# CHAPTER FOUR AFFECTED ENVIRONMENT

## 4.1 INTRODUCTION

This chapter provides a description of the primary resources of concern that could potentially be affected by projects approved under the ASR Program. The existing conditions of these resources serve as a baseline from which to identify and evaluate potential impacts. Topics discussed include the range of conditions that may be present at project sites, sources of site-specific resource information, and the regulatory setting within which the resource is managed or protected.

The ASR Program is national in scale and therefore has the potential to affect resources in all 50 states, five territories, and the District of Columbia. The projects that would be reviewed and potentially approved for registration under the ASR Program would be implemented in geographically diverse areas (both urban and rural), as well as previously disturbed and undisturbed sites. Because of the wide variety of natural and manmade environments that may be affected by the ASR Program, and the complexity of resources potentially affected, it is not possible to provide a detailed comprehensive description of locally affected environments in this PEA. Instead, this chapter characterizes resources in general terms and identifies those resources that may require additional site-specific analysis (for instance, wetlands). A discussion of applicable regulations is included to define the relevant considerations applicable to this PEA.

As described in Chapter 1, development of site-specific EAs for ASR Program projects would still be needed for individual towers that do not meet the criteria for categorical exclusion.

Communications towers are part of the existing landscape and the following section describes their general characteristics and distribution.

## 4.2 EXISTING COMMUNICATIONS TOWERS

Communications towers serve many purposes and support antennas used by various agencies and industries. They provide support for national defense, homeland security (including border surveillance), and monitoring maritime vessels in distress. (National defense and other systems operated by Federal agencies are not licensed by the FCC, and their towers are not required to be registered unless they are also used for FCC-licensed services.) In addition, antennas on communications towers provide the public with various communications services such as radio, television, cellular phone, paging, microwave, and public safety communications (such as police/fire dispatch).

### 4.2.1 General Characteristics

Communications towers are generally of three construction types: monopole designs (including those disguised as trees and other stealth towers), lattice structures, and guyed towers. Monopole and lattice designs are referred to as self-supporting because they do not require guy wires. The three types of construction are illustrated in Figure 6.


**Figure 6: Tower Types**

A monopole tower is a single tube tower with one foundation; monopole towers typically do not exceed 200 feet (61 meters) in height. Usually, the antennas are mounted on the exterior of monopole towers, although some stealth designs, such as flagpoles, house the antennas inside the pole. Because they are limited in height, monopoles are most often used for services that require relatively low antennas such as cellular phones.

Lattice towers afford the greatest flexibility and are often used in heavy loading conditions. A lattice tower is typically three-sided with a triangular base; however, there are some four-sided lattice towers.

A guyed tower is a straight tower supported by guy wires to the ground, which anchor the tower. Guyed towers require the greatest amount of land to accommodate the guy wire arrays and anchor points. For taller heights (roughly 300 feet [91 meters] and greater) it is usually much less expensive to build a guyed tower than any other kind. Therefore, most radio and television broadcast towers are guyed towers.

All towers that are taller than 200 feet (61 meters) AGL require FAA notification and the FAA usually prescribes lighting for these towers. Certain shorter towers located near airport runways also require FAA notification and may require lighting. FCC policy generally prohibits construction of new towers over 2,000 feet (610 meters) in height.

Tower sites also may include other structures such as sheds or outbuildings, as well as ground lighting and power lines.

### 4.2.2 Number of Existing Towers

Towers registered in the ASR database date back to 1900. As of June 28, 2011, there were 85,261 towers (i.e., structures coded as "Towers" or "Tower Arrays") registered in the FCC database (FCC 2011b). The number of new registrations peaked in 1999, 2000, and 2001, and has been trending downward since then. In particular, new registered tower construction has decreased over the last 5 years, from 3,730 new towers in 2006 to 2,527 new towers in 2010.

Approximately 67 percent of the towers in the ASR database are less than 301 feet (91 meters) AGL, and 94 percent are less than 451 feet (137 meters) AGL. Less than 1 percent of registered towers are taller than 1,000 feet (305 meters) AGL:

- 0 to 300 feet (0 to 91 meters) AGL — 67.6 percent
- 301 to 450 feet (91 to 137 meters) AGL — 26.5 percent
- 451 to 1,000 feet (137 to 305 meters) AGL — 5.1 percent
- Greater than 1,000 feet (305 meters) AGL — 0.8 percent

## 4.2.3 Distribution of Existing Towers

Figure 7 depicts the distribution of registered towers by state. Texas has the largest number of towers, followed by California, Florida, Ohio, and Georgia.

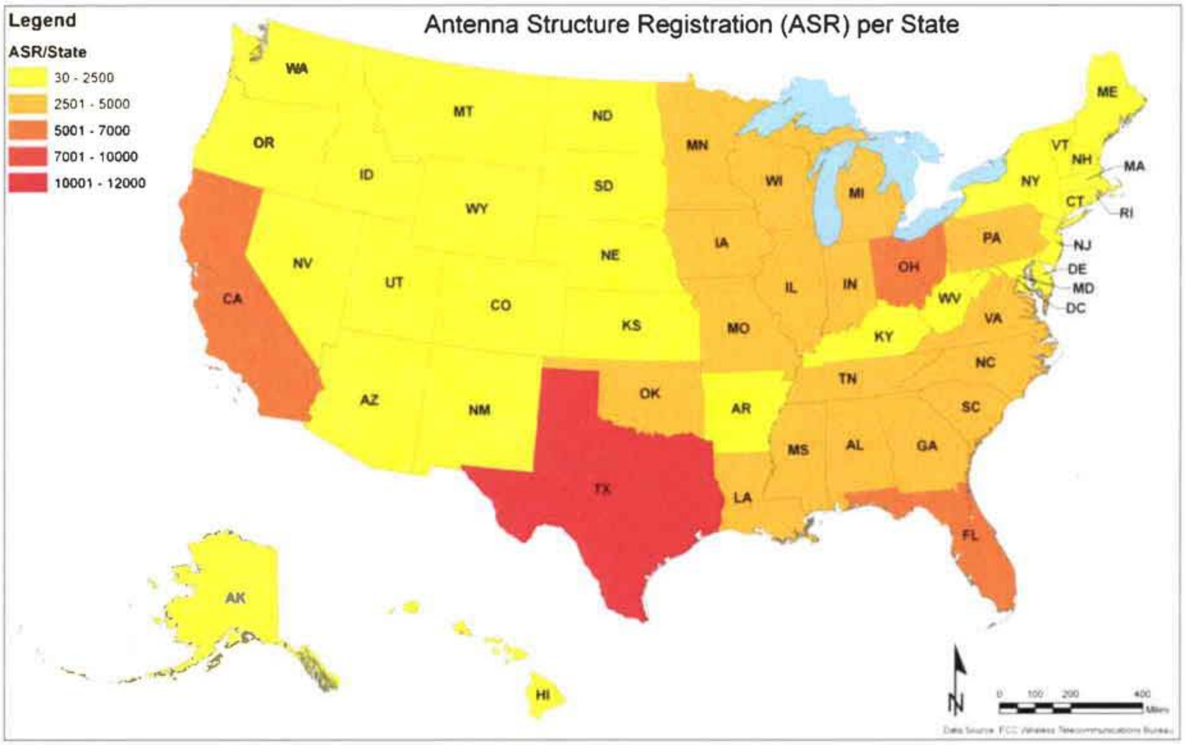


**Figure 7: Number of Towers by State**
Source: FCC 2011b

There is concentration of towers exceeding 300 feet (91 meters) AGL in the eastern and mid-western portions of the United States. Towers over 1,000 feet (305 meters) are generally concentrated in the mid-western and southeastern regions of the United States. As for tower locations outside the 50 states, there are locations in the territories of Puerto Rico, Virgin Islands, Guam, Northern Mariana Islands, and American Samoa. (For towers over 300 feet [91 meters], there are locations in Puerto Rico and Guam. For towers over 1,000 feet [305 meters], there is only one location in Puerto Rico.)

## 4.2.4 Future Needs/Trends

The continuing growth of the wireless services industry and the increasing demand for public safety communications have generated, and will continue to generate, a need for new communications towers subject to the ASR program.

There are factors suggesting the number of new registered towers constructed each year may continue to decline, as well as factors suggesting the trend might instead level off or even slightly increase. One factor suggesting decline is the continued splitting of cells (the area covered by each base station antenna) to meet needs for capacity. Smaller cells typically require lower antennas, which frequently can either be collocated on existing structures or placed on shorter towers that do not require registration and lighting. Another factor that has reduced the need for towers in recent years is consolidation in the telecommunications industry, which has enabled companies to avoid duplication of facilities. In addition, the future need for new towers may be reduced due to the development of distributed antenna system (DAS) technology. Where DAS is deployed, service is provided through a series of antennas typically mounted at a height of about 30 to 40 feet (9 to 12 meters), which eliminates the need for many taller towers. A single neutral-host DAS can accommodate multiple carriers. For economic and other reasons, DAS is not a viable solution for all areas. Where it is deployed, however, fewer registered towers will be necessary to provide cellular or broadband services.

These factors suggesting a decline in the need for new registered towers may be offset, however, by initiatives to build out services and bring broadband to rural areas, which may be more efficiently served by a taller tower covering a greater area. The greater availability of funding to build out public safety systems is another factor that may increase the number of registered towers.

The height distribution of future registered towers may also vary from recent years. In particular, now that full power stations have completed the transition to digital television, TV broadcasters are unlikely to need many new towers, and the FCC therefore expects a significant decline in construction of the tallest towers (those taller than about 600 feet [183 meters]). On the other hand, increased funding for public safety systems may lead to more towers in the range of approximately 350 to 450 feet (107 to 137 meters).

The median number of new registered towers constructed each year over the past 5 years is 2,867 towers (3,730 new towers in 2006; 2,927 in 2007; 2,867 in 2008; 2,686 in 2009; and 2,527 in 2010). This PEA uses 2,800 as a conservative estimate of the number of new registered towers anticipated to be constructed each year over the next 10 years. Although the number of new towers constructed each year may continue to decrease, it is not possible to predict with any certainty what that decrease will be.

## 4.3 RESOURCES NOT AFFECTED

The No Action Alternative, Alternative 1, and the three options under Alternative 2 are anticipated to have no impacts or negligible impacts on the resources listed. Negligible impacts are barely perceptible or measurable and remain localized and confined. A brief discussion of each resource and the rationale for its dismissal from further analysis is provided below.

### 4.3.1 Geology

The No Action Alternative, Alternative 1, and all options of Alternative 2 are expected to result in no impacts or negligible impacts to geology. All alternatives would require some excavation and earthwork; however, the excavation would not likely be deep enough to affect the geologic character of the site(s). Therefore, this resource topic is not addressed further in this PEA.

### 4.3.2 Soils

Under the No Action Alternative, Alternative 1, and all options of Alternative 2, surficial ground disturbance would occur within the footprint of the communications tower and any guy wire anchor points, if the tower is to be supported by guy wires. Because of the small amount of excavation required to construct a tower, adverse impacts to soil would be short-term and negligible under all alternatives. Therefore, this resource topic is not addressed further in this PEA.

### 4.3.3 Farmlands

Prime and unique farmlands and farmlands of state and local importance are protected under the Farmland Protection Policy Act of 1981 (7 U.S.C. § 4201 *et seq.*). Prime farmland is characterized as land with the best physical and chemical characteristics for the production of food, feed, forage, fiber, and oilseed crops. Prime farmland is either used for food or fiber crops or is available for those crops; it is not urban, built-up land, or water areas. Unique farmland is defined as land that is used for the production of certain high-value crops, such as citrus, tree nuts, olives, and fruits. Federal agencies must examine the potentially adverse effects to prime or unique farmlands or farmlands of state or local importance before approving any action that would irreversibly convert farmland to non-agricultural uses.

Farmlands are often sought as sites for communications towers because of the need for telecommunications services in rural areas. Under the No Action Alternative, Alternative 1, and all options of Alternative 2, construction of new towers in areas containing protected farmland soils would convert only small amounts of farmlands within the tower footprint and guy wire anchor points (if needed) to non-agricultural (tower) use. In most cases, continued agricultural use of the farmland surrounding the tower would continue. Therefore, impacts to farmlands would be negligible and this resource topic is not addressed further in this PEA.

### 4.3.4 Groundwater

The No Action Alternative, Alternative 1, and all options of Alternative 2 are anticipated to have no impacts or negligible impacts to groundwater. Excavation and earthwork for new towers would be relatively minor and localized and applicants would be required to adhere to Federal, state, and local regulations that protect groundwater resources. Therefore, this resource topic is not addressed further in this PEA.

### 4.3.5 Coastal Zones/Coastal Barriers

The coastal zone consists of coastal waters and the adjacent shore lands, strongly influenced by each other and in proximity to the shorelines of the several coastal states. The coastal zone includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends, in Great Lakes waters, to the international boundary between the United States and Canada and, in other areas, seaward to the outer limit of State title and ownership. The zone extends inland from the shorelines only to the extent necessary to control shore lands, the uses of which have a direct and significant impact on coastal waters, and to control those geographical areas which are likely to be affected by or vulnerable to sea level rise. Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal government.

The Coastal Zone Management Act of 1972 (16 U.S.C. § 1451 *et seq.*) is administered by the Department of Commerce's Office of Ocean and Coastal Resource Management within the National Oceanic and Atmospheric Administration. It applies to all coastal states and to all states that border the Great Lakes. The Federal Consistency provision, contained in Section 307 of the Act, allows affected states to review Federal activities to ensure that they are consistent with the state's coastal zone management program.

The Coastal Barrier Resources Act of 1982 (16 U.S.C. § 3501 *et seq.*) protects coastal areas. These areas serve as barriers against wind and tidal forces caused by coastal storms and also provide habitat for aquatic species. One of the goals of the Act is to protect the natural resources associated with coastal barriers and this goal is applicable to the construction of communications towers. Currently, the Coastal Barrier Resources System includes 585 system units along the Atlantic Ocean, Gulf of Mexico, Florida Keys, Great Lakes, and Puerto Rico.

The No Action Alternative, Alternative 1, and all options of Alternative 2 are expected to result in negligible impacts to the coastal zone or coastal barrier resources because towers constructed in these areas would require only small amounts of disturbance to soils and vegetation within the footprint of the communications tower and any guy wire anchor points needed. However, coastal zones and coastal barriers contain important habitats for migratory birds and towers located in these areas may affect migratory birds; therefore, these areas are discussed in Section 4.6.3 and Section 5.4.3.3.

### 4.3.6 Designated Wilderness Areas

The Wilderness Act of 1964 established the National Wilderness Preservation System and a process for Federal land management agencies to recommend wilderness areas to Congress. Hundreds of wilderness zones within already protected federally administered property, consisting of over 9 million acres (3.6 million hectares), comprised the original National Wilderness Preservation System. As of August 2008, a total of 704 separate wilderness areas, encompassing 108 million acres (44 million hectares), had been set aside. With the passage of the Omnibus Public Lands Act in March 2009, the number increased to 756 wilderness areas. This is approximately 5 percent of the entire U.S. land area, though only about 2.5 percent of the 48 contiguous states. Wilderness areas exist in every state except Connecticut, Delaware, Iowa, Kansas, Maryland, and Rhode Island.

Wilderness, as defined by the Wilderness Act, is untrammeled (free from man's control), undeveloped, and natural, and offers outstanding opportunities for solitude and primitive recreation. People value wilderness for its wildlife; scenery; clean air and water; and opportunities for solitude, personal growth experiences, and a sense of connection with nature and values beyond themselves.

Communications towers are rarely proposed within wilderness areas because of the remoteness of many of these areas and the difficulties of obtaining managing agency approval. Furthermore, in the event a tower is proposed for construction in a wilderness area, the FCC rules require preparation of an EA. Therefore, the No Action Alternative, Alternative 1, and all options of Alternative 2 are expected to result in negligible impacts to designated wilderness areas and these areas are not addressed further in this PEA.

### 4.3.7 Air Quality

The Clean Air Act, as amended, requires the U.S. Environmental Protection Agency (EPA) to set two types of National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. Primary standards set limits to protect public health, including the health of "sensitive" populations, such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, or buildings. Emissions from backup generators at project sites which contain fuel-burning internal combustion engines could temporarily increase the localized levels of some pollutants. However, the No Action Alternative, Alternative 1, and all options of Alternative 2 would not result in any noticeable short-term or long-term impacts to air quality. The No Action Alternative, Alternative 1, and all options of Alternative 2 are expected to have negligible impacts on air quality so this resource area is not addressed further in this PEA.

