AHM allows. Thus, the level of hunting opportunity afforded each State increases or decreases each year in accordance with the annual status of waterfowl populations.

The cumulative impacts to hunted ducks and geese are considered during the establishment of the Migratory Bird Frameworks from which States choose hunting seasons and bag limits. Refuges then choose to reflect State regulations or establish more restrictive specific regulations if necessary, thereby ensuring Refuge hunting will not lead to any adverse cumulative impacts.
Under this Alternative, approximately 1,318 acres (13% of the refuge area) would be open to waterfowl hunting. Anticipated waterfowl harvest is expected to be approximately 1,200 birds per year. Currently, there are approximately 100 to 150 total annual goose hunter trips to the Refuge and annual harvest varies from approximately 50 to 150 geese per year. The 5-year average for waterfowl harvest at the adjacent Shiawassee River SGA is 7,509 ducks and geese with 5,943 hunter trips, for an average of 1.26 birds harvested per hunter trip (note: Shiawassee River State Game Area hunts waterfowl 7 days/week during the waterfowl season and has a morning and afternoon lottery). In 2014, Michigan DNR estimated total waterfowl harvest for the southern lower peninsula of Michigan at 232,350 birds (26,471; 95% CL). Therefore, if the increased waterfowl hunt were additive to the SGA, it would represent only a small fraction of waterfowl harvest state-wide. However, it is anticipated that some waterfowl hunters would hunt the Refuge instead of the SGA thereby reducing the overall impact on waterfowl. Given the managed and regulatory framework and low additional hunting pressure, there are no anticipated cumulative impacts to waterfowl.

**Migratory Waterbirds**

Migratory waterbirds include American coot, common gallinule, sora, and Virginia rail. There is high variability in the North American coot population with a long-term average of 1.75 million coots from 1955 to 2009. There have historically been very few American coots taken in Mid-Michigan. The Shiawassee River SGA reports harvest of coot is annually less than 1% of the total waterfowl taken during their managed hunts (< 75 coots). Harvest of common gallinule would be incidental to waterfowl hunting on the Refuge. Estimated harvest of coots and gallinule in the Refuge is anticipated to be between 0-10 birds on an annual basis. Therefore, hunting of coots and gallinule at Shiawassee NWR would not be anticipated to contribute to adverse cumulative impacts to the population of these species in the State or flyway.

The only long-term dataset available for assessing the North American population trends of sora and Virginia rail is the North American Breeding Bird Survey. These data are not sufficient to determine Michigan trends for these species. Sora and Virginia rail also do not show a statistically significant population trend in North America. In the Mississippi Flyway, 98% of rails harvested are sora and 2% are Virginia rails. Very few rails are anticipated to be harvested from the Refuge based on harvest information from the State of Michigan. Estimated harvest of sora and Virginia rail is anticipated to be between 0-10 birds on an annual basis. Therefore, hunting of sora and Virginia rail is not anticipated to contribute to an adverse impact to these species in the State or flyway.

**Other Migratory Gamebirds**

The American woodcock population is managed on the basis of two independent populations, the Eastern and Central. Michigan woodcock are in the Central Management Region and have shown a 1.12% decrease per year from 1968 to 2010. The Central population data showed a 0.97% long-term decline. Although found on the Refuge, fewer than 25 hunters per year would likely attempt to harvest American woodcock at Shiawassee NWR. Also, woodcock hunting is coordinated between the DNR and the Migratory Bird Commission. In 2010, there were 94,657 woodcock harvested in Michigan (Steward and Sargent 2017). Thus, the anticipated harvest of
25 woodcock from the Refuge would have no anticipated cumulative impact on woodcock populations.

Specific data is not available on the number of Wilson's snipe hunters and snipe harvest in Michigan. The Refuge estimates fewer than 10 hunters will visit the Refuge to hunt Wilson’s snipe annually. Thus, the harvest would be unlikely to adversely impact statewide and regional populations.

**Wild turkey**

Wild turkeys may be hunted within the Refuge under this Alternative. The number of licenses issued for turkey hunting is regulated by turkey management units through a lottery system administered by the Michigan DNR. The number of permits is set by Michigan DNR to distribute hunting pressure and sustainable wild turkey populations. Currently the Refuge is located within turkey management unit ZA, which is a 10-county turkey management unit. For the 2017 spring turkey hunt, there were 1,200 permits issued for each of 4 hunt time periods (i.e., 4,800 permits available for the entire 2017 spring turkey season). Turkey harvest reporting is not mandatory in Michigan and harvest is estimated through post-season surveys. In 2016, there were 1,062 turkeys harvested (223; 95% CL) across all hunt periods in turkey management unit ZA (Frawley 2017b). Turkey harvest from the Refuge is anticipated to be 10 to 50 turkeys per year. Considering that turkeys are a highly managed species, the number of permits issued for the management unit is established by the State, and the relatively small proportion of the zone that Refuge lands comprise, it is anticipated that hunting turkeys on the Refuge under this Alternative would have no cumulative impact on local or regional turkey populations.

**Small Game**

Small game populations are expected to fluctuate in response to natural ecological cycles with some individual mortality from hunters as a result of this Alternative. It is not possible to project the small game harvest on the Refuge with available information. This alternative would remove some individuals of the Refuge’s larger carnivores (coyote, raccoon, and fox), but would not be expected to cause a population change based on the expected limited number of hunters for these species.

All of the species proposed for hunting have populations that are cyclical because of inter and intra-specific competition for changing food resources, winter weather severity, and other ecological factors from changing habitat conditions. The management of these species is underpinned by the scientific field of population ecology. Based on repeated empirical evidence, small game harvest is a compensatory form of mortality in ecosystems like Shiawassee NWR (i.e., hunters of these species are not substantially adversely affecting those populations on the Refuge because they are taking fewer individuals than would perish due to limited resources and weather). This concept of animal surplus relates especially well to species with high potential for population increase and high mortality rates. For example, the annual mortality rate for squirrels can be upwards of 0.40, and cottontail rabbits are known to have up to 0.80 annual mortality rates.
Surveys of Michigan small game hunters have been conducted by the Michigan DNR (Frawley 2008a and 2008b). In 2007, an estimated 202,618 people in Michigan hunted small game with the following estimated harvest by species: 365,946 (cottontail rabbit), 3,208 (gray fox), 8,841 (red fox), 56,704 (coyote), 65,817 (ring-necked pheasant), 171,506 (raccoon), 506,814 (squirrels, all species).

Frawley (2008b) suggested raccoon and opossum may be increasing in Michigan during the last 20 years, while red fox may be declining. The latter trend coincides with an increase in coyote harvest, suggesting red fox are declining because of inter-specific competition with coyotes. Approximately, 4,353 acres (44% of the refuge area) of the refuge will be open to small game hunting and is anticipated to offer 100 to 200 small game hunter trips per year. Overall, small game hunting on the Refuge will not have a cumulative impact on small game populations at a regional or State level.

Feral hog
Feral hogs are not native to the United States and can cause extensive damage to forests, wetlands, and water resources. Michigan DNR estimates there are 1,000 to 3,000 feral swine in the State. Feral hogs have not been documented to occur on Shiawassee NWR. The desired population of feral hogs on the Refuge is zero. Under this Alternative, feral hogs would be allowed to be harvested incidental to other lawful hunting.