### 4.3.8 Noise

The sound environment of the project site(s) would vary, but would generally consist of natural ambient and human-created sounds (occasional traffic, operation of machinery, etc.). The No Action Alternative, Alternative 1, and all options of Alternative 2 would result in no long-term differences in noise frequencies, magnitudes, or durations at the project site(s). Furthermore, because tower construction is a private activity that is subject to state and local regulations, such as requirements to perform work during day-time business hours, the FCC expects that any short-term impacts to adjacent land uses and populations would be mitigated. Construction workers also are required to comply with Occupational Safety and Health Administration noise regulations. The No Action Alternative, Alternative 1, and all options of Alternative 2 are expected to have negligible impacts on noise and this resource area is not addressed further in this PEA.

### 4.3.9 Land Use

Land use is the way in which, and the purposes for which, people use the land and its resources. Land use planning varies depending on land ownership and jurisdictional boundaries. Land use is generally guided by local comprehensive plans that specify the allowable types and locations of present and future land use. Land use classifications in the areas considered for ASR Program projects would vary widely depending on location and would include residential, commercial, industrial, and recreational land uses. New towers would continue to be subject to review by local jurisdictions and the No Action Alternative, Alternative 1, and all options of Alternative 2 would not affect those reviews.

## 4.4 WATER RESOURCES

Water resources refer to the occurrence, availability and physical, chemical, and biological characteristics of surface water including hydrologic properties and water quality for aquatic plant and animal communities and public water supplies. Water resources include aquifers, springs, streams, river, lakes, reservoirs, estuaries, wetlands, and near shore and offshore marine waters. Water use classifications generally include public water supply, recreation, propagation of fish and other aquatic life, agricultural use, and industrial use.

Water resources are inherently site-specific resources, and this document can only characterize them in general terms. Site-specific conditions may be discussed in project-specific NEPA documentation, where required for a project.

Water resources (water quality and quantity) are protected and regulated by many Federal statutes and EOs, as well as State and local regulations and directives. Surface waters are protected from pollution originating from point sources such as sewage treatment plant discharges and industrial discharges, and from non-point sources such as runoff from urban paved areas, mines, and livestock operations. Relevant Federal statutes and EOs are described below.

### 4.4.1 Surface Water

Surface waters include springs, streams, rivers, lakes, reservoirs, estuaries, and near shore and offshore marine waters. Surface waters are naturally replenished by precipitation and lost through natural processes such as discharge to oceans, evaporation, and subsurface seepage. The total quantity of water and proportion of water lost in any surface water system are dependent on precipitation in its watershed, storage capacity, soil permeability, runoff characteristics of land in the watershed, timing of the precipitation, and evaporation rates.

Human activities can have an impact on the total quantity of water in the system. Impervious surfaces (e.g., paved roads, parking lots, and buildings) and channelization of streams increase runoff quantities and velocities. Impacts on water quality come from human activities that cause sediments and pollutants to enter waterways.

Water quality has two parameters. Chemical water quality describes the general chemical character of surface water and includes all of the inorganic and organic chemicals found in natural waters for which humans, other animals, and vegetation have moderate to high tolerance. Changes in chemical quality can make water unfit for drinking water purposes while still fit for other purposes. Often, changes in chemical quality are gradual and can go unnoticed until tastes or odors develop. Toxics are heavy metals, carcinogens, and other inorganic and organic chemicals that, even in low concentrations, might be harmful to human or animal life; therefore, it is important to prevent contamination of water supplies by avoiding the potential addition of these harmful materials. Chemical or physical changes and the presence of toxins in the water might also affect the quality of the surface water for recreational purposes.

Physical water quality describes the attributes of odor, taste, and color of surface water that reflect its desirability for use. Changes in these attributes can make water undesirable for human consumption.

The EPA regulates primary drinking water supplies under the Safe Drinking Water Act of 1974 (42 U.S.C. § 300f *et seq.*). This Act was established to ensure safe drinking water for the public and to prescribe requirements for states to implement the public water supply supervision program and underground injection control program under the authority of the Act.

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 401 *et seq.*) requires authorization from the U.S. Army Corps of Engineers (USACE) for construction activities in or near any navigable water of the United States. The Wild and Scenic Rivers Act of 1968 (16 U.S.C. § 1271 *et seq.*) preserves selected rivers in a free-flowing condition and protects their local environments.

### 4.4.2 Wetlands and Waters of the United States

The Federal Water Pollution Control Act of 1972, better known as the Clean Water Act (CWA) (33 U.S.C. § 1251 *et seq.*, as amended), is the primary Federal law regulating water pollution. The CWA regulates water quality of all discharges into waters of the United States (WOUS). The term WOUS applies only to surface waters – including rivers, lakes, estuaries, coastal waters, and wetlands – used for commerce, recreation, industry, sources of fishing, and other purposes. The term "wetlands" means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

According to the USACE definition of wetlands contained in 33 CFR 328, three conditions must be present for an area to be classified as jurisdictional wetlands: the area must contain hydric soils; it must support hydrophytic vegetation; and it must have an appropriate hydrologic regime. Typical wetland areas include marshes, swamps, and bogs, and, in general, are transitional zones between terrestrial and aquatic ecosystems. Wetlands are of particular importance to waterfowl and provide habitat for numerous other wildlife. Wetlands occur throughout the United States and are delineated based on regional or local criteria determined by the USACE. Wetlands vary extensively because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance.

The CWA also establishes state water quality certification requirements under Section 401; dredged or fill material permit requirements under Section 404; and the National Pollutant Discharge Elimination System (NPDES) under Section 402. The NPDES Permit Program regulates wastewater discharges from point sources. Congress has delegated to many states the responsibility to protect and manage water quality within state boundaries by establishing water quality standards and identifying waters not meeting these standards, including managing the NPDES system. Facility construction or modifications may require one or more of the following permits:

- **NPDES General Permit.** This permit may be required for a constructed or relocated facility if the facility discharges any waters other than to the sanitary sewer.
- **NPDES Stormwater Construction Permit.** This permit is required for any construction activity that will affect 1 acre or more, unless local restrictions impose a smaller acreage threshold. Specifically excluded is construction activity that includes "routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility."

Section 404 of the CWA provides for the protection of the nation's waters and wetlands by establishing a program regulating the discharge of dredge and fill material within WOUS, including wetlands, and requiring a permit for such activities. The USACE, EPA, and USFWS jointly administer the wetlands program. The USACE administers the day-to-day program, including authorizing permits to place dredge and fill material in WOUS and making jurisdictional determinations of WOUS, including wetlands.

USACE permits are required for all activities resulting in the discharge of dredged or fill material to WOUS, including wetlands. The USACE has delegated Section 404 permitting authority to some states. Section 401 of the CWA provides authority for states to require that a water quality certification be obtained before issuance of a Section 404 permit. Additional protection to surface water and aquatic biological resources from impacts associated with stormwater runoff is provided by Section 402, which requires a NPDES permit for various land development activities.

EO 11990 (Protection of Wetlands) requires Federal agencies to minimize the destruction, loss, or degradation of wetland habitat and to preserve and enhance the natural and beneficial values of wetland habitat. Wetlands are defined by their hydrologic regime, vegetation characteristics, and soil types. Although the FCC as an independent agency is not subject to EO 11990, the FCC has made a policy decision to consider the effects on wetlands as part of its evaluation of the effects on the human environment under NEPA.

Wetland habitats generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. Wetlands have important ecological functions and are biologically diverse. They assimilate nutrients in surrounding surface waters, remove suspended solids and pollutants from stormwater, and protect shorelines from wind and wave action and storm-generated forces.

The USFWS is the principal Federal agency providing information on the extent and status of the Nation's wetlands. The USFWS provides stewardship for the wetlands data that comprise the Wetlands Layer of the National Spatial Data Infrastructure and makes these data available via the National Wetlands Inventory Wetlands Mapper on the internet (USFWS 2010a).

Wetlands also contain riparian zones that are important habitats for migratory birds, and towers constructed in these areas may affect migratory birds, as discussed in Section 4.6.3 and Section 5.4.3.3.

## 4.5 FLOODPLAINS

Floodplains are defined as areas adjoining inland or coastal waters that are prone to flooding. Floodplain protection is important to natural resources management because it directly affects surface water quality and the value of aquatic habitats.

Existing conditions for floodplain resources vary tremendously depending on location. Site-specific conditions may be discussed in project-specific NEPA documentation, where required for a project. The Federal Emergency Management Agency produces Flood Insurance Rate Maps (FIRMs) depicting the spatial layout of areas that may be potentially affected by flood events. In addition to showing the locations of the 100-year and 500-year floodplains, many FIRMs show the base flood elevation.

FIRMs delineate floodplains with other descriptors, the most important of which are the floodway and the 100-year coastal, high hazard floodplain. The floodway is the channel of a river or other watercourse and adjacent land areas that are required to remain free from development to discharge the base flood without cumulatively increasing the water-surface elevation. Because the coastal floodplain is subject to storm surge floodwaters, this region has more stringent statutes for development than the normal 100-year floodplain.

EO 11988 (Floodplain Management) requires Federal agencies to determine whether a proposed action would occur within a floodplain and to take action to minimize occupancy and modification of floodplains. At a minimum, areas designated as floodplains are susceptible to 100-year floods (defined as a flood having a 1 percent chance of occurring in any given year). EO 11988 requires that Federal agencies proposing to site a project in the 100-year floodplain consider alternatives to avoid adverse effects and incompatible development in the floodplain. If no practicable alternatives exist to siting a project in the floodplain, the project must be designed to minimize potential harm to, or within, the floodplain. Furthermore, a notice must be publicly circulated explaining the project and the reasons for its siting in the floodplain. As an independent agency, the FCC is not subject to EO 11988; however, the FCC has made a policy decision to consider the effects on 100-year floodplains as part of its evaluation of the effects on the human environment under NEPA.

Floodplains also contain riparian zones that are important habitats for migratory birds, and towers constructed in these areas could adversely affect migratory birds, as discussed in Section 4.6.3 and Section 5.4.3.3.

## 4.6 BIOLOGICAL RESOURCES

Biological resources include plants and animals and their habitats. In general, biological resources include native and non-native plants that comprise the various habitats, animals present in such habitats, and natural areas that help support these plant and wildlife populations. These resources include plant populations and communities, and wildlife populations and their relationship to habitats, including upland, aquatic, wetland, and riparian ecosystems.

The subsections below provide a description of the affected environment for different types of biological resources, including descriptions of laws and EOs governing each of these resources. In particular, because the nature of the ASR Program involves structures that extend hundreds of feet into the sky, the effect of antenna structures on T&E bird species, migratory birds, and Bald and Golden Eagles is a principal biological concern. These resources are therefore discussed in more detail below.

### 4.6.1 Vegetation and Wildlife

Vegetation and wildlife are affected by several factors, including topography, water availability, aerial extent, connectedness, and interferences attributable to human activity. Distribution and abundance of terrestrial vegetation and wildlife species are heavily influenced by available habitat. Available habitats vary significantly across the United States and its territories even within short distances.

Vegetation and wildlife resources vary widely depending on location. These resources include native and non-native plant species (vegetation) and native and non-native or migratory animal species (wildlife) and their habitats. Common, broadly classified ecosystems include deserts, grasslands, scrub, woodlands and forests, aquatic zones, wetlands, and riparian areas. Examples of broad, naturally occurring ecosystems include old growth coniferous forests in the Pacific Northwest, long-leaf pine forests of the lower eastern seaboard, and undisturbed areas within the southwestern deserts.

Because terrestrial and aquatic vegetation and wildlife vary widely depending on location, they are discussed in general terms in this PEA. Potential project sites are located across the United States and its territories, and providing baseline information for all vegetation and wildlife resources that could be affected by specific project sites is beyond the scope of this PEA. Site-specific vegetation and wildlife resources would be addressed in project-specific NEPA documentation, where required for a project.

There are no Federal statutory or regulatory requirements that address non-protected vegetation and wildlife, but state, regional, or local requirements may apply.

Vegetation and wildlife resources include T&E species and critical habitats, which are addressed separately in Section 4.6.2.

### 4.6.2 T&E Species/Critical Habitat

The Endangered Species Act of 1973 (16 U.S.C. § 1531 *et seq.*) prohibits any actions that may harm or jeopardize the continued existence of any T&E species or designated critical habitat.

The ESA defines an endangered species as any species in danger of extinction throughout all or a significant area of its range and a threatened species as any species likely to become endangered in the near future. Under Section 7 of the ESA, Federal agencies, in consultation with USFWS (for species other than marine species which are under the jurisdiction of the National Marine Fisheries Service), must ensure their actions are not likely to jeopardize the continued existence of any T&E species (i.e., a listed species) or to result in the destruction or adverse modification of critical habitat. Critical habitat is defined as a specific geographic area that is essential for the conservation of a T&E species and that may require special management and protection (USFWS 2011b). USFWS is responsible for compiling the lists of T&E species under its jurisdiction.

The ESA prohibits "taking" endangered or threatened species. The "taking" prohibition includes any harm or harassment. Information on T&E species, including species descriptions and habitat requirements, is available on the USFWS website (http://www.fws.gov/endangered/).

When a species is proposed for listing under the ESA, USFWS must consider whether there are areas of habitat that are essential to the species' conservation. Those areas may be proposed for designation as "critical habitat." Critical habitat is defined in the ESA as a specific geographic area that is essential for the conservation of a T&E species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. Not all listed species have formally designated critical habitat. The USFWS maintains an online service for information regarding critical habitat designations (http://criticalhabitat.fws.gov/crithab/). This service provides a list of species with formally designated critical habitat, and access to critical habitat spatial data, critical habitat metadata, Federal Register documents, and USFWS species profiles.

There are 1,373 federally listed T&E species broadly distributed throughout the United States and its territories (USFWS 2011c). Critical habitat has been designated by USFWS for 523 of the listed species (USFWS 2011b). Identifying and discussing each species and its habitat is beyond the scope of this PEA; therefore, T&E species and their habitats will be addressed in general terms. Site-specific T&E species and critical habitats would be addressed in project-specific NEPA documentation, where required for a project. The FCC's existing rules require preparation of an EA when a project may affect T&E species or designated critical habitat.

Because towers registered under the ASR program may particularly affect migratory birds, this PEA gives special attention to T&E bird species. The USFWS currently lists 91 T&E bird species and/or populations that occur in the United States and its territories (Table 2).

**Table 2: Number of Bird Species Listed by Lead USFWS Region**

| Lead USFWS Region | Threatened Species | Endangered Species | Totals |
|---|---|---|---|
| 1 – Pacific: ID, OR, WA, HI, Pacific Islands | 3 | 41 | **44** |
| 2 – Southwest: AZ, NM, OK, TX | 2 | 8 | **10** |
| 3 – Great Lakes–Big Rivers: IL, IN, IA, MI, MO, MN, OH, WI | 0 | 3 | **3** |
| 4 – Southeast: AL, AR, FL, GA, KN, LA, MS, NC, Puerto Rico/Virgin Islands, SC, TN | 3 | 15 | **18** |
| 5 – Northeast: CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA, WV | 1 | 1 | **2** |

| Lead USFWS Region | Threatened Species | Endangered Species | Totals |
|---|---|---|---|
| 7 – Alaska: AK | 2 | 2 | **4** |
| 8 – California and Nevada: CA, NV, Klamath Basin area of OR | 4 | 6 | **10** |
| **Totals** | **15** | **76** | **91** |

Source: USFWS 2011b

Notes: Two species (Heinroth's Shearwater and Kaempfer's tody-tyrant) are not included because they are not native to the United States. Two species (Piping Plover and Roseate Tern) are counted more than once because these birds have distinct population segments, each with its own individual listed status.

Of the 91 bird species listed as threatened or endangered, 23 species have critical habitat designated. While designation as a critical habitat does not necessarily preclude development activities, activities that require a federal permit, approval (such as FCC registration), license, or funding and are likely to destroy or adversely modify the area of critical habitat require consultation with USFWS.

### 4.6.3 Migratory Birds

A migratory bird is any species that lives, reproduces, or migrates within or across international borders at some point during its annual life cycle. The Migratory Bird Treaty Act of 1918 (16 U.S.C. § 703 *et seq.*) makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird, including feathers or other parts, nests, eggs, or products, without an appropriate permit. It has been extended to include almost all birds that have the ability to seasonally relocate within various parts of the United States. The MBTA prohibits the taking of migratory and certain other birds, their eggs, nests, feathers, or young.