4.2.5.B Anticipated Direct and Indirect Impact of Proposed Hunt on Refuge Programs, Facilities, and Cultural Resources
This Alternative will have little additional impact upon facilities or cultural resources. Hunting is one of the priority public uses and is compatible with the purposes for which the Refuge was established. Hunting is also a way for the public to gain an increased awareness and appreciation of the Shiawassee NWR and the National Wildlife Refuge System. Hunting activities will result in no ground disturbance or disturbance to standing structures and therefore would have no effect on any histories properties. No additional facilities such as roads or parking lots would be required to implement this Alternative. This Alternative would require some additional Refuge program effort; however, it is still designed to be administered with minimal Refuge resources. The annual costs of Refuge activities to attain this Alternative hunting program would be supported through the annual Refuge operating budget and use of volunteers. These costs include staff and operating expenses for Refuge law enforcement and volunteer assistance during the hunting season. The annual budget also includes Refuge staff activities associated with evaluating resources available for hunting (e.g., biological assessments of target species) and preparing for the hunt(s) (e.g., special signage, kiosks and access). The Recreational Fee Program is also utilized to cover costs associated with the hunt such as hunting brochures, blind maintenance, road maintenance, mowing, and other upkeep. It is anticipated that implementation of this Alternative would require additional resources to implement, but funding would be sufficient to implement the Alternative into the future.

Activities that might cause an effect to a historic property would be subject to a case-by-case Section 106 review.
4.2.5.C Anticipated Direct and Indirect Impact of Proposed Hunt on Refuge Environment and Community

Refuge personnel expect no measurable adverse impacts by this proposed action on the Refuge environment which includes soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur in some areas; however, these disturbances would be minimal and temporary.

This Alternative would allow increased hunting opportunities. Increased hunting on the Refuge may slightly increase the expenditure of funds by hunters in the local community for meals, lodging and transportation. According to the 2011 National Survey of Fishing, Hunting and Wildlife Associated Recreation, hunting and fishing expenditures in Michigan totaled $2.3 billion. Also in 2011, $1.2 billion was spent on wildlife watching recreational activities in Michigan. Although the number of hunters may increase slightly as a result of this Alternative, there would be no change in the availability of non-consumptive uses of the Refuge over current conditions.

There would be minimal to negligible effects to surface soils, topography and vegetation in areas opened to hunting. Hunting access, in most cases, will be by foot or bike access only. Refuge regulations do not permit the use of vehicles off of designated Refuge roads. Parking will be restricted to designated parking lots or along roadsides. Impacts on vegetation should be temporary and similar to that occurring from non-consumptive users.

Impacts to the natural hydrology would be imperceptible. The Refuge staff expects impacts to air and water quality to be minimal. The effect of these Refuge-related activities on overall air and water quality in the region are anticipated to be negligible.

Impacts associated with solitude are expected to be minimal given the limited time, season and space management techniques used to avoid conflicts among user groups.

4.2.5.D Other Past, Present, Proposed, and Reasonably Foreseeable Hunts and Anticipated Impacts

Under this Alternative, there would be no other reasonably foreseeable future hunts other than that proposed in this Alternative. If additional hunts are proposed in the future, it would require an amendment to the Hunt Plan and all applicable procedures, including a revised or amended EA. Therefore, there would be no anticipated impacts on other past, present, proposed, and reasonably foreseeable hunts.
4.2.5 E Anticipated Impacts If Individual Hunts Are Allowed To Accumulate
National Wildlife Refuges, including Shiawassee NWR, conduct or will conduct hunting programs within the framework of State and Federal regulations. The proposed Alternative is at least as restrictive as the State of Michigan. By maintaining hunting regulations that are as, or more, restrictive than the State's, individual Refuges ensure that they are maintaining seasons which are supportive of management on a regional basis. Refuges will coordinate with the Michigan DNR annually to maintain regulations and programs that are consistent with the State's management program.

4.2.6 Environmental Justice
Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects unique to minority or low-income populations in the affected area. The Alternative will not disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations. However, with the expansion of species, seasons, and locations where hunting will be allowed, this Alternative will offer increased opportunity for minority or low-income populations to hunt on the Refuge.

4.2 Alternative 3 – Modified Preferred Alternative
Permit hunting for white-tailed deer and waterfowl.
This Alternative would allow hunting of white-tailed deer, waterfowl, waterbirds and feral hog as described in Alternative 2, the Preferred Alternative, but would not include the hunting of turkey, small game, American woodcock or furbearers as described in Alternative 2. In summary, Alternative 3 would allow the following hunts as described in Alternative 2:

Deer Hunt Area (Figure 2-1).
Open for deer hunting during fall archery and firearms DNR seasons.
  a. Open to lottery hunts.
     i. Applicants selected randomly through State of Michigan Retail Sales System.
  b. Number of hunts and hunters dependent on deer population objectives.
  c. Number of hunts, types of hunts, number of individuals, and dates to be determined before the start of the season.
  d. Stands or blinds may not be left overnight.
  e. Parking allowed only in designated areas.
Incidental take of feral hogs will be allowed during Refuge hunts.

**Waterfowl Hunt Area** (Figure 2-2)

- Open for ducks and geese during DNR seasons after September 30\(^{th}\).
  - a. Non-toxic shot only.
  - b. Hunts allowed four days per week (Saturday, Sunday, Tuesday, and Thursday) during regular goose season after September 30\(^{th}\).
  - c. Authorized hunter access allowed 1 ½ hours before legal shooting time.
  - d. Authorized shooting hours are ½ hour before legal sunrise until 12:00 p.m.
  - e. Use of hunting dogs is permitted.
  - f. Parking allowed only in designated areas.
  - g. 25 shell limit.

- Open for American coot, common gallinule, sora, Virginia rail, and Wilson's snipe.
  - h. Concurrent with refuge duck and goose hunting season and regulations.

Incidental take of feral hogs will be allowed during Refuge hunts.

4.3.1 Habitat Impacts

Except for the non-ambulatory deer hunts, on-land hunting access would be non-motorized, with parking restricted to designated parking areas. Non-ambulatory hunters and their assistants would be allowed motor vehicle access only on established roadways during the 4-day hunt and in designated parking locations specifically identified to avoid impacts to sensitive vegetation. Waterfowl/waterbird (ducks, geese, coots, rails, etc.) hunting along the Shiawassee, Tittabawassee, Cass and Flint Rivers would be by boat. Therefore, impacts on vegetation from land-based hunters would be inconsequential (i.e., the existing natural communities would not be appreciably disrupted by low to moderate pedestrian traffic as evidence from past experience, because most hunting activities will occur during the vegetative dormant season and activities would be distributed throughout the Refuge). In addition, the majority of waterfowl/waterbird hunting would occur on the rivers during the dormant season and therefore would have little to no impact to Refuge habitat.

Under this Alternative, each year an estimated 600 deer hunters would utilize approximately 9,895 acres open to deer hunting (99% of the Refuge area) and approximately 1,020 migratory bird hunters would utilize approximately 1,318 acres open to migratory bird hunting (13% of the Refuge area). Under this Alternative, the number of deer hunters is anticipated to be relatively the same as under the No Action Alternative (current condition). The number of waterfowl/waterbird hunters would be expected to increase over current conditions; however, the vast majority of these hunters would hunt from boats as very limited lands would be open to waterfowl/waterbird hunting thus the impact of these hunters on land is anticipated to be less than under current conditions.

The Refuge under the legal authority of the Migratory Bird Conservation Commission and the Migratory Bird Conservation Act (16 U.S.C. § 715 - 715s) is “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” The Refuge’s CCP further refines those purposes and identifies goals and strategies that would enable the Refuge to fulfill its mission. In implementing the CCP, the Refuge conducts habitat management actions.
that favor healthy and functional ecological communities on Refuge lands. This approach benefits all native fish and wildlife species, including species traditionally hunted. Habitats are not managed to favor hunted species over other species, but are managed to maintain healthy populations of the appropriate species for the type of habitat available on the Refuge. Because of this approach, implementation of this Alternative will not result in significant direct, indirect, or cumulative effects to habitats at any scale due to proposed hunting activities.