According to rulemaking effective March 31, 2010, the MBTA protects 1,007 species in the 50 states and 5 U.S. territories (USFWS 2010c). The USFWS is the lead agency for managing and protecting migratory birds. Courts have rendered differing decisions regarding the scope of the MBTA's application to federal agencies, as well as whether a party may be liable under the MBTA for the unintentional, incidental death of a migratory bird. The FCC has not yet resolved the nature and scope of its responsibilities, if any, under the MBTA. Because migratory birds are part of the human environment that is considered under NEPA, however, they are being addressed in this PEA.

The 1988 amendment to the Fish and Wildlife Conservation Act (Public Law 100-653, Title VIII), which is administered by the USFWS, mandates identification of Birds of Conservation Concern. The Act requires that USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The *Birds of Conservation Concern 2008* (USFWS 2008) is the most recent list of species, all of which are protected by the MBTA. Birds are listed at three geographic scales: Bird Conservation Regions (BCRs), USFWS Regions, and National. The 2008 list includes species from the United States and its territories and is used to identify conservation priorities. Nongame birds, gamebirds without hunting seasons, subsistence-hunted nongame birds in Alaska, and ESA candidate, proposed, listed endangered or threatened, and recently delisted species may be included. The number of species on each list is as follows: 1) BCR – 10 to 53 species; 2) USFWS Region – 27 to 78 species; and 3) National list – 147 species.

#### 4.6.3.1 Data Limitations and Uncertainty

In reviewing the available data on migratory birds, factors considered included objectivity, integrity, transparency, and reproducibility. Information presented in this PEA is based primarily on information provided in peer-reviewed studies (those that have been published in professional journals or accepted for publication such as Gehring et al. 2011). Every attempt was made to obtain the most complete set of available data, including studies conducted overseas and throughout the United States, as well as the most recently published data. USFWS was instrumental in providing many references for review. Studies that are in preparation and were submitted as part of the docket (e.g., Longcore et al. 2011a and 2011b, both in preparation) were also carefully reviewed and used in the development of the PEA.

There is some uncertainty associated with both total migratory bird populations and individual species populations. As Longcore et al. (2011b in preparation) acknowledged, the population estimates they used may vary by as much as an order of magnitude. In addition, population levels vary from year to year and geographically.

There is also considerable uncertainty associated with estimating avian mortality caused by communications towers. Several of the existing studies describe extreme episodic events of limited geographic scope. Longcore et al. (2011a and 2011b, both in preparation) conducted a meta-analysis of existing studies, many of which involved only large, one-time bird kills at individual towers. As a result, the conclusions drawn by many of the existing studies are not based on typical conditions at a majority of tower sites.

There are not adequate data available that quantify the impacts of various sources of mortality on individual bird species. Studies suggest that fatality rates at communications towers are not similar for all migratory bird species and that there may be a disproportionate adverse effect on certain species (e.g., Graber 1968, Longcore et al. 2011b in preparation). Some researchers suggest that this adverse effect may be biologically significant for some species such as Bay-breasted Warbler, Swainson's Warbler, Harris' Warbler, and Black-throated Warbler (Longcore et al. 2011b in preparation). However, the data are inconclusive and the importance of these mortality sources at a species level is not well understood. In a draft report, Longcore et al. (2011b in preparation) estimate that towers may disproportionately kill certain bird species when compared to other sources of mortality. For 12 species, they estimate that mortality at towers is greater than 1 percent of the total population size and may have an impact on population viability. They further state that one of these species is endangered, and an additional eight species are Birds of Conservation Concern. However, as noted above, their results were based on a meta-analysis of existing studies that were not designed to address species-specific effects. In addition, the analysis carries an inherent bias by including an overrepresentation of extreme episodic events that skew the mortality estimates.

#### 4.6.3.2 Migratory Bird Abundance

Populations of migratory birds can be approximated by extrapolating from the results of a number of large-scale monitoring efforts. These surveys cover a wide range of geography and habitats, but they do not necessarily cover all of the areas being considered in this PEA. Databases from these surveys can provide valuable population estimates suitable for the purpose of characterizing, at least in part, the affected environment. While these databases may not account for all species, during all seasons (e.g., migration), and in all areas, they do provide a sense of the magnitude of the bird populations in the United States. Databases used to describe bird populations in this PEA did not always include Hawaii and U.S. territories, and these limitations are noted. Because of these factors, the data presented below may underestimate the populations for the entire United States and its territories, but are reasonable estimates for developing a context for evaluating migratory bird abundance. Data from four databases which consider large-scale monitoring efforts were used to develop estimates for breeding and wintering landbirds and waterfowl and are discussed below.

### 4.6.3.3 Land Birds – Breeding

Estimates of populations of land birds were obtained by querying the Partners in Flight (PIF) Land Bird Population Estimates Database, Version 2004. This database was derived from the U.S. Geological Survey's Breeding Bird Survey relative abundance data from the 1990s. The PIF database has some limitations; however, it does provide rough approximations for populations of land birds breeding in the United States (Blancher et al. 2007). In particular, the PIF database does not include all migratory bird species in the United States. Currently, there are 1,007 species listed as migratory under the MBTA; however, the PIF database includes only approximately 448 species.

The PIF data indicate that more than 2.6 billion land birds may breed in the United States (Table 3). However, the PIF data are not available for Hawaii or the U.S. territories. The USFWS estimates that there are a minimum of 10 billion migratory birds that breed in North America, with fall populations on the order of 20 billion (USFWS 2002b). Alaska supports the greatest number of birds followed by Texas. Not surprisingly, states with larger land areas support a greater number of birds than smaller states.

On a worldwide basis, passerine birds (also called perching birds or songbirds) comprise approximately 5,000 of the nearly 9,000 species of birds; or more than half of all bird species. Similarly, of the just over 700 species of breeding birds known to occur in the United States, more than 400 species (over 50 percent) are passerines and are considered migratory. These species include long-distance migrants that migrate between South and North America, for example, as well as local migrants that migrate within the boundaries of the United States. Because passerines are more likely to be found on land, the 448 species of land birds discussed in this section are predominantly passerine species. Therefore, of the estimated 2.6 billion land birds (Blancher et al. 2007), most are passerines (but not all because owls, hawks, and grouse are also included as land birds).

**Table 3: Population Estimates of Land Birds by State**

| State | Total Number of Birds |
|---|---|
| Alaska | 354,438,940 |
| Texas | 187,720,450 |
| California | 127,831,060 |
| Montana | 96,785,140 |
| North Dakota | 87,086,740 |
| Colorado | 76,527,990 |
| Minnesota | 73,819,710 |
| Kansas | 70,212,480 |
| Oregon | 67,704,530 |
| Arizona | 66,312,486 |
| Missouri | 64,704,690 |
| Illinois | 61,380,010 |
| Wisconsin | 60,942,926 |
| Washington | 57,764,540 |
| South Dakota | 56,866,729 |
| New Mexico | 56,249,770 |
| Iowa | 55,542,900 |
| Oklahoma | 53,124,340 |
| Nevada | 52,550,223 |

**Table 3 (continued): Population Estimates of Land Birds by State**

| State | Total Number of Birds |
|---|---|
| Nebraska | 51,396,276 |
| Michigan | 50,539,990 |
| Ohio | 49,313,544 |
| Pennsylvania | 48,868,111 |
| Idaho | 48,673,206 |
| North Carolina | 47,758,030 |
| Wyoming | 46,782,308 |
| Arkansas | 46,710,170 |
| Kentucky | 46,386,110 |
| New York | 45,410,483 |
| Georgia | 45,148,550 |
| Florida | 41,062,190 |
| Alabama | 40,189,320 |
| Louisiana | 39,782,380 |
| Indiana | 39,251,680 |
| Tennessee | 38,494,330 |
| Utah | 36,008,890 |
| Mississippi | 35,899,529 |
| Virginia | 34,282,800 |
| Maine | 26,071,040 |
| South Carolina | 25,810,090 |
| West Virginia | 23,122,460 |
| Maryland | 11,513,860 |
| Vermont | 8,702,387 |
| Massachusetts | 7,467,622 |
| New Hampshire | 7,247,700 |
| New Jersey | 6,764,350 |
| Connecticut | 4,070,804 |
| Delaware | 2,489,969 |
| Rhode Island | 665,500 |
| **Total** | **2,683,449,332** |

Source: http://www.rmbo.org/pif_db/laped/about.aspx



There is a regional, habitat-based component to these data that is not apparent when sorted by state. Bird Conservation Regions are distinct ecoregions of North America with similar bird communities, habitats, and resource management issues. Figure 8 depicts the BCRs in North America. Table 4 presents land bird population estimates in BCRs, in order of highest to lowest numbers.

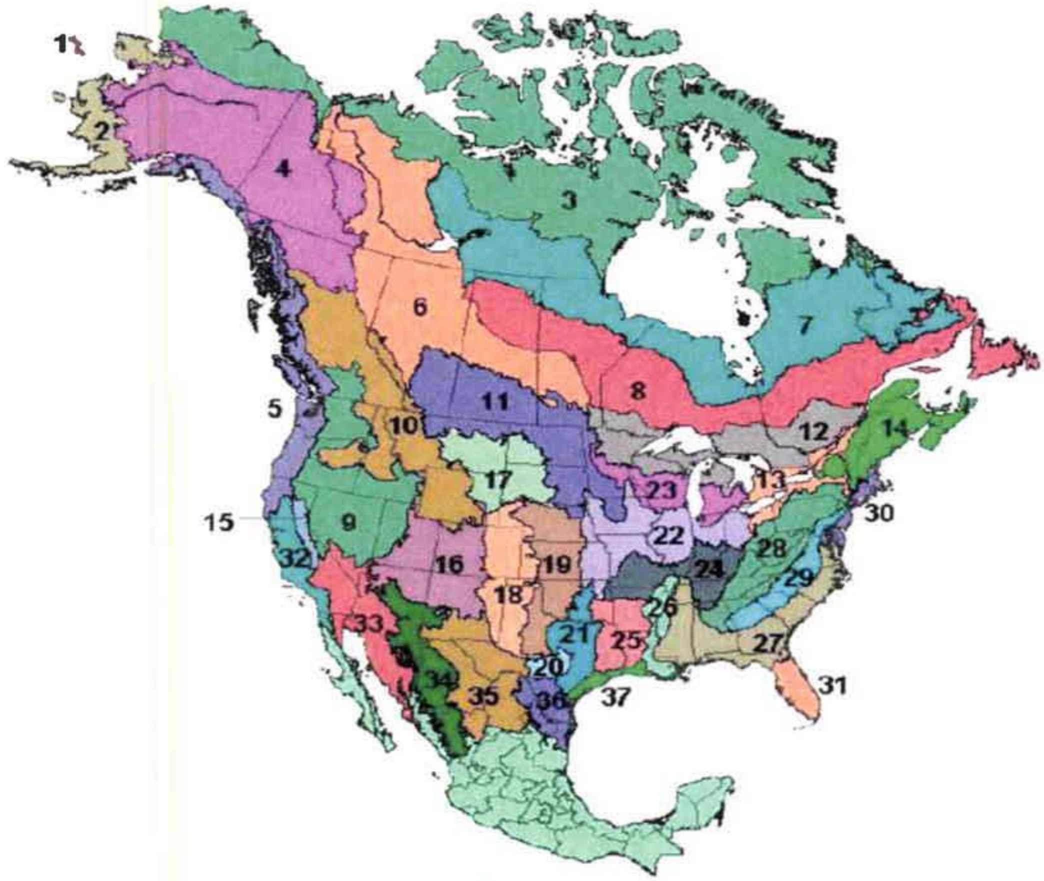


**Figure 8: Bird Conservation Regions of the United States**

Source: USFWS 2008

The Eastern Tallgrass Prairie area (associated with portions of the states of Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, and Kansas) and the Northwestern Interior Forest (associated with a large portion of Alaska) have the highest population estimates.

**Table 4: Bird Conservation Regions Population Estimates**

| BCR Number | BCR Name | Land Bird Population Estimate |
|---|---|---|
| 22 | Eastern Tallgrass Prairie | 207,142,114 |
| 4 | Northwestern Interior Forest | 190,922,700 |
| 28 | Appalachian Mountains | 158,396,314 |
| 9 | Great Basin | 157,718,948 |
| 27 | Southeastern Coastal Plain | 155,551,550 |
| 11 | Prairie Potholes | 153,954,330 |
| 10 | Northern Rockies | 122,233,890 |
| 24 | Central Hardwoods | 114,228,180 |
| 5 | Northern Pacific Rainforest | 112,011,170 |
| 19 | Central Mixed-grass Prairie | 105,730,754 |

**Table 4 (continued): Bird Conservation Regions Population Estimates**

| BCR Number | BCR Name | Land Bird Population Estimate |
|---|---|---|
| 16 | Southern Rockies/Colorado Plateau | 97,729,720 |
| 18 | Shortgrass Prairie | 97,583,387 |
| 23 | Prairie Hardwood Transition | 95,603,494 |
| 17 | Badlands and Prairies | 94,915,476 |
| 2 | Western Alaska | 71,061,500 |
| 12 | Boreal Hardwood Transition | 69,940,640 |
| 25 | West Gulf Coastal Plain/Ouachitas | 68,206,840 |
| 29 | Piedmont | 65,195,362 |
| 32 | Coastal California | 64,355,370 |
| 21 | Oaks and Prairies | 58,950,640 |
| 14 | Atlantic Northern Forest | 50,810,930 |
| 33 | Sonoran and Mohave Deserts | 49,145,890 |
| 26 | Mississippi Alluvial Valley | 41,476,830 |
| 13 | Lower Great Lakes/St. Lawrence Plain | 38,433,390 |
| 3 | Arctic Plains and Mountains | 38,419,800 |
| 35 | Chihuahuan Desert | 37,417,656 |
| 34 | Sierra Madre Occidental | 30,497,170 |
| 30 | New England/Mid-Atlantic Coast | 27,434,650 |
| 31 | Peninsular Florida | 25,107,880 |
| 37 | Gulf Coastal Prairie | 24,806,109 |
| 36 | Tamaulipan Brushlands | 24,280,200 |
| 15 | Sierra Nevada | 16,885,098 |
| 20 | Edwards Plateau | 15,362,350 |
| 1 | Aleutian/Bering Sea Islands | 1,939,000 |
| **Total** | | **2,683,449,332** |

Source: http://www.rmbo.org/pif_db/laped/about.aspx

### 4.6.3.4 *Land Birds – Wintering*

The Christmas Bird Count, currently administered by the National Audubon Society, provides a significant amount of data for wintering birds. The surveys, which were started in 1900, are conducted in more than 2,100 count circles throughout the United States, Canada, South and Central Americas, Mexico, and the Caribbean and Pacific Islands including Hawaii. National Audubon Society's American Birds Annual Summary reports contain regional summaries and provide count data. Based on a review of data for the winters of 2000/2001 through 2009/2010, an average of almost 60 million birds (comprising about 655 species) winters within the United States. This includes waterfowl, which are counted as part of a separate monitoring effort described in a subsequent section. Table 5 provides the data for each winter.

**Table 5: Recent Christmas Bird Count Data for the United States**

| Christmas Bird Count Number | Winter | Number of Species Observed in the United States | Total Number of Birds Observed in the United States |
|---|---|---|---|
| 110th | 2009-2010 | 654 | 51,581,105 |
| 109th | 2008-2009 | NA | 61,347,290 |
| 108th | 2007-2008 | 665 | 63,531,134 |
| 107th | 2006-2007 | 643 | 65,109,503 |
| 106th | 2005-2006 | 652 | 57,357,023 |
| 105th | 2004-2005 | 652 | 66,219,394 |
| 104th | 2003-2004 | 654 | 59,552,857 |
| 103rd | 2002-2003 | 660 | 69,456,347 |
| 102nd | 2001-2002 | 657 | 47,241,040 |
| 101st | 2000-2001 | NA | 51,657,566 |
| | **Average** | **655** | **59,305,326** |

Source: National Audubon Society American Birds (2001-2010)
(http://birds.audubon.org/american-birds-annual-summary-christmas-bird-count)

### 4.6.3.5 Waterfowl – Breeding

Through the Waterfowl Breeding Population and Habitat Survey (WBPHS), the population of ducks (excluding scoter, eiders, long-tailed ducks, mergansers, and wood ducks) breeding in the United States can be generally estimated. The WBPHS assesses populations annually in important breeding areas in Alaska, Canada, and the north-central portion of the United States. This survey covers more than 3 million square miles (7.8 million square kilometers) and is the best source for estimating the population of ducks in the United States. The 2010 Waterfowl Population Status report (USFWS 2010b) indicates that the total number of breeding ducks is approximately 9.1 million. This is the sum of the long-term averages between 1955 and 2009 for regions for which data are available; this number may underestimate the total number since it does not include other regions that support breeding ducks, including Hawaii and the U.S. territories. It also does not include geese or other waterfowl species that are not ducks (e.g., swans and coots).

### 4.6.3.6 Waterfowl – Wintering

The USFWS mid-winter waterfowl survey provides population estimates for species of ducks (dabbling, diving, and sea ducks), geese, swans, and coots that winter within the United States. These estimates provide nationwide data for major concentration areas outside of Hawaii and the U.S. territories. Despite some potential limitations in the data set due to, but not limited to, differences in field methodology, changes in personnel, differences in survey effort and changes in areas surveyed, this dataset is the best currently available for assessing population sizes of wintering waterfowl in the United States (with the exception of Hawaii and U.S. territories). According to the survey, more than 29 million waterfowl winter in the United States.

### 4.6.3.7 Migratory Bird Geographic Patterns

The migratory habits of birds are highly variable among and within individual species but can be classified into several general categories (Kerlinger, 1995). Short distance migrants include those species that may wander locally, winter near a small portion of the breeding range, or move to different elevations, for example. Medium distance migrants may move distances of one to several states. Birds may move only as far as is needed to take advantage of local food and shelter resources. Kerlinger (1995) considers these two categories as partial migrants and describes them as the most common types of migration patterns. Most of the North American birds, including shorebirds, some hawks, and passerines (e.g., thrushes, orioles, warblers, hummingbirds, and tanagers) are in this category. Long distance migrants, or complete migrants (Kerlinger 1995), include those species that breed in North America and completely leave their breeding range to spend the winter in more southern latitudes. Some long distance migrants have been known to migrate great distances; for example, the Red Knot, which breeds in the Canadian Arctic and winters in Tierra del Fuego in southern South America approximately 9,300 miles away. Another form of migration is called irruptive migration, where the patterns are not seasonally or geographically dependent but, instead, are highly dependent upon availability of food resources.

Just as the distance of migration is highly variable, the routes taken can also be specific to species, subspecies and populations. Four general major flyways (Atlantic, Mississippi, Central and Pacific) have been recognized (Figure 9). This terminology, however, oversimplifies most avian migratory patterns. General routes of migration typically conform closely to major topographical features such as large river systems or mountain chains.

Generally, migration follows a north-south orientation, although there can be an east-west component such that elliptically shaped round-trip patterns can occur. Some species may migrate along a narrow band, particularly those species that are habitat-limited, such as shorebirds which may consistently use the same stopover points each year. For example, the Delaware Bay is renowned for its importance to hungry north-bound shorebirds that stop there to feed on horseshoe crab eggs. For many species of songbirds, migration is along a broad front where the width may be species-specific. Other avian species have converging routes where the path of migration can become constricted to align with land masses. The peninsula of New Jersey functions this way to funnel many individuals of many species together. Banding and modern radar studies provide much of the data used in understanding migration patterns, including location, abundance, and timing.

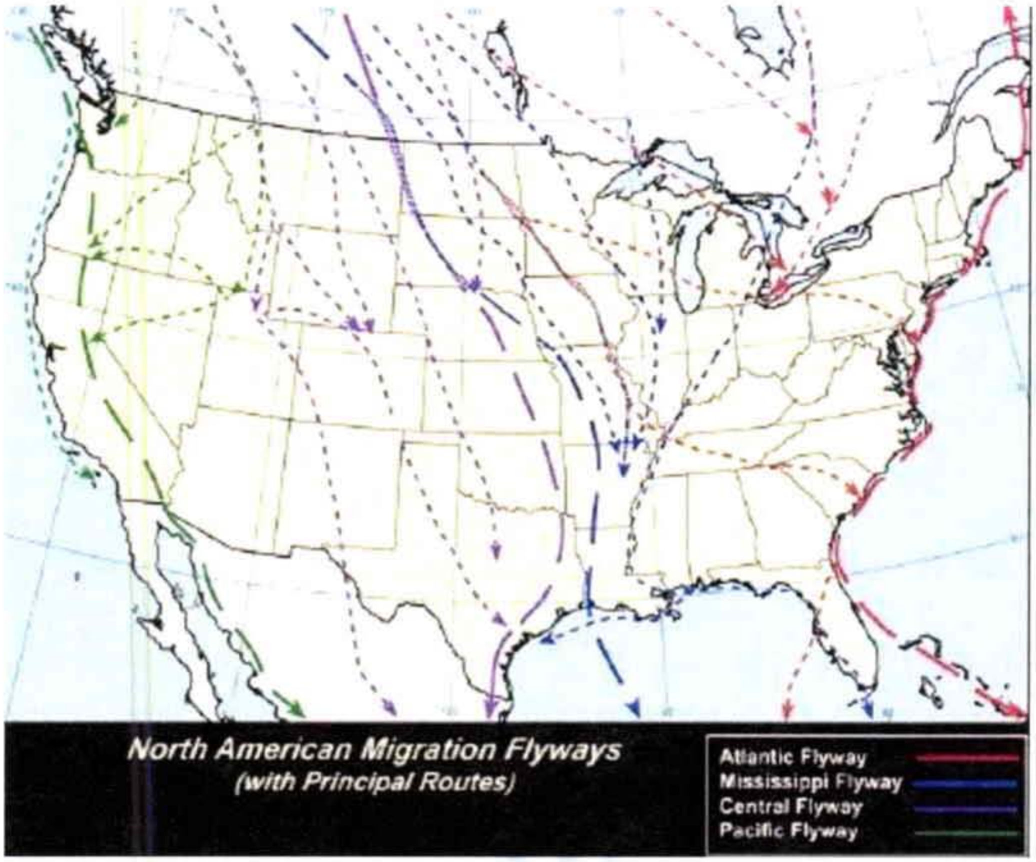


**Figure 9: General Depiction of North American Avian Migratory Flyways**

Source: http://www.birdnature.com/flyways.html

As shown in some of the examples above, specific geographic features can provide valuable bird habitat and play an important role in bird migration patterns in both the fall and spring. Topographic features can also assist, obstruct, or altogether preclude migratory movements. These features include coastal zones, ridgelines, bird staging areas and colonial nesting sites, and riparian zones – all of which can provide orientation assistance as well as foraging and resting habitat for migrating birds.

Coastal zones include islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. Coastal barriers protect coastal areas from wind and tidal forces caused by coastal storms. Both provide habitat for aquatic species, many of which are a food source for migratory birds such as shorebirds.

Ridgelines are topographical features formed along the highest points of mountain ridges such as the Appalachian Front. For the purposes of this PEA, a ridgeline is defined as being the elongated crest of a mountain at least 500 feet (152 meters) above the surrounding landscape, including the area within 100 feet (31 meters) downslope of the peak on either side. Ridgelines are commonly used by migrating raptors because of the thermal updrafts used in soaring that are found there. As summarized in Longcore et al. (2008), topographical features such as ridgelines may be important habitat features for migrating neotropical songbirds as well. Studies such as Williams et al. (2001) reported large numbers of migrants at low flight elevations along ridgelines in New Hampshire. In addition to helping birds orient themselves during migration, ridgelines may further assist migrating birds by reducing the amount of energy expended because birds can ride in updrafts coming from these features. However, the general consensus is that the birds most at risk from collisions with communications towers (migratory songbirds) generally migrate in broad spatial fronts and do not concentrate along ridgelines as raptors do (Hutto 2000, Gauthreaux et al. 2003, Faaborg et al. 2010).

Geographically relevant staging (stopover) areas provide important foraging opportunities and shelter where migratory birds can rest and add fat reserves prior to continuing on their migration route. For example, many undeveloped areas along the Gulf coast are important stopover locations for the high numbers of north-bound songbirds that land there after crossing the Gulf of Mexico in the spring. They provide high quality and ecologically important habitat necessary for bird survival during migration, breeding, and wintering seasons. The locations of these areas are well known by state wildlife agencies and USFWS.

Colonial nesting sites contain multiple nests of breeding birds and are found throughout the United States. Colonial nesting sites can be composed of mixed species or a single species, many of which are migratory, and the number of individuals and nests can vary greatly. Common colonial nesting bird species belong to two major groups – seabirds (albatrosses, shearwaters, pelicans, gulls, storm-petrels, etc.) and wading birds (ibis, egrets, herons, spoonbills, night-herons, bitterns and storks) (USFWS 2002a). Typically, colonial nesting sites are located in inaccessible areas associated with remote terrestrial, aquatic, and wetland habitats that also support other birds as stopover feeding/resting points during migration. Use of the colonial nesting site during the year is dependent upon the species' breeding cycle for that area. Colonial nesting site locations typically can be identified in coordination with USFWS or state wildlife agencies.

Riparian zones occur throughout the United States as long strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other inland aquatic systems that affect or are affected by the presence of water. This vegetation contributes to unique ecosystems that perform a large variety of ecological functions. There is no universally recognized or widely accepted definition that adequately describes all riparian zones (Anderson 1987). Stream and river ecosystems differ regionally and locally in many characteristics, including width, depth, frequency of flooding, hydrogeomorphic factors, and vegetation. These differences are most apparent between eastern and western regions of the United States. Riparian zones in the western United States tend to be much narrower than in the East and contrast highly with surrounding uplands. Although riparian zones comprise a very small proportion of most landscapes, they frequently are used by wildlife in much greater proportion to their availability. Riparian zones in the western United States comprise less than 1 percent of the total land area, yet these areas are used by more species of breeding birds than any other habitat in North America (Knopf et al. 1988). Riparian zones are an extremely important component of wetland and floodplain ecosystems, and provide foraging and sheltering areas for migratory birds.

### *4.6.3.8 Migratory Bird Flight Altitudes*

Most birds generally fly below 500 feet (152 meters; Ehrlich et al. 1988); however, heights on migration flights vary among groups of birds as a function of whether they are day or night migrants and whether they migrate over land or water. According to the Cornell Laboratory of Ornithology website on migration, songbirds largely migrate nocturnally within 2,100 to 2,400 feet (641 to 732 meters) of the land surface. In Kerlinger's (1995) book on bird migration, he reports that 75 percent of songbirds migrate nocturnally within 2,000 feet (610 meters) above the ground, as confirmed in numerous radar studies. Over water, songbird migration occurs at higher altitudes. Shorebirds can also migrate within the same zone as songbirds, but generally migrate near 3,000 feet (914 meters). Waterfowl show more variation and are largely found at 100 to 200 feet (31 to 61 meters). Some waterfowl may even move just above the water. For soaring birds such as hawks and gulls, migration begins as the thermals and updrafts upon which they rely develop during the morning hours. As the day heats up, soaring activity increases and so does the elevation of activity. Over the course of a day, soaring birds are typically migrating at 600 feet to 1,500 feet (183 to 457 meters) and higher, with the maximum height approximately 3,500 to 4,000 feet (1,067 to 1,219 meters). Birds gliding in updrafts along ridgelines or over water may occur at relatively low levels (5 to 20 feet [1.5 to 6 meters]) or as high as 600 feet (183 meters). Figure 10 shows migratory flight altitudes for various bird groups.

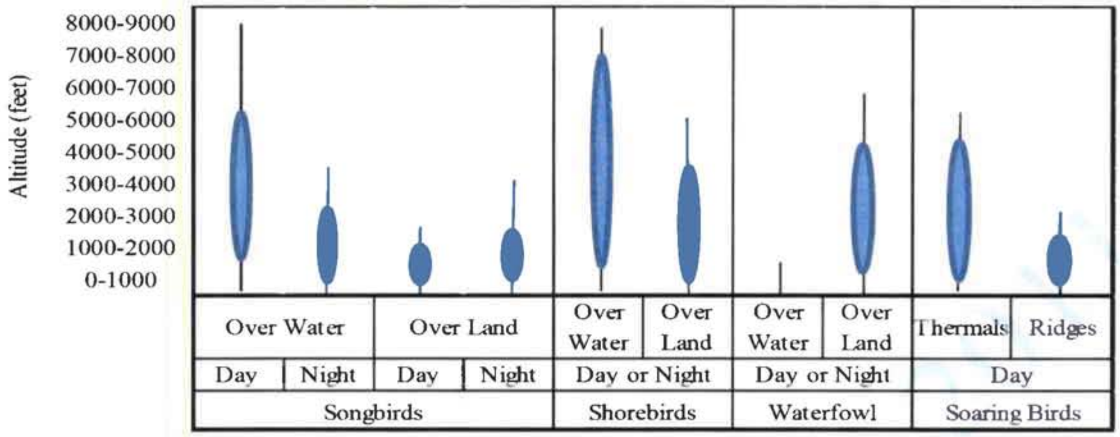


**Figure 10: Migratory Flight Altitudes for Various Bird Groups**

Source: adapted from Kerlinger 1995

### *4.6.3.9 Timing of Migration*

According to Zimmerman (1998) and Kerlinger (1995), smaller birds or those using powered flight, such as many songbirds, shorebirds and rails, typically migrate at night. This nocturnal pattern is more typical for birds than diurnal migration. Flight begins after sunset and activity peaks soon after. Soaring birds (hawks, pelicans, cranes and swallows), however, migrate during the day because many of them rely on thermals and updrafts that develop a few hours after sunrise. Migration activities cease as the thermals/updrafts dissipate in late afternoon. Other daytime migrants include some species of waterfowl, gulls, nighthawks and swifts. Wading and diving birds will migrate during the day or at night.

In North America there are two general migration seasons, spring and fall, though the timing and duration of migration is variable. Different species within a group can show differing migration schedules just as populations within the same species can differ with respect to timing.

Spring patterns show movement northward toward the breeding grounds. Though some bird species may move relatively early in the year, other species are still migrating in June. Fall migration can be similarly drawn out. Zimmerman (1998) indicates that populations breeding in the southern portion of a species' range may migrate before a population to the north, simply because breeding is completed sooner. Fall migration may begin soon after post-breeding dispersal in late summer and continues well into the fall months.

### *4.6.3.10 Avian Mortality from Communications Towers*

Manville (2001) estimated annual bird mortality from communications towers at 4 to 5 million birds and indicated that mortality might actually range as high as 40 to 50 million birds. The lower end (4 to 5 million) of Manville's estimate has been typically cited in other papers as a reasonable approximation of bird kills at towers (e.g., Gehring et al. 2009, Gehring et al. 2011 in press, Longcore et al. 2011a in preparation). For purposes of assessing impacts, the FCC has decided to use an estimated annual avian mortality of 5 million birds. The FCC notes that Longcore et al. (2011a in preparation) estimated annual avian mortality at towers in the United States and Canada at between 3.9 and 5.9 million, and future revisions to this manuscript may increase the upper-end annual mortality estimate to over 6 million birds (Longcore, pers. comm.). In light of the incomplete status of the Longcore et al. study, and given that Manville's figures fall within the Longcore et al. range, the FCC considers 5 million annual bird deaths to be a reasonable conservative estimate.

Appendix B provides a summary of the existing data sources that report avian mortality at communications towers and that were used in developing this PEA.

***Geographic Distribution***

Longcore et al. (2011a in preparation) have proposed that mortality is not equal across geographic regions. The number and height of towers in an area appear to influence geographic trends in mortality. Mortality was estimated to be highest (about 620,000 birds annually) in the southeastern United States (Southeastern Coastal Plain Bird Conservation Region which includes parts of VA, NC, SC, GA, FL, AL, MS, LA, TN), where there is a higher proportion of tall towers. This rate is higher than for all of Canada (almost 144,000 birds annually), where towers tend to be fewer and shorter. Since mortality generally occurs during migration, mortality is not related to local population size of migratory birds. For example, in Alaska, which is estimated to support more than 354,000,000 breeding birds, the mortality rate from collision with communications towers is estimated to be less than 2,000 birds annually. In Alaska, there are fewer towers per unit area when compared to other states.