The cumulative impact of this Alternative would be similar to Alternative 2 but would have even less impact because there would be no turkey, small game, American woodcock or furbearer hunting on the Refuge.

4.3.2 Biological Impacts
Other wildlife not being harvested (including birds, mammals, reptiles, amphibians and invertebrates) may be temporarily disturbed by hunters approaching an animal’s site and the animals may flush or move to avoid human contact. Deer and waterfowl/waterbird hunts would occur in the fall when most if not all of these animals are not breeding or nesting and when young are highly mobile. In addition, because of the nature of the hunters (quiet, slow moving and camouflaged) and because of the time of year of most hunts (and hunters) and the dispersed nature of hunting activities across a large area, disturbance to non-hunted animals is expected to be minimal, of short duration and localized. Because other public uses are restricted to existing trails and roads and sensitive areas of the Refuge are closed during critical times of year for wildlife, such as the closing of the Wildlife Drive to protect nesting bald eagles and migratory waterfowl, there are no anticipated significant direct, indirect, or cumulative effects to non-hunted wildlife from this Alternative.

Mortality/harvest of game animals would occur under this Alternative. Specifically this Alternative would allow the harvest of deer and geese (as under the No Action Alternative), but also ducks, coots, gallinule, rails, snipe and feral pig (if present). The harvest of Refuge wildlife species will be in accordance with Refuge-specific regulations, Federal regulations and Michigan State regulations and bag limits. Because these species are regulated and monitored, there will be no anticipated long-term population impacts locally or regionally. Migratory species such as ducks and geese are under Federal regulation and are managed and monitored at a flyway level, and harvest regulations are set on an annual basis. If changes in populations are detected and reach a level where the species could no longer be harvested, those regulations would be stepped down from the flyway level to State level. Additionally, game animals such as deer are managed under the authority of the State and are managed at State and regional levels. Since this Alternative would follow all Federal and State regulations, any changes in regulations such as season and bag limits on game species would be implemented at the Refuge level. Disturbance to other wildlife during hunts is described above.

4.3.3 Listed Species
There are currently no known federally threatened or endangered species on the Refuge. No activity under this Alternative would impact potential habitat for threatened and endangered species that may occur within the Refuge. Potential disturbance, if the species were present, is highly unlikely do to 1) a remote chance of co-occurrence of the species and hunters, 2) the lack of potential presence of listed bats during the deer and waterfowl/waterbird hunt seasons, and 3) the likely hibernation/lack of inactivity and secretive nature of the eastern massasuga during the
deer and waterfowl hunts. Therefore, we conclude there would be no effect to federally listed species from this Alternative.

4.3.4 Historic Properties and Cultural Resources
This Alternative will result in no additional ground disturbance or disturbance to standing structures. Therefore, this Alternative would have no effect on any historic properties or cultural resources.

4.3.5 Cumulative Impact Analysis

4.3.5.A Anticipated Direct and Indirect Impact of Proposed Hunt on Wildlife Species
The State of Michigan has administered and monitored hunting programs on nearby State Game Areas for decades. During this time, the Michigan DNR has not documented any significant adverse effects of regulated hunting programs throughout the State on populations of wildlife species. The hunting program for Shiawassee NWR will be managed consistent with the programs administered by the State.

**White-tailed deer**
Projected harvest of deer on the Refuge is based on past white-tailed deer hunts on the Refuge. In 2016, we received 994 applications for 596 permits; all of the permits were issued through a lottery system managed by Michigan DNR’s retail sale system. Hunters reported harvesting 107 deer in 2016 (the 5-year average is 118 deer harvested), which varied by gender 30% male (buck) and 70% female (doe) deer. Hunter success in 2016 averaged 18%, which was below the 5-year average of 21%. Under this Alternative the deer hunt will essentially be unchanged from the 2016 (and past years) hunt, with the exception of opening a few newly acquired tracts of Refuge land to deer hunting. The white-tailed deer hunt area includes approximately 9,895 acres (99% of the refuge area).