***Species-specific Effects***

Longcore et al. (2011b in preparation) have proposed that mortality at communications towers is not equal across all avian taxa. Mortality has been observed for 239 species in the United States and Canada (Longcore et al. 2011b in preparation). Observed mortality is highest for neotropical migrants, and for some of these species mortality has been estimated to be more than 1 percent of the species' population, which the authors term "biologically significant." The birds that appear to be most vulnerable to communications towers comprise approximately 350 species of neotropical migratory birds. In particular, these species include thrushes, vireos, and warblers, which migrate at night and are therefore susceptible to collisions with towers, especially on foggy nights or on nights with low cloud ceilings during spring and fall migrations (Manville 2001). Longcore et al. (2011b in preparation) estimate that 95 percent of tower mortality consists of passerines (songbirds), and that among passerines, mortality rates are highest for warblers (52 percent of all mortality; 3+ million individuals annually), vireos (11 percent; nearly 2 million), sparrows (9.5 percent; almost 350,000) and thrushes (6 percent, almost 258,000). The authors suggest that mortality may be more than 1 percent of the species population for 12 species (range 1-8 percent), eight of which are warblers. One of the 12 is endangered, and eight are birds of conservation concern. However, as noted above in Section 4.6.3.1, Longcore et al. (2011b in preparation) results were based on a meta-analysis of existing studies that were not designed to address species-specific effects. In addition, the analysis carries an inherent bias by including an overrepresentation of extreme episodic events that skew the mortality estimates.

***Declining Mortality Hypothesis***

Over the last five decades of monitoring bird populations, the number of bird mortalities at towers is reported to be decreasing while the number of towers is increasing (Morris et al. 2003). Morris et al. compared mortality data from 1970 to 1999 for four separate towers (three in New York and one in Ohio), which were all approximately 1,000 feet (305 meters) in height. The comparison reported a significant decrease in the number of birds salvaged at all four towers within the 30-year period, suggesting a corresponding reduction in the number of birds that collided with the towers during the same period. According to Morris et al., other long-term studies consistently show a similar decline in total bird mortality (with other factors remaining equal, e.g., tower height). Morris et al.(2003) suggested that this reduction in bird mortality might be due to the following:

1. An overall decrease in migratory bird populations;
2. Potential changes in patterns of wind direction, cloud cover, and visibility;
3. An increase in predator and scavenger removal of bird carcasses at tower sites;
4. A change in migration patterns; and,

5. An increase in background light pollution (with a resulting decrease in migrant attraction to tower lighting).

However, when comparing the similar and parallel reduction in number of bird mortalities at the four tower sites, Morris et al. (2003) suggest that the factors affecting the observed decline in migrant mortality at communications towers are more likely large-scale factors, such as weather patterns and population size, rather than more site-specific factors, such as an increase in scavengers.

Nehring and Bivens (1999) reviewed a 38-year mortality study at a 1,364-foot (416-meter) tower in Tennessee and report a similar decline in mortality rate and species diversity over time. Even after removing two mass kills (in 1968 and 1970), the long-term trend showed a significant reduction in the number of birds killed. Nehring and Bivens (1999) offer these three potential causes for the observed decline:

1. A change in migration routes to avoid the urban expansion of Nashville, Tennessee;
2. An increase in background light pollution, which reduces the attraction to the tower lights (same as #5 above);
3. An increase in scavenging rates, resulting in a decrease in birds recovered, which is not indicative of a true decline in mortality (same as #3 above).

While there is some compelling data suggesting an overall reduction in bird mortality at towers over the last five decades, this trend is best viewed as being hypothetical because it has been observed at only a few towers. Therefore, additional research on the declining mortality hypothesis is needed.

#### *4.6.3.11 Other Sources of Avian Mortality*

In addition to communications towers, there are other anthropogenic causes of mortality in birds, including collisions with buildings, windows, motor vehicles, and wind turbines, as well as predation by cats. Erickson et al. (2005) summarized these sources of bird mortality and estimated that 500 million to possibly over 1 billion birds are killed annually. However, subsequent studies of collisions with building glass and predation by cats indicate that these estimates are low and that annual mortality from these two sources likely exceeds 2 billion birds.

Avian collisions with buildings and power lines and cat predation appear to cause the bulk (> 80 percent) of annual avian mortality. Klem et al. (2009) report that "…except for habitat destruction, collisions with clear and reflective building sheet glass cause the deaths of more birds than any other human-related avian mortality factor." They conservatively estimate that 1 billion birds are killed annually from collisions with building glass in the United States alone. There is also recent evidence (Dauphiné and Cooper 2009) that free-ranging domestic cats may kill "at least one billion birds" every year in the United States. This and other studies have shown that domestic cats pose threats to many bird populations through their predation of adult, nestling, and juvenile birds. Predation risk from cats may also cause stress responses in birds that may contribute to bird population declines (Dauphiné and Cooper 2009). Table 6 summarizes the mortality estimates from several sources.

Table 6: Sources and Estimates of Annual Avian Mortality in the United States (in millions)

| Mortality Source | Klem et al. (2009) | Dauphiné and Cooper (2009) | Erickson et al. (2005) | NWCC Committee (2001) | Sibley Guides | American Bird Conservancy |
|---|---|---|---|---|---|---|
| Buildings/ Windows | 1,000 | ----- | 550 | 98 – 980 | 97 – 976 | ----- |
| Power lines | ----- | ----- | 130 | 0.01 – 174 | 174 | 10 – 154 |
| Cats | ----- | 1,000 | 100 | NA | 500 | ----- |
| Vehicles | 60 | ----- | 80 | 60 – 80 | 60 | 10.7 – 380 |
| Pesticides | ----- | ----- | 67 | ----- | 72 | ----- |
| Hunting | 120 | ----- | ----- | ----- | 15 | ----- |
| Communications towers | ----- | ----- | 4.5 | 4 – 50 | 5 – 50 | 4 – 50 |
| Wind turbines | 0.4 | ----- | 0.0285 | 0.01 – 0.04 | 0.033 | 0.01 – 0.04 |
| Airplanes | ----- | ----- | 0.025 | ----- | ----- | ----- |

Sources: ABC Source (www.abcbirds.org/abcprograms/policy/collisions/index.html)
Sibley Guides Source (www.sibleyguides.com)

As discussed previously, the majority of birds killed by collisions with communications towers are migratory neotropical songbirds. The other sources represented in Table 6 also result in mortality to neotropical migratory songbirds, although there is not clear evidence of the percentages of songbirds that are included in the totals. Klem et al. (2009) reported the top ten bird species recorded as killed during their studies in New York City in autumn 2006 and spring 2007; migratory birds comprised all of the top ten species in 2006 and nine of the top ten species in 2007.

### 4.6.4 Bald and Golden Eagles

Bald Eagles historically occurred throughout the contiguous United States and Alaska. After severely declining in the lower 48 states between the 1870s and the 1970s, Bald Eagles have rebounded and re-established breeding territories in each of the lower 48 states. The largest North American breeding populations are in Alaska and Canada, but there are also significant Bald Eagle populations in Florida, the Pacific Northwest, the Greater Yellowstone area, the Great Lakes states, and the Chesapeake Bay region. Bald Eagle distribution varies seasonally. Bald Eagles that nest in southern latitudes frequently move northward in late spring and early summer, often summering as far north as Canada. Most eagles that breed at northern latitudes migrate southward during winter, or to coastal areas where waters remain unfrozen. Migrants frequently concentrate in large numbers at sites where food is abundant, often roosting together communally. In some cases, concentration areas are used year-round: in summer by southern eagles and in winter by northern eagles (USFWS 2007).

Bald Eagles generally nest near coastlines, rivers, large lakes, or streams that support an adequate food supply. They often nest in mature or old-growth trees, snags (dead trees), cliffs, rock promontories, and with increasing frequency on manmade structures such as power poles and communications towers (USFWS 2007).

Golden Eagle populations are believed to be declining throughout their range in the contiguous United States (Harlow and Bloom 1989, Kochert and Steenhof 2002, Kochert *et al.* 2002, Good *et al.* 2007, Farmer *et al.* 2008, Smith *et al.* 2008). Golden Eagles will migrate from the Canadian provinces and northeastern states to areas that are milder in the winter or have less snow cover. Wintering Golden Eagles have been identified in all states in the continental United States. Golden Eagles are not known to roost communally as is common with wintering Bald Eagles in some areas of the U.S, but will gather together if local food sources are abundant (Palmer 1988).

Golden Eagles nest on cliffs and in the upper portions of deciduous and coniferous trees, or on artificial structures such as windmills, electric transmission towers, and artificial nesting platforms (Phillips and Beske 1990, Kochert et al. 2002). Golden Eagles currently breed in and near much of the available open habitat in North America west of the 100th Meridian, as well as in the northern Appalachian Mountains of the eastern United States (Palmer 1988, Kochert et al. 2002), although they are not common in the eastern half of the United States. Golden Eagles avoid nesting near urban areas and do not generally nest in densely forested habitat. Individuals will occasionally nest near semi-urban areas where housing density is low and in farmland habitat; however, Golden Eagles have been noted to be sensitive to some forms of human presence (Palmer 1988).

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. § 668 *et seq.*) ensures the protection of Bald and Golden Eagles. The BGEPA prohibits anyone without a permit from "taking" bald and golden eagles, including their parts, nests (active and inactive) or eggs. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.

Although the BGEPA does not specify the distances required to protect active Bald and Golden Eagle nests from human-induced impacts, concern over disturbance of Bald and Golden Eagle nests has resulted in the recommendation of spatial or temporal buffers (restriction of activity within an area or period of time) to reduce impacts. Temporal buffers may supplement or be used in place of spatial buffers. Temporal buffers typically extend from the time of arrival of the adult birds in the nesting area through the first few weeks of nesting development.

Scientific support for buffer distances to protect breeding eagles from human activities is limited (Whittington et al. 2010). The USFWS has developed guidelines for Bald Eagles, which recommend no construction activity within 660 feet (0.2 kilometer) of an active Bald Eagle nest during nesting season if the construction activity would be visible from the nest (USFWS 2007). No USFWS guidelines exist for Golden Eagles and there is little published literature with information on appropriate buffer distances for their nests. Suter and Joness (1981) recommended no construction activity occur within 0.6 mile (1 kilometer) of an active Golden Eagle nest during the nesting season to avoid nest abandonment.

## 4.7 CULTURAL RESOURCES

The primary Federal regulation requiring consideration of historic properties is Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C § 470 *et seq.*). NEPA review may also encompass the consideration of effects on cultural resources that do not qualify as historic properties under the NHPA.

Under the NHPA, historic properties are defined as districts, sites, buildings, structures, or objects listed in or eligible for listing in the National Register of Historic Places, a list that is maintained by the Department of the Interior, National Park Service. Typically, historic properties can be placed into the following categories:

- **Archaeological resources.** This includes prehistoric or historic sites where human activity has left physical evidence of that activity. These may be associated with buildings, structures, and landscapes that remain aboveground.
- **Architectural and landscape resources.** This includes buildings, structures, districts, or objects that have historic or architectural significance. Battlefields would be included in this category.

- **Traditional Cultural Places and Tribal Religious or Cultural resources.** These include resources that are used by a group for traditional cultural purposes or that have religious or cultural significance to a Native American Tribe (including Alaska Native Villages) or Native Hawaiian organization.

Properties may be eligible for listing in the NRHP if they possess significance at the national, state, or local level in American history, architecture, archaeology, engineering, or culture. For a property to be considered a historic property, it must meet basic criteria and retain the historic integrity of those features necessary to convey its significance. To convey significance, historic properties will always possess several, and usually most, of the following seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. The passage of time may require re-evaluation of historic properties to reaffirm the original National Register status. Effects on historic properties may include both direct effects and visual or other indirect effects. An effect on a historic property is cognizable under the NHPA if it alters a character-defining feature of eligibility.

More than 80,000 properties are listed in the NRHP. Almost every county in the United States has at least one property listed in the NRHP. Because of the broad scope and location of the potential ASR Program projects, the description of site-specific cultural resources is beyond the scope of this PEA. Proponents of individual actions subject to the ASR Program are required to identify historic properties and assess effects on those properties pursuant to procedures set forth in the *Nationwide Programmatic Agreement for the Review of Effects on Historic Properties for Certain Undertakings Approved by the FCC* (FCC 2004). Site-specific conditions identified in this review would be discussed in project-specific NEPA documentation, if required.

## 4.8 OTHER VISUAL AND AESTHETIC RESOURCES

Visual and aesthetic resources are the natural and man-made features that constitute an area's visual character. They include the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distances of seen areas) of a geographically defined viewshed. Visual resources generally refer to the urban environment, whereas aesthetic resources typically refer to natural and scenic areas.

The visual and aesthetic characteristics of a project site depend on whether the area is a remote, rural, or urban setting. In a remote or rural setting, the landscape tends to be dominated by naturally occurring landforms and vegetation. Although naturally occurring visual resources dominate rural areas, some signs of human activity are likely to be present and may also contribute to the aesthetics. Examples include houses, agricultural fields, fences, barns, highways, communications towers, power lines, and lighthouses. Remote areas may have no visible man-made structures. Within an urban setting, natural features that may be present include parks and other green spaces, waterfalls, and ponds.

Effects to aesthetic and visual resources deal broadly with the extent to which development contrasts with the existing environment, architecture, historic or cultural setting, or land use. Evaluating the visual and aesthetic qualities of an area is a subjective process because the value an observer places on specific landscape features varies depending upon the values and attitudes of the observer. Visual intrusions may also have an impact on some traditional cultural practices. Regardless of the subjective nature of assessing visual and aesthetic qualities of an area, landforms, water surfaces, vegetation, and man-made features can generally be considered characteristic of an area if they are inherent to the composition and function of the landscape.

There are no general Federal statutory or regulatory requirements that protect visual resources and aesthetics, but state, regional, or local requirements may apply. The National Scenic Byways Program (P.L. 105–178, 23 U.S.C. §162) protects the viewsheds of national scenic byways, and state laws similarly protect state-designated scenic byways. Consultation with the National Park Service may be required for potential impacts on the visual resources in National Parks. Section 6(f) of the Land and Water Conservation Fund Act (16 U.S.C. §460) protects visual resources in some outdoor recreation sites and facilities. In addition, as discussed in Section 4.7, Section 106 of the NHPA requires evaluation of visual impacts on historic properties.

## 4.9 ECONOMICS

Tower proponents incur costs for the planning, permitting, construction, and operation and maintenance of their structures. Environmental compliance costs may include site selection and feasibility studies, environmental studies, NEPA documentation, agency coordination and consultation, and permitting. NEPA documentation requirements are driven by the ASR regulations.

In 2009, 67 tower registrations required an EA; in 2010, 69 tower registrations required an EA. The FCC estimates that under the current ASR program, EA preparation for a tower typically costs between $5,000 and $15,000 (with exceptional cases costing up to $25,000), depending on the complexity of issues and resources to be addressed. A typical EA takes approximately 45 to 50 days to process from receipt until issuance of a FONSI. To date, no proposed tower subject to the ASR program has required preparation of an EIS, most likely due to the willingness of ASR applicants to amend their tower proposals (in either location or design), to reduce, minimize, or eliminate environmental impacts and thereby obtain a FONSI.

Costs of tower structures are generally higher for self-supported lattice towers when compared to towers of similar height that would be supported with guy wires. In particular, the material expense for a self-supported lattice tower is typically more than for a guyed tower of comparable height because more steel is used; foundations also cost more for self-supported lattice towers than for guyed towers because lattice towers are usually larger in cross section and require more concrete. Because more material (steel and concrete) is used, on-site construction time for self-supported lattice towers is also generally longer than for guyed towers, which increases the labor cost of self-supported lattice towers. On the other hand, the cost of land will typically be higher for a guyed tower than for a lattice tower. For example, a 250-foot (76-meter) guyed tower may require more than 3 acres (1.2 hectares) of land, whereas a 250-foot (76-meter) self-supported tower typically requires less than 1 acre (0.4 hectare). Monopole towers are often more expensive to construct than self-supported lattice towers of similar height because of material costs. A monopole tower is one large steel tube whereas a lattice tower is comprised of many smaller steel tubes. However, the time to construct for a monopole is usually shorter than for a lattice tower. It is not relevant to compare the costs of monopole towers against guyed towers because monopole towers are generally less than 200 feet (61 meters) and guyed towers are usually much taller.

## 4.10 RADIO FREQUENCY RADIATION

Radiofrequency (RF) radiation (radio waves) is defined as electromagnetic waves (generated by the oscillation of a charged particle) with a wave frequency (the number of waves per unit time) in the RF range, which is between 10 kilohertz and 300,000 megahertz (MHz) (Morris 1992). Radio waves are radiated by antennas used for several applications, including cellular communications, radio and television broadcasts, two-way radio communications, and others. Antennas are often located atop hills, towers, rooftops, and other elevated structures to enhance their operating range.

Although RF radiation does not present the same type of health hazards as "ionizing" radiation sources such as X-rays and gamma rays (which can cause molecular changes that may result in significant genetic damage), high intensities of RF radiation can be harmful. Similar to microwaves (which fall within the RF range), RF radiation has the ability to heat biological tissue rapidly, resulting in tissue damage, which is known as a "thermal" effect. The extent of this heating depends on several factors, the most important of which are the intensity and frequency of RF radiation. Others include the size, shape, and orientation of the exposed object, duration of exposure, environmental conditions, and efficiency of heat dissipation (FCC 1999).

In 1996, the FCC adopted guidelines for human exposure to RF radiation, which were based on criteria developed by the National Council on Radiation Protection and Measurement in 1986 and on standards developed by the American National Standards Institute and the Institute of Electrical and Electronics Engineers, Inc. in 1992. These exposure guidelines are based on the threshold level at which harmful biological effects may occur, which depends on electric and magnetic field strength and power density. The FCC guidelines are most stringent for the frequency range from 30 to 300 MHz, the range in which the human body absorbs RF radiation most efficiently. Maximum permissible exposure (MPE) limits were developed for two categories. The first category, which affects the occupational population, applies to human exposure to RF fields when people are exposed due to their employment, have been made fully aware of the potential for exposure, and can exercise control over their exposure. The second category, which affects the general population, applies to human exposure to RF fields when the general public may be exposed or when personnel exposed because of their employment may not be aware of exposure or cannot exercise control over the exposure. A significant impact would occur if exposure limits to the occupational or general population exceeded the MPE limits.

Because the likelihood of exceeding the MPE limits depends heavily on operating power, the FCC exempts many lower power operations from routine evaluation for compliance with these limits. For example, the FCC requires that tower-mounted installations for cellular telephone services be evaluated only if antennas are mounted lower than 32.8 feet (10 meters) above the ground and the total power of all channels being used is more than 1,000 watts of effective radiated power (2,000 watts in some frequency ranges). By contrast, commercial radio and television stations may operate at up to millions of watts of effective radiated power. Therefore, all radio and television broadcast antennas must be evaluated for compliance with the RF exposure limits. Due to large populations and the numerous communication sources (e.g., radio stations, cellular telephones, CB radios) present in urban areas, radio wave exposure is higher in areas where the majority of FCC-registered antenna sites currently exist. Due to relatively small populations and fewer emitting sources, radio wave exposure is generally lower in rural areas and areas where undeveloped sites may be selected for new towers.

This page intentionally left blank.

# CHAPTER FIVE ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential impacts that the alternatives described in Chapter 3 (No Action Alternative, Alternative 1, and all options of Alternative 2) may have on the resources described in Chapter 4. It is important to note that the ASR program is national in scope, and the environmental impacts of each individual tower may vary greatly depending on local conditions. Therefore, this PEA does not assess the environmental impacts of any particular tower. Rather, the PEA focuses on the broad, programmatic impacts of the ASR program in a national context. The impacts of individual towers are discussed as a means of establishing context for the programmatic assessment. In addition, the PEA considers in Chapter 7 whether the FCC's processes, including its criteria for determining which towers are categorically excluded and which require an EA, ensure that potentially significant impacts of individual towers will be identified and considered. If an individual tower may have potentially significant environmental impacts, those impacts would be addressed in an EA prepared for that tower.

For each resource addressed in Section 5.4 below, the No Action Alternative establishes the baseline of existing conditions in the future if towers continue to be constructed and registered under the ASR program as it currently exists. The discussion then assesses impacts from the ASR program under each of the alternatives considered. In Chapter 7, the PEA makes findings based upon these assessments as to whether the impacts are significant.

## 5.1 CATEGORIES OF IMPACTS

Impacts (or effects) can be categorized in a variety of ways, such as by description (beneficial or adverse) and duration (short- or long-term). NEPA requires consideration of all categories of impacts that apply to a proposed action and assessment of direct, indirect, and cumulative impacts.

**Direct impacts** are caused by the action and occur at the same time and place, for example, birds colliding with towers.

**Indirect impacts** are caused by the action and are later in time or removed in distance, but are still reasonably foreseeable. For example, this includes habitat avoidance by some birds in areas where towers are constructed or changes in flight patterns due to the presence of towers.

**Cumulative impacts** result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. The cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource, no matter what entity (Federal, non-Federal, or private) is taking the actions. Cumulative impacts are the combined, incremental effects of human activity. In accordance with NEPA and to the extent reasonable and practical, this PEA considers the combined effects of the No Action Alternative, Alternative 1, and all options of Alternative 2 with other actions that may affect the resources identified. For example, other potential impacts on birds include collisions with other vertical structures, predation by cats, and population changes due to climate change. This PEA also considers under cumulative impacts the combination of the environmental effects of future towers to be registered under the ASR program with the ongoing effects of existing registered towers. Cumulative impacts are addressed in Chapter 6.

## 5.2 SIGNIFICANCE OF IMPACTS

According to CEQ regulations (40 CFR 1508.27), significance under NEPA requires consideration of both context and intensity, as discussed in this chapter and in Chapter 6. Chapter 7 of this PEA discusses whether any of the ASR Program's environmental impacts are classified as significant.

### 5.2.1 Context

The significance of an impact must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. Both short- and long-term effects are relevant.

The ASR Program is national in scale and therefore has the potential to impact resources throughout the United States, its territories, and the District of Columbia. The projects that would be reviewed and potentially approved for registration under the ASR Program would be implemented in geographically diverse areas (both urban and rural), as well as previously disturbed and undisturbed sites. Because of the wide variety of natural and manmade environments that may be affected by the ASR Program, and the complexity of resources potentially affected, it is not possible to provide a detailed comprehensive description of resource impacts at individual sites in this PEA. Therefore, Chapter 5 characterizes resource impacts in general terms and identifies those resources that may require additional site-specific analysis of impacts.

For purposes of evaluating the impacts of the ASR program as a whole, as addressed in this PEA, the relevant context is generally national or international in scope. In addition, this PEA considers whether project-specific EAs may be necessary to address the potential effects of individual towers. In such project-specific EAs, the discussion of impacts will be more local in context.

### 5.2.2 Intensity

Intensity refers to the severity of impact. The following should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
2. The degree to which the proposed action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of Federal, state, or local laws or requirements imposed for the protection of the environment.

Neither the CEQ regulations nor the FCC regulations provide definitions of the thresholds of impact. Therefore, this PEA uses impact threshold definitions that take into consideration the characteristics of communications towers. Four levels are used to describe the intensity of direct and indirect impacts on each resource, as well as cumulative impacts discussed in Chapter 6, for each alternative:

- Negligible – The impact is barely perceptible or measurable and remains localized and confined. For example, excavation required to construct a tower would cause surficial ground disturbance, which would impact soils. However, because the typical footprint of disturbance for construction of a tower is small, adverse impacts to soils would be barely perceptible and confined to the footprint of the tower and compound.
- Minor – The impact is slight but perceptible and measurable and remains localized and confined. For example, construction of a tower in or near a wetland may cause a perceptible change in the wetland's size, integrity, or continuity. However, the change would be slight and the wetland's ability to perform vital functions, such as filtering pollutants or providing habitat for wildlife, would not be affected.
- Moderate – The impact is readily apparent and sufficient to cause a change in the character-defining features of a resource. It generally does not affect the resource's viability. For example, clearing 1 acre (0.4 hectare) of trees would cause a clearly detectable change in a forest community and may have an appreciable impact on that community. This could include changes in the abundance, distribution, or composition of vegetation communities, but would not include changes that would affect the viability of plant populations in the forest.
- Major – The impact results in a substantial and highly noticeable change in character-defining features or involves an individually important feature of a resource. A major impact may, but does not necessarily, affect the resource's viability. For example, an impact that results in the deaths of large numbers of individual wildlife would be highly noticeable and constitute a major impact.

### 5.2.3 Significance Determination

Once the relevant context has been identified and an impact has been determined to be negligible, minor, moderate, or major, a determination of the impact's significance must be made, based on the requirements in 40 CFR 1508.27. Three levels of impact can be identified:

- No Impact – No impact is anticipated.
- No Significant Impact – An impact is anticipated, but the impact does not meet the intensity/context significance criteria for the specified resource.
- Significant Impact – An impact is anticipated that meets the intensity/context significance criteria for the specified resource.

The levels of these impacts and their specific definitions vary based on the resource that is being evaluated. For example, what constitutes a significant impact may be different for wetlands when compared to visual resources, both in terms of the relevant context and the intensity of effects.

Negligible, minor, and moderate impacts are generally not significant. Negligible and minor impacts are not significant because their intensity is only barely or slightly perceptible within a localized and confined context. Moderate impacts are usually not significant because they are not highly noticeable and do not involve individually important features. However, a moderate impact may be significant if its importance is magnified by the context in which it occurs.

Major impacts are often significant, but are not necessarily so when considered in context. For instance, a major impact would be significant if it threatens the viability of a population so that the population may not recover. For example, the deaths of many individual members of a wildlife population, while a major impact, may not constitute a significant impact in the context of a much larger total population that is subject to far greater forces. As explained in Chapter 7, the ASR Program for this reason does not have a significant impact at the national level on migratory birds.

Findings regarding the significance of the ASR Program's impacts on the resources considered in this PEA are made in Chapter 7, based on the relevant context and assessments of intensity presented in this chapter, and the assessment of cumulative impacts in Chapter 6.

## 5.3 ASSUMPTIONS

Impacts may result during both the construction of a tower and the operational phase after the tower is constructed. The construction of a tower and its associated compound, including any supporting structure(s), access road(s), or installation of utilities, may cause impacts resulting from heavy equipment operation, vegetation clearing, and ground-disturbing activities. In general, impacts from construction of towers are negligible or minor, given the relatively small footprints of the towers; in most instances, construction impacts are also temporary.

Once a tower is constructed, it may also cause impacts to resources, especially birds and visual quality/aesthetics, due the extension of a structure into the airspace. Operational impacts can be ongoing as long as the tower is in place.

The following assumptions have been made with respect to future tower construction under the No Action Alternative, Alternative 1, and all options of Alternative 2.

### 5.3.1 Tower Construction Footprints

A typical project site size and area of ground disturbance (vegetation clearing, impervious surface, etc.) for a 200-foot (61-meter) monopole or self-supported, unguyed tower is approximately 1 cleared acre (0.4 hectare). Guyed towers require a much larger project site size (approximately 30 or more acres [12.1 hectares] for a 1,000-foot [305-meter] guyed tower). However, although the project site is much larger for a guyed tower, the project site size is dictated by the guy wire array, which extends out from the tower structure. The actual ground disturbance for a guyed tower is not much greater than for an unguyed tower, since the additional ground disturbance required for the guy wire anchor points is small.

### 5.3.2 Number of Towers

It is assumed that a similar number of towers would be built under the No Action Alternative, Alternative 1, and all options of Alternative 2, because none of the alternatives would reduce the demand and need for towers. It is also assumed that under all alternatives, communications providers would first seek to collocate their antennas on existing towers or other structures to reduce costs and time involved in receiving environmental approvals and constructing new towers.

Although there is reason to think that the number of new registered towers constructed may continue its recent trend of decline, this PEA conservatively assumes that construction will occur at a pace similar to the median of the last five years. On this basis, it is estimated that approximately 2,800 towers per year will be constructed during the 10-year time period addressed in this PEA (see Section 4.2.4).

### 5.3.3 Tower Location

It is assumed that tower location is driven by the technological requirements and landscape conditions in a specific area. Because the consideration of areas important to migratory birds is similar under the No Action Alternative, Alternative 1, and Option C of Alternative 2, it is assumed that there likely would be no substantial difference in the locations of towers that would be built under each of these alternatives. It is anticipated that under Option B, applicants would attempt where possible to site towers that are over 450 feet (137 meters) tall, have guy wires, or use red steady lighting outside of coastal zones, ridgelines, bird staging areas, and colonial nesting sites, and to site all towers away from Bald and Golden Eagle nests, to avoid having to prepare an EA. Also, under both Option A and Option B some proposed towers may be moved out of avian high use areas as a result of the environmental review process. However, the degree to which towers could be placed to avoid these areas would likely be limited. For example, it is likely that many towers proposed in coastal zones could not be moved out of the coastal zone, since these areas are typically large. Also, moving a tower off a ridgeline may result in the need for a taller tower or multiple towers, which may offset the potential beneficial impacts to migratory birds.

### 5.3.4 Tower Height

It is assumed that tower height is driven by the technological requirements and landscape conditions in a specific area. As a result, it is assumed that there likely would be no substantial difference in the heights of towers that would be built under the No Action Alternative, Alternative 1, and all options of Alternative 2. It is possible that in some instances tower owners may choose to construct towers less than 450 feet (137 meters) tall because of the increased level of NEPA documentation and review required for taller towers under Alternative 2 Option C and, in some locations, Option B. However, in many instances, particularly for broadcast towers, it is unlikely that such a tower could be reduced appreciably in height and still be able to meet service coverage requirements. Under all options of Alternative 2, some proposed towers may also be reduced in height as a result of the environmental review process. Again, however, the ability appreciably to reduce tower heights is in most instances likely very limited. Furthermore, the use of shorter towers may mean that more towers will be required to meet service requirements.

### 5.3.5 Support System

It is assumed that the use of guy wires instead of a self-supported design is driven by the structural requirements at a specific location, as well as economic considerations and local regulations. As a result, it is assumed that there likely would be at most a limited reduction in the number of towers proposed and built using guy wire supports under Alternative 2 Options A and B when compared to the No Action Alternative and Alternative 1. It is possible that in some instances tower owners may choose to build towers without guy wires because of the increased level of NEPA documentation and review required for towers with guy wires in some locations under Alternative 2 Option B. Also, in some instances the environmental review process may result in the elimination of guy wires under Alternative 2 Options A and B. However, in many instances the elimination of guy wires from proposed towers will be technically or economically infeasible. It is assumed that there likely would be no substantial difference in tower support systems under the No Action Alternative, Alternative 1, and Option C of Alternative 2 because it is ordinarily not feasible to avoid the use of guy wires on a tower over 450 feet (137 meters) tall.

### 5.3.6 Lighting Scheme

For the No Action Alternative, no changes to lighting schemes would occur because the current FAA lighting circular would still apply to all existing and future towers. For Alternative 1, revisions to the FAA lighting circular are assumed to occur, so that no new towers will use red steady-burning lights and existing tower owners may choose to remove or turn off red steady-burning lights. For all options of Alternative 2, the PEA considers lighting effects on migratory birds under two mutually exclusive alternatives: (1) the FAA does not revise its lighting circular, so that the only permitted alternatives to lighting styles employing red steady-burning lights are lighting styles employing white strobe lights (which have their own environmental concerns); and (2) the FAA revises its lighting circular, so that no new towers will use red steady-burning lights and existing tower owners may choose to remove or turn off red steady-burning lights.

Given the increased level of NEPA documentation and review required under Alternative 2 Option B for red steady-burning lighting schemes when proposed in conjunction with a location on a ridgeline or within a coastal zone or bird staging area/colonial nesting site, it is assumed that if the FAA does not revise its lighting circular, fewer towers would be proposed and built using red steady-burning lighting schemes under Alternative 2 Option B when compared to the No Action Alternative. Also, the environmental review process would likely result in some new towers not using red steady lights under Alternative 2 Option A and, for towers over 450 feet (137 meters) in height, Option C. However, the option to avoid red steady-burning lighting may not be available in many instances due to zoning or other restrictions on or community opposition to white strobe lights. Therefore, the reduction in the use of red steady lights would be less under any option of Alternative 2 without revisions to the FAA lighting circular than under Alternative 1 or any option of Alternative 2 with revisions to the FAA lighting circular.

Under Alternative 1 and all options of Alternative 2, it is assumed that revisions to the FAA lighting circular would result in some tower owners removing or turning off red steady-burning lights on existing towers.

## 5.4 IMPACTS BY RESOURCE

The anticipated impacts from continuation of the ASR Program (No Action Alternative), the existing ASR Program with FAA lighting changes (Alternative 1), and modifications to the ASR Program (Alternative 2 Options A, B, and C) for the resources described in Chapter 4 are presented below.