The Michigan DNR evaluates periodic white-tailed deer population surveys, hunter check stations, vehicle collision reports, crop damage complaints, and mail-in surveys from hunters in the area. In addition, the DNR flies a winter aerial deer survey covering Shiawassee River State Game Area and Shiawassee NWR. The resulting data are intended to assess trends in the deer herd. This is requisite to appropriately adjusting harvest quotas to reach a scientifically defensible and socially acceptable deer population goal. Michigan’s deer herd is managed by means of Deer Management Units (DMU) that covers specific geographic boundaries throughout the State. Shiawassee NWR and Shiawassee River SGA are designated collectively as DMU 273. The deer management goal for DMU 273 is to manage the white-tailed deer herd at 600-800 deer. Over the last 5 years deer populations have estimated to be within management goals under existing deer hunt framework and therefore continuing this framework there are no anticipated cumulative impacts on white-tailed deer.
**Waterfowl**

This Alternative would open duck hunting on the Refuge in addition to the current goose hunting. National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, “Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88–14),” filed with the Environmental Protection Agency on June 9, 1988. The Service published Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment and Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53776), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006 as announced in a March 9, 2006, Federal Register notice (71 FR 12216).

Waterfowl populations throughout the United States are managed through an administrative process known as flyways. The Refuge is located in the Mississippi Flyway. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc.) in which information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment. Annual waterfowl assessments are based on the distribution, abundance, and flight corridors of migratory birds. An Annual Waterfowl Population Status Report is produced each year and includes the most current breeding population and production information available for waterfowl in North America. The Report is a cooperative effort by the Service, Canadian Wildlife Service, various State and provincial conservation agencies, and private conservation organizations. An Annual Adaptive Harvest Management Report (AHM) provides the most current data, analyses, and decision making protocols. These AHM reports are intended to aid the development of waterfowl harvest regulations in the United States for each hunting season. In Michigan, the Michigan DNR selects season dates, bag limits, shooting hours, and other options using guidance in these reports. Their selections can be more restrictive, but cannot be more liberal than the AHM allows. Thus, the level of hunting opportunity afforded each State increases or decreases each year in accordance with the annual status of waterfowl populations.

The cumulative impacts to hunted ducks and geese are considered during the establishment of the Migratory Bird Frameworks from which States choose hunting seasons and bag limits. Refuges then choose to reflect State regulations or establish more restrictive specific regulations if necessary, thereby ensuring Refuge hunting will not lead to any adverse cumulative impacts.

Under this Alternative, approximately 1,318 acres (13% of the refuge area) would be open to waterfowl hunting. Anticipated waterfowl harvest is expected to be approximately 1,200 birds per year. Currently, there are approximately 100 to 150 total annual goose hunter trips to the Refuge and annual harvest varies from approximately 50 to 150 geese per year. The 5-year average for waterfowl harvest at the adjacent Shiawassee River SGA is 7,509 ducks and geese.
with 5,943 hunter trips, for an average of 1.26 birds harvested per hunter trip (note: Shiawassee River State Game Area hunts waterfowl 7 days/week during the waterfowl season and has a morning and afternoon lottery). In 2014, Michigan DNR estimated total waterfowl harvest for the southern lower peninsula of Michigan at 232,350 birds (26,471; 95% CL). Therefore, if the increased waterfowl hunt were additive to the SGA, it would represent only a small fraction of waterfowl harvest state-wide. However, it is anticipated that some waterfowl hunters would hunt the Refuge instead of the SGA thereby reducing the overall impact on waterfowl. Given the managed and regulatory framework and low additional hunting pressure, there are no anticipated cumulative impacts to waterfowl.