### 5.4.1 Water Resources

Evaluation criteria for impacts on water resources are based on water quality, use, and associated regulations. Adverse impacts on water resources would occur if the project:

- Violates a Federal, state, or local law or regulation adopted to protect water resources.
- Causes irreparable harm to human health, aquatic life, or beneficial uses of aquatic ecosystems.
- Degrades surface water quality.
- Reduces water availability or supply to existing users.

#### *5.4.1.1 Surface Water*

#### No Action Alternative

Under the No Action Alternative, impacts to surface waters would be expected to stay the same. Construction of new towers would be expected to result in short-term and long-term negligible to minor adverse impacts on surface water resources, due to the potential for construction activities to cause increased sediment runoff into surface waters and the creation of permanent impervious surfaces at the project site. The magnitude of adverse impacts would depend on the specific location and the construction requirements of that location. The current ASR Program requires applicants to prepare an EA for towers that would cause a significant change in surface features, including water diversion.

Construction of the tower and equipment building would typically result in the disturbance of no more than several acres, and therefore would be expected to result in negligible to minor adverse impacts to surface waters from sedimentation. Construction of any additional roads and utilities that might be required could result in minor adverse impacts on surface water resources from sedimentation, depending on site-specific soil conditions, topography, and surface water bodies at any given location.

Construction of new tower facilities creates a small amount of permanent impervious surfaces that could slightly increase the quantity of storm water runoff, decrease storm water quality, and reduce the amount of groundwater that infiltrates underlying aquifers. Most towers would likely only require the tower and equipment building to be permanently impervious, which would have a long-term, negligible adverse impact on surface water resources due to storm water runoff. The length of road and road material needed at any one site is variable and these factors may contribute to impacts on surface waters. Construction of an access road adjacent to a stream would have the potential to introduce roadway contaminants directly into surface water resources, as well as increase the potential for flash flooding downstream. At most sites, these kinds of impacts would be negligible.

At some locations, the creation of access roads may require minor modifications of stream channels, such as installing a culvert or hardened stream crossing. These kinds of modifications could result in minor long-term adverse impacts on surface waters, such as increased potential for flooding. The magnitude of the impact would depend on the site-specific location. Under FCC regulations, diversion of surface water would require the project applicant to prepare an EA for the project.

The use of construction staging areas would result in short-term negligible adverse impacts. It is not expected that staging areas would be cleared, graded, or permanently altered, although minor soil disturbance could occur as a result of vehicle traffic.

Towers may require a backup generator, most likely powered by diesel or liquid propane. Storage of fuels on site has the potential to introduce contamination into surface water. The potential that a spill or leak would occur is small, and the amount of fuel onsite would not be sufficient to cause widespread contamination. Spills or leaks would likely result in short-term negligible to minor adverse impacts on surface water resources. Surface water or areas that have karst terrain would be more susceptible to adverse impacts in the event of a spill or leak.

### Alternative 1

Alternative 1 would be expected to have similar impacts on surface water resources as described under the No Action Alternative.

### Alternative 2 Options A, B, and C

Changes to the ASR Program proposed under all options of Alternative 2 would be expected to have similar impacts on surface water resources as described under the No Action Alternative.

### *5.4.1.2 Wetlands and Waters of the United States*

ASR Program projects affecting wetland areas would require site-specific evaluation and agency consultation to identify and delineate wetlands and WOUS, determine permitting requirements, and develop mitigation measures if required. In addition, wetland areas may contain riparian zones that are important habitats to migratory birds; these are discussed in Section 5.4.3.3.

### No Action Alternative

Under the No Action Alternative, impacts to wetlands and WOUS would be expected to stay the same. The current ASR Program requires applicants to prepare an EA for proposed towers that would cause a significant change in surface features, including wetland fill. Construction of new towers would be expected to result in short-term and long-term negligible to minor adverse impacts on wetlands and WOUS, due to the potential for construction activities to disturb wetlands or WOUS, cause increased sediment runoff into these resources, and create permanent impervious surfaces at the project site. The magnitude of adverse impacts would depend on the specific location and the construction requirements of that location, but in any event should be no greater than negligible to minor due to the small size of the areas to be disturbed or covered with impervious surfaces. Due to the EA requirement, any wetland fill would require approval from the USACE.

### Alternative 1

Alternative 1 would be expected to have similar impacts on wetlands and WOUS as described under the No Action Alternative.

### Alternative 2 Options A, B, and C

Changes to the ASR Program proposed under all options of Alternative 2 would be expected to have similar impacts on wetlands and WOUS as described under the No Action Alternative.

## 5.4.2 Floodplains

ASR Program projects require site-specific evaluation and, where appropriate, agency consultation to determine whether a project is within the floodplain and develop mitigation measures if required. The FCC's practice is to require that an EA prepared for a new tower project in a floodplain include a building permit showing that the structure is at least 1 foot (0.3 meter) above the base flood elevation.

Floodplains may also contain riparian zones that are important habitats to migratory birds. These are discussed in Section 5.4.3.3.

### No Action Alternative

Under the No Action Alternative, impacts to floodplains would be expected to stay the same. The current ASR Program requires applicants to prepare an EA for towers proposed in floodplains. Construction of new towers would be expected to result in short-term and long-term negligible to minor adverse impacts on floodplains, due to the potential for construction activities to cause slightly increased floodwater flows downstream of the project site.

### Alternative 1

Alternative 1 would be expected to have similar impacts on floodplains as described under the No Action Alternative.

### Alternative 2 Options A, B, and C

Changes to the ASR Program proposed under all options of Alternative 2 would be expected to have similar impacts on floodplains as described under the No Action Alternative.

## 5.4.3 Biological Resources

ASR Program projects affecting biological resources would require site-specific evaluation to identify specific biological resources that may be affected by new tower projects. Impacts are discussed below in general terms.

#### 5.4.3.1 *Vegetation and Wildlife (Other than T&E Species/Critical Habitat and Migratory Birds)*

Construction of new towers and associated compounds would affect vegetation and wildlife due to construction disturbance. The typical footprint of disturbance for towers is small. Although guyed towers have a much larger overall footprint than self-supported structures, the actual area of disturbance is not that much greater because, other than the tower and compound, only small areas need to be excavated to place concrete footers for the guy wire arrays. Vegetation such as shrubs and trees may also be cleared in other portions of the site for construction equipment staging areas or access roads.

### No Action Alternative

Under the No Action Alternative, impacts to vegetation and wildlife would be expected to stay the same. Construction of new towers would be expected to continue to cause short- and long-term negligible to minor adverse impacts on vegetation and wildlife due to removal and disturbance of vegetation, some direct mortality to less mobile wildlife, habitat fragmentation and removal, and introduction of non-native invasive species. The current ASR Program requires applicants to prepare an EA for proposed towers that would have a significant effect on surface features, including deforestation. The current ASR Program also requires preparation of an EA for towers to be constructed in wilderness areas and wildlife preserves, as well as wetlands and floodplains.

Potential adverse impacts on vegetation and wildlife associated with site development would vary depending on the characteristics of the tower location and could include direct long-term impacts associated with removal of vegetation, as well as indirect short- and long-term impacts associated with direct mortality to some less mobile wildlife (reptiles, amphibians, small mammals) and habitat fragmentation or removal during, or as a result of, site development. Placement of a tower in an urbanized environment would have less potential for adverse impacts on vegetation and wildlife than placement in an undeveloped area.

Development in fields, successional habitats, or fallow agricultural land would be expected to affect vegetation characterized by herbaceous species, shrubs and young tree species; in forested habitats, large trees, saplings, and associated understory vegetation would be affected. Wildlife dependent on these habitats would also be affected. Some indirect damage to trees and understory vegetation would also be expected to occur as a result of damage to root systems, soil compaction, and landscape modification associated with the use of heavy construction equipment for site development.

Removal and disturbance of vegetation to accommodate site development has the potential to introduce and spread non-native invasive species of vegetation due to disturbance of native habitats and introduction of species from seeds carried in on construction equipment used at other sites. Spread of non-native invasive species in the area of tower development could result from disturbance which could allow these species to become established from seed stock on the site or in adjacent habitats. Invasive species could also be introduced through construction equipment brought to the site from other locations. The establishment and spread of common reed is of particular concern in wetland and coastal areas; it can aggressively take over areas previously characterized by native plants. In terrestrial environments, species such as tear-thumb and porcelain berry can quickly dominate areas of native vegetation. Use of standard best management practices to clean equipment that is moved from one area to another can help reduce the spread of non-native invasive species.

***Alternative 1***

Alternative 1 would be expected to have similar negligible to minor impacts on vegetation and wildlife as described under the No Action Alternative.

### Alternative 2 Options A, B, and C

Changes to the ASR Program proposed under all options of Alternative 2 would be expected to have similar impacts on vegetation and wildlife as described under the No Action Alternative. Because any adverse impacts under Alternative 2 would be negligible to minor, it is unlikely that the preparation and review of additional EAs would be of more than minor benefit.

### *5.4.3.2 T&E Species and Critical Habitat*

Impacts on T&E species were classified using the following terminology, as defined under the ESA:

- **No effect** – would be determined if a proposed action would not affect a listed species or designated critical habitat.
- **May affect/not likely to adversely affect** – would be determined if impacts on listed species are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.
- **May affect/likely to adversely affect** – would be determined when an adverse effect on a listed species occurs as a direct or indirect result of proposed actions and the effect is neither discountable nor completely beneficial.
- **Likely to jeopardize proposed species/adversely modify critical habitat** – would be determined if the USFWS identified situations in which actions could jeopardize the continued existence of a listed species or adversely modify habitat critical to a species within or outside of the project area.

### No Action Alternative

Under the No Action Alternative, impacts to T&E species and critical habitat would be expected to stay the same. The current ASR Program requires applicants to prepare an EA for towers that may affect listed T&E species or critical habitats, or are likely to jeopardize the continued existence of proposed T&E species or result in destruction or adverse modification of proposed critical habitats. Towers that would not affect these resources may be categorically excluded from preparation of an EA, which would allow applicants to obtain FCC approval more quickly, thereby saving the applicant time and money.

Under the No Action Alternative, a determination of whether the proposed construction or operation of a new tower is likely to adversely affect a federally listed T&E species or critical habitat would be based on a site-specific review of information available from USFWS. If it is determined that there is potential for adverse impacts on a threatened or endangered species, the applicant or the FCC would need to coordinate with the appropriate USFWS office. Through this coordination, the impacts may be reduced to no effect or not likely to adversely affect. If it is not possible to reduce the impacts to no effect or not likely to adversely affect, the FCC and USFWS would enter into formal consultation resulting in a Biological Opinion and mitigating measures, and an EA would be required. Similarly, if it is determined that a project is likely to jeopardize the continued existence of proposed T&E species or result in destruction or adverse modification of proposed critical habitats, the applicant or the FCC would coordinate with the appropriate USFWS office, and an EA would be required if the likely jeopardy or destruction or adverse modification of habitat cannot be avoided.

In addition, tower operators currently attempt to site new towers outside of areas that might affect listed species or critical habitat to avoid the potential for costly project delays due to agency coordination requirements.

The FCC has recently entered into programmatic consultation with USFWS under Section 7(a)(1) of the ESA. This consultation is expected to result in an evaluation of the degree to which the ASR Program contributes to furthering the purposes of the ESA, along with possible recommendations to improve or enhance this contribution, as well as a description of any subsequent consultation that may be required between USFWS and the FCC at a less aggregated regional or local scale.

The FCC's procedures for implementing the ESA ensure that adverse effects to T&E species will be mitigated if they cannot be avoided. Due to the FCC's requirements to coordinate with the USFWS and to prepare EAs in appropriate cases, the No Action Alternative is anticipated to have short- to long-term negligible to minor impacts to threatened and endangered species and critical habitat.

### Alternative 1

Alternative 1 would be expected to have similar impacts on T&E species and critical habitat as described under the No Action Alternative.

### Alternative 2 Options A, B, and C

Changes to the ASR Program under Alternative 2 Options A, B, and C would be expected to have similar impacts on T&E species and critical habitat as described under the No Action Alternative.

### *5.4.3.3 Migratory Birds*

### Direct Effects

Direct effects on migratory birds from towers consist of mortality caused by collisions with the tower structure and guy wires.

***Data Limitations and Uncertainty***

There are approximately 50 studies in the peer-reviewed scientific literature that have documented bird kills at towers. With 85,261 registered towers constructed as of June 28, 2011 (FCC 2011b), the number of studies from which to draw conclusions is limited.

***Overview***

Although towers of all types have the potential to kill some birds, collision risk is known to increase with the height of the tower, with the addition of guy wire supports, and with the amount and type of lighting (Manville 2001). Towers that cause the most mortality to migratory birds are those that exceed 1,000 feet (305 meters) AGL (Longcore et al. 2011a, in preparation), are illuminated at night with red steady-burning incandescent red or white lights (Gehring et al. 2009), are supported by guy wires (Gehring et al. 2011 in press), are located near wetlands or other natural habitat types where birds gather together, are located in major songbird migration corridors, and are located in areas that have a history of inclement weather especially during spring and fall migrations (Manville 2001). Mortality is significantly greater at taller towers with red steady-burning lights and guy wires, and there is little evidence of multiple bird deaths at shorter tower heights with flashing lighting schemes and absence of guy wires (Kerlinger et al. 2010, Gehring et al. 2011 in press). Inclement weather including fog, overcast conditions and precipitation is typically a contributing factor to larger-scale mortality events (Cochran and Graber 1958, Caldwell and Wallace 1966, Avery et al. 1976).

In September 1948, a 450-foot (131-meter) radio tower in Baltimore, Maryland was the first communications tower documented to kill migratory birds (Aronoff 1949). The first long-term study of the impact of a communications tower on birds was begun in 1955 by the Tall Timbers Research Station in northern Florida. During the 25-year study, 42,384 birds representing 189 species were documented as killed (Crawford and Engstrom 2000). Over the course of a 38-year study at one television tower in Eau Claire, Wisconsin beginning in 1957, Kemper collected approximately 121,560 birds representing 123 species (Kemper 1996). This study includes the all-time record for most birds collected during a single-night tower strike – more than 12,000 birds were collected in a single night in 1963 from the base of the tower (Kemper 1996). Another large tower kill occurred in January 1998, when up to 10,000 Lapland Longspurs and several other species died in a one-night, multi-tower incident in western Kansas (Manville 200).

As discussed in Chapter 4, Manville (2001) estimated annual bird mortality from communications towers at 4 to 5 million birds and indicated that mortality might actually range as high as 40 to 50 million birds. The lower end (4 to 5 million) of Manville's estimate has been typically cited in other papers as a reasonable approximation of bird kills at towers (e.g., Gehring et al. 2009, Gehring et al. 2011 in press, Longcore et al. 2011a in preparation). For purposes of assessing impacts, the FCC has decided to use an estimated annual avian mortality of 5 million birds.

***Tower Location***

Towers in all locations have the potential to kill some birds. However, towers located near wetlands or other natural habitat types where birds gather together, in major songbird migration corridors, and in areas that have a history of inclement weather, especially during spring and fall migrations, cause more avian mortality (Manville 2001). Longcore et al. (2011a in preparation) have proposed that mortality is not equal across geographic regions.

As discussed in Section 4.6.3.10, geographic trends in mortality appear to be influenced by the number and height of towers in an area. Mortality was estimated to be highest in the southeastern United States where the proportion of tall towers is higher. This mortality is higher than for all of Canada where towers tend to be fewer and shorter.

***Tower Height***

Towers of all heights have the potential to kill some birds. However, taller towers present more of a hazard to migratory birds. While the available data do not permit quantification of the relative hazards of towers of different heights with any precision, it is clear, for example, that towers that exceed 1,000 feet (305 meters) AGL cause many times more avian mortality than towers of 450 feet (137 meters) AGL or less.