**Migratory Waterbirds**
Migratory waterbirds include American coot, common gallinule, sora, and Virginia rail. There is high variability in the North American coot population with a long-term average of 1.75 million coots from 1955 to 2009. There have historically been very few American coots taken in Mid-Michigan. The Shiawassee River SGA reports harvest of coot is annually less than 1% of the total waterfowl taken during their managed hunts (< 75 coots). Harvest of common gallinule would be incidental to waterfowl hunting on the Refuge. Estimated harvest of coots and gallinule in the Refuge is anticipated to be between 0-10 birds on an annual basis. Therefore, hunting of coots and gallinule at Shiawassee NWR would not be anticipated to contribute to adverse cumulative impacts to the population of these species in the State or flyway.

The only long-term dataset available for assessing the North American population trends of sora and Virginia rail is the North American Breeding Bird Survey. These data are not sufficient to determine Michigan trends for these species. Sora and Virginia rail also do not show a statistically significant population trend in North America. In the Mississippi Flyway, 98% of rails harvested are sora and 2% are Virginia rails. Very few rails are anticipated to be harvested from the Refuge based on harvest information from the State of Michigan. Estimated harvest of sora and Virginia rail is anticipated to be between 0-10 birds on an annual basis. Therefore, hunting of sora and Virginia rail is not anticipated to contribute to an adverse impact to these species in the State or flyway.

**Other Migratory Gamebirds**
Specific data is not available on the number of Wilson's snipe hunters and snipe harvest in Michigan. The Refuge estimates fewer than 10 hunters will visit the Refuge to hunt Wilson’s snipe annually. Thus, the harvest would be unlikely to adversely impact statewide and regional populations.

**Feral hog**
Feral hogs are not native to the United States and can cause extensive damage to forests, wetlands, and water resources. Michigan DNR estimates there are 1,000 to 3,000 feral swine in the State. Feral hogs have not been documented to occur on Shiawassee NWR. The desired population of feral hogs on the Refuge is zero. Under this Alternative, feral hogs would be allowed to be harvested incidental to other lawful hunting.
4.3.5.B Anticipated Direct and Indirect Impact of Proposed Hunt on Refuge Programs, Facilities, and Cultural Resources

This Alternative will have little additional impact upon facilities or cultural resources. Hunting is one of the priority public uses and is compatible with the purposes for which the Refuge was established. Hunting is also a way for the public to gain an increased awareness and appreciation of the Shiawassee NWR and the National Wildlife Refuge System. Hunting activities will result in no ground disturbance or disturbance to standing structures and therefore would have no effect on any historic properties. No additional facilities such as roads or parking lots would be required to implement this Alternative. However, this Alternative would require some additional Refuge program effort; however, it is still designed to be administered with minimal Refuge resources. The annual costs of Refuge activities to attain this Alternative hunting program would be supported through the annual Refuge operating budget and use of volunteers. These costs include staff and operating expenses for Refuge law enforcement and volunteer assistance during the hunting season. The annual budget also includes Refuge staff activities associated with evaluating resources available for hunting (e.g., biological assessments of target species) and preparing for the hunt(s) (e.g., special signage, kiosks and access). The Recreational Fee Program is also utilized to cover costs associated with the hunt such as hunting brochures, blind maintenance, road maintenance, mowing, and other upkeep. It is anticipated that implementation of this Alternative would require additional resources to implement, but slightly less than Alternative 2, but funding would be sufficient to implement the Alternative into the future.

Activities that might cause an effect to a historic property would be subject to a case-by-case Section 106 review.

4.3.5.C Anticipated Direct and Indirect Impact of Proposed Hunt on Refuge Environment and Community

Refuge personnel expect no measurable adverse impacts by this proposed action on the Refuge environment which includes soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur in some areas; however, these disturbances would be minimal and temporary.

This Alternative would allow increased hunting opportunities, but slightly less than Alternative 2. Increased hunting on the Refuge may slightly increase the expenditure of funds by hunters in the local community for meals, lodging and transportation. According to the 2011 National Survey of Fishing, Hunting and Wildlife Associated Recreation, hunting and fishing expenditures in Michigan totaled $2.3 billion. Also in 2011, $1.2 billion was spent on wildlife watching recreational activities in Michigan. Although the number of hunters may increase slightly as a result of this Alternative, there would be no change in the availability of non-consumptive uses of the Refuge over current conditions.

There would be minimal to negligible effects to surface soils, topography and vegetation in areas opened to hunting. Hunting access, in most cases, will be by foot or bike access only. Refuge regulations do not permit the use of vehicles off of designated Refuge roads. Parking will be restricted to designated parking lots or along roadsides. Impacts on vegetation should be temporary and similar to that occurring from non-consumptive users.
Impacts to the natural hydrology would be imperceptible. The Refuge staff expects impacts to air and water quality to be minimal. The effect of these Refuge-related activities on overall air and water quality in the region are anticipated to be negligible.

Impacts associated with solitude are expected to be minimal given the limited time, season and space management techniques used to avoid conflicts among user groups.

4.3.5.D Other Past, Present, Proposed, and Reasonably Foreseeable Hunts and Anticipated Impacts

Under this Alternative, there would be no other reasonably foreseeable future hunts other than that proposed in this Alternative. If additional hunts are proposed in the future, it would require an amendment to the Hunt Plan and all applicable procedures, including a revised or amended EA. Therefore, there would be no anticipated impacts on other past, present, proposed, and reasonably foreseeable hunts.

4.3.5.E Anticipated Impacts If Individual Hunts Are Allowed To Accumulate

National Wildlife Refuges, including Shiawassee NWR, conduct or will conduct hunting programs within the framework of State and Federal regulations. This Alternative is at least as restrictive as the State of Michigan. By maintaining hunting regulations that are as, or more, restrictive than the State's, individual Refuges ensure that they are maintaining seasons which are supportive of management on a regional basis. Refuges will coordinate with the Michigan DNR annually to maintain regulations and programs that are consistent with the State's management program.

4.3.6. Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects unique to minority or low-income populations in the affected area. The Alternative will not disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations. However, with the expansion of species and locations where hunting will be allowed, this Alternative will offer a slightly increased opportunity for minority or low-income populations to hunt on the Refuge.

CHAPTER 5. REGULATORY COMPLIANCE

The Refuge Recreation Act of 1962 (16 U.S.C 460k) authorizes the Secretary of the Interior to administer National Wildlife Refuges for public recreation as an appropriate incidental or
secondary use (1) to the extent that is practicable and consistent with the primary objectives for which an area was established, and (2) provided that funds are available for the development, operation, and maintenance of permitted recreation.

The National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 688dd-ee) authorizes the Secretary of the Interior to permit the use of any area within the NWR System for any purpose, including but not limited to hunting, fishing, and public recreation whenever those uses are determined to be compatible with the purposes for which the area was established. The Improvement Act of 1997 is the latest amendment to the NWR System Administration Act. It supports the NWR System Administration Act’s language concerning the authorization of hunting and other recreational uses on Refuge lands. The NWR Improvement Act substantiates the need for the NWR System to focus first and foremost on the conservation of fish, wildlife, and plant resources and their habitats and states that other uses will only be authorized if they are determined to be compatible with this mission statement and the purposes for which the Refuge was established.

Providing hunting opportunities is consistent with the Refuge's 2001 Comprehensive Conservation Plan and U.S. Fish and Wildlife Service policies on wildlife dependent recreation and hunting as mandated by the National Wildlife Refuge System Improvement Act of 1997. The Service has determined (i.e., Compatibility Determination included with the 2001 CCP) that this use is compatible with the purpose of the Refuge and the mission statement of the NWR System.

**CHAPTER 6. CONSULTATION AND COORDINATION WITH OTHERS**

We will be conducting public outreach through various methods including news releases, website, social media, and the Federal Register Notice on the Draft Hunt Plan and this associated draft Environmental Assessment.

**REFERENCES**


Frawley, B. J. 2008a. 2007 small game harvest survey. Michigan Department of Natural Resources. Wildlife Division Report No. 3493