Most of the data pertaining to the impact of communications towers on migratory birds is focused on tall, guyed towers (Weir 1976, Avery et al. 1978, Avery et al. 1980, Trapp 1998, Derby et al. 2002, Johnson et al. 2000, Gehring et al. 2011 in press). From 1955 through 1983, approximately 44,007 birds were found killed at a television tower in Leon County, Florida (Crawford and Engstrom 2001). This study was able to isolate tower height from other factors because the tower was lengthened from its original 670-foot (204-meter) height to 1,010 feet (308 meters) in 1960, and then shortened to 308 feet (94 meters) in 1989. The number of birds killed when the tower was reduced to 308 feet (94 meters) was lower by a factor of 32 compared to when the tower was at 1,010 feet (308 meters) (Crawford and Engstrom 2001). Crawford and Engstrom (2001) suggest that towers approximately 300 feet (94 meters) or shorter in height may not pose as great a threat of avian mortality as caused by towers 650 feet (200 meters) or greater in height. They reported no significant difference between the numbers of birds killed when the tower was 670 feet (204 meters) versus 1,010 feet (308 meters). Longcore et al. (2011a in preparation), on the other hand, report that two-thirds of the estimated avian mortality from towers is attributable to towers over 1,000 feet (300 meters) tall, even though the vast majority of towers in the United States are shorter than this height. They also report that approximately 20 percent of kills are attributable to towers less than 490 feet (149 meters) tall based on the sheer number of towers below that height. As described in Section 4.2.2, more than 94 percent of towers in the ASR database are less than 450 feet (137 meters) tall.

In a recent study, Gehring et al. (2011 in press) found that tall towers greater than 1,000 feet (305 meters) in height and supported by guy wires accounted for 70 times the bird fatalities when compared to medium-height (380 to 480 feet [116 to 146 meters]) unguyed towers and nearly five times as many as medium-height guyed towers. Nevertheless, the literature as a whole reflects a certain level of bias in the research, in that taller towers with large bird kills have been studied more frequently than shorter towers, especially those less than 200 feet (61 meters).

As shown in Figure 11 below, in general, as tower height increases and encroaches into migratory flight altitudes, so does a tower's potential to be a hazard to migrating birds.

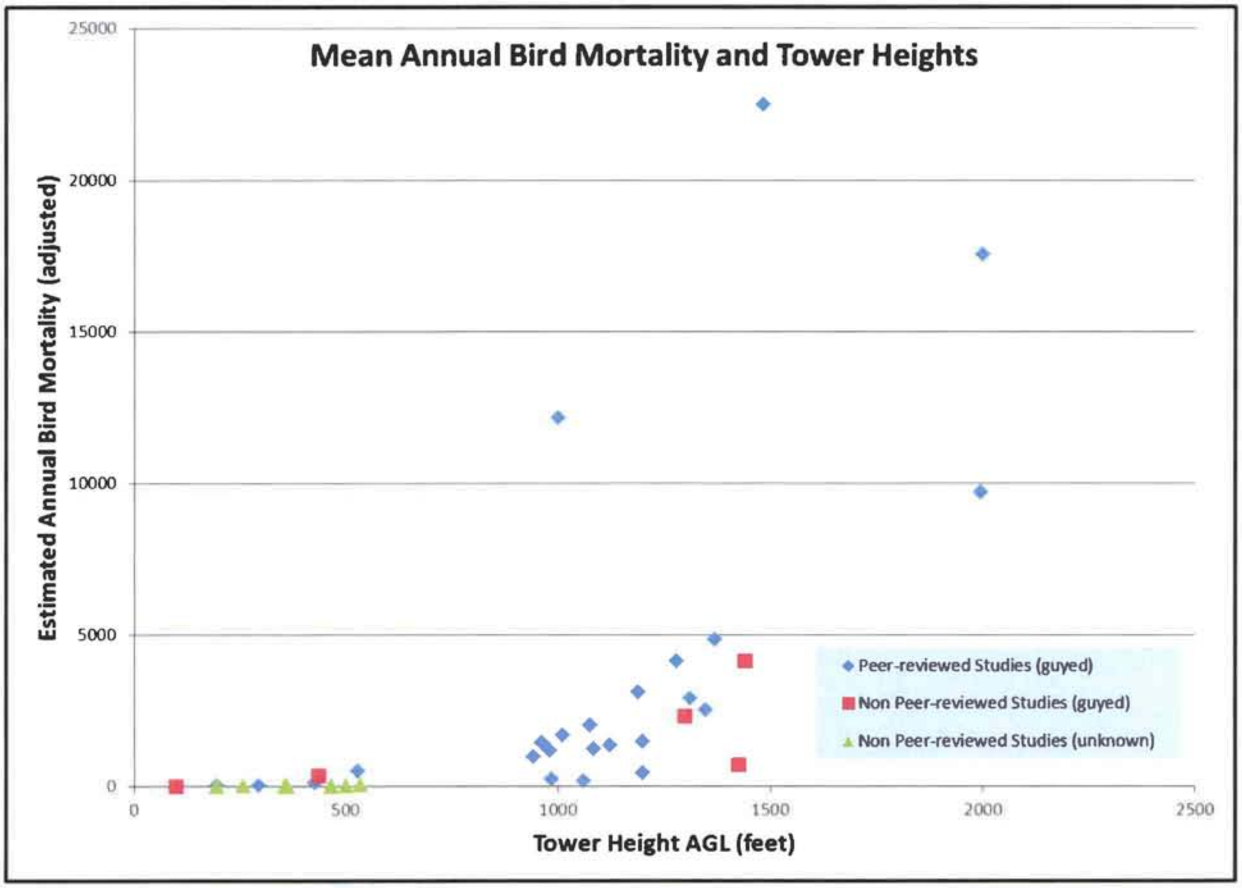


**Figure 11: Mean Annual Bird Mortality and Tower Heights**

To provide more detailed information (given the scale of Figure 11), the mean annual bird mortality for towers less than 600 feet (183 meters) is provided below in Figure 12.

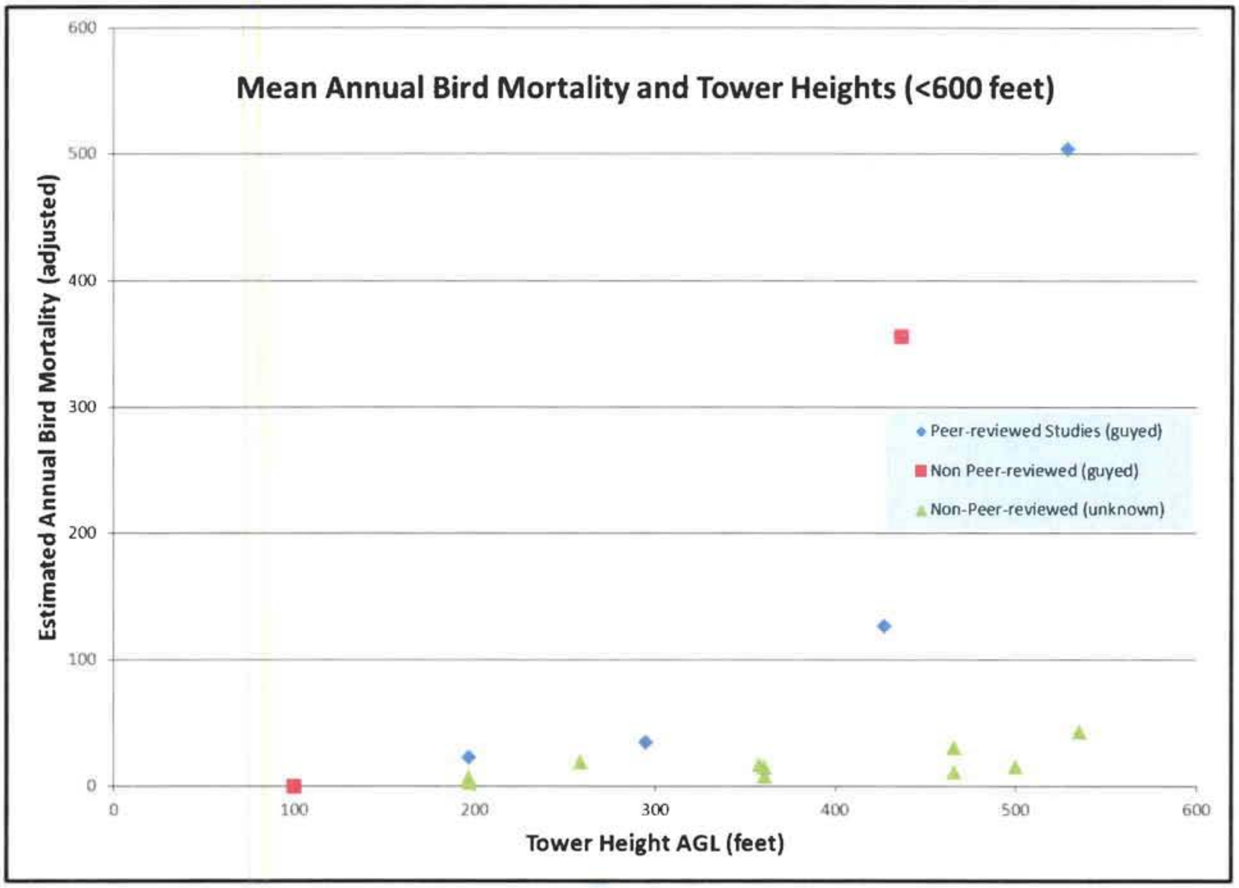


**Figure 12: Mean Annual Bird Mortality and Tower Heights (<600 feet)**

Reducing tower heights would reduce avian mortality; however, it is likely that most towers could not be significantly reduced in height. To minimize construction costs, tower owners typically build towers to the minimum height needed. In addition, tower height is determined primarily by service needs and landscape features; reducing a tower's height may result in the need for additional towers, which may offset the potential beneficial impact to birds.

### *Guy Wires*

The presence and number of guy wires and the distance they extend from the tower have been shown to influence bird mortality (Avery et al. 1977). However, because guy wires are invariably associated with the tallest towers (out of structural necessity), and because all tall towers require aviation obstruction marking lights, it is inherently more difficult to separate out the contribution of guy wires alone to the overall mortality profile of a tower than it is for aviation obstruction lighting, which can be more easily experimentally manipulated. Nevertheless, Avery et al. (1977) observed at the 1,201-foot (366-meter) Omega tower in North Dakota (which is stabilized by three sets of five guy wires) that avian mortality on foggy nights was more concentrated near the tower base, indicating that light attraction may have been the key factor, whereas mortality on clear nights was more evenly distributed over a broader area beneath the guy wire array, suggesting that guy wires may have been the key factor in mortality. The interpretation by Avery et al. (1977) is that on nights with low visibility, migrants are attracted to tower lights, resulting in collisions with the tower structure itself; whereas on clear nights mortality appears to be more likely due to collision with wires, other birds, or exhaustion (Longcore et al. 2008, Gehring et al. 2009).

A potentially significant variable regarding guy wires is how far out from the base of the tower they are anchored. Bierly (1968) suggested that the greater the angle of the wire from the vertical tower, the greater the amount of exposed wire there is at higher elevations, and hence the greater the probability of birds colliding with the wires. If that is true, it might therefore be preferable to have the connecting point for guy wire arrays be as close to the tower base as feasible consistent with structural safety, thereby minimizing exposed wires at higher elevations. In any case, the presence of an array of guy wires increases the risk to migratory birds.

Figure 13 below shows annual bird mortality from towers with various numbers of guy wire sets from peer-reviewed studies included in Longcore et al. (2011a in preparation). Bird mortality is higher at towers with multiple guy wire sets. The number of guy wire sets typically increases with tower height. As a result the two factors (tower height and number of guy wire sets) are difficult to separate from one another. Reducing the number of guy wire sets would reduce avian mortality; however, it is likely that in many cases the number of guy wire sets could not be safely reduced, since the number of sets is dependent upon tower height. As noted above, tower owners typically build towers to the minimum height needed so that construction costs are minimized. In addition, tower height is determined primarily by service needs and landscape features. While reducing a tower's height may decrease the number of guy wire sets needed, building a shorter tower may result in the need for additional towers, which may offset the potential beneficial impact to birds.

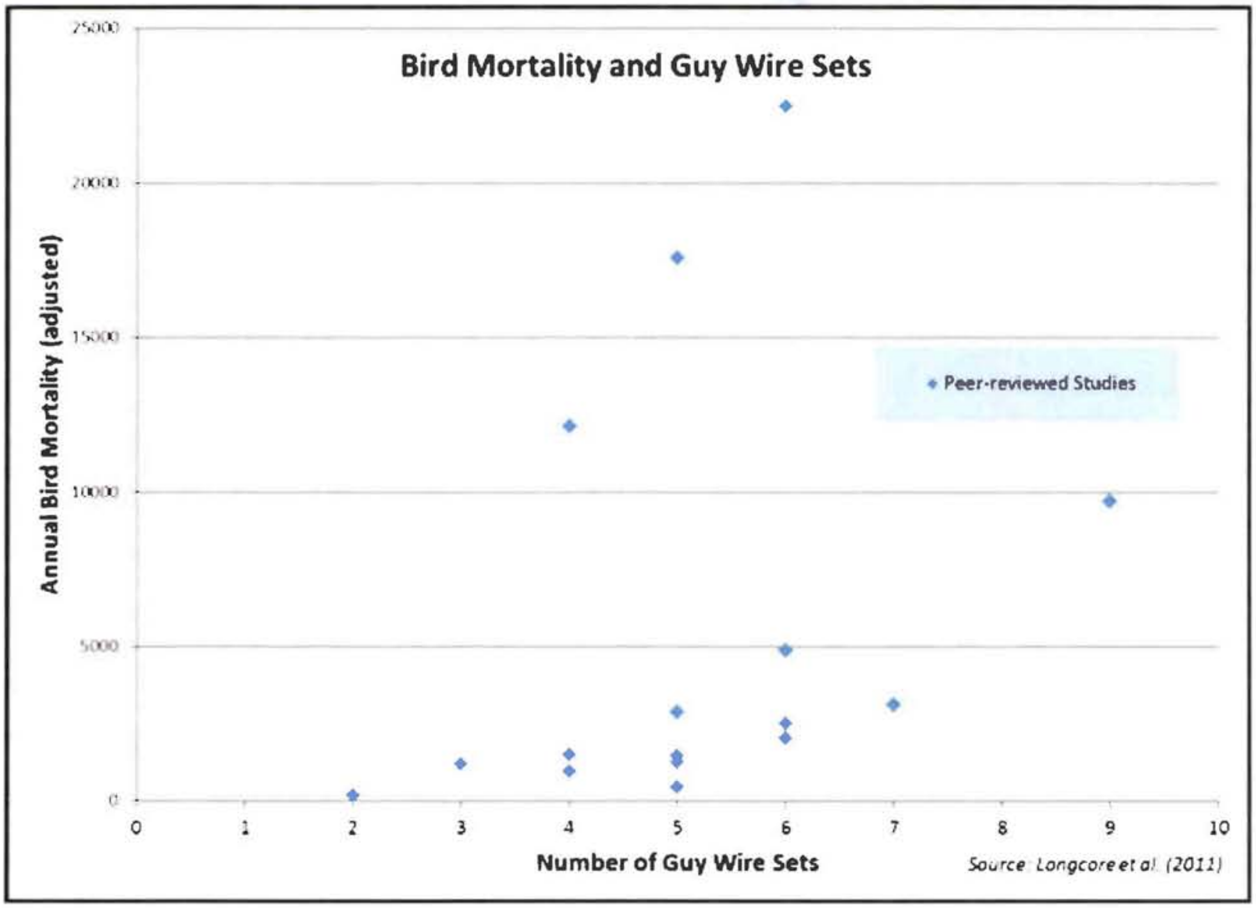


**Figure 13: Bird Mortality and Guy Wire Sets**

*Tower Lighting Schemes*

Lighting appears to be a particularly important variable in avian mortality due to communications towers, because artificial lights are known to attract night-migrating songbirds, especially on nights of low visibility due to heavy fog, low cloud ceiling, or precipitation linked to moving or stalled cold fronts (Tordoff and Mengel 1956, Ball et al. 1995).

Migratory birds' attraction to lights was first documented in 1874 in *Field and Stream* magazine and later by Allen (1880, cited in Cochran 1959), who reported birds being killed from flying into lighthouses. Cochran and Graber (1958) and Cochran (1959) reported that songbirds were particularly attracted to red lights at a television tower during poor weather conditions. The presence of fog and mist exacerbate the situation in two ways. First, moisture causes light to refract off water droplets, resulting in a bright halo around each tower light and making the tower more attractive to migrating birds. Second, the moon and stars are obscured, causing birds to abandon their migration flight and instead fly in circles around lit towers. The circling behavior is thought to result from birds attempting to keep the artificial light source at a constant bearing as they apparently do with the stars and moon (Emlen 1967, Evans and Ogden 1996, Åkesson and Bäckman 1999, Mouritsen and Larsen 2001). Once birds lose the light from the stars and moon they will orient toward any available artificial light (such as tower lighting) and in doing so will begin circling around the light source, thereby increasing the likelihood of colliding with the tower structure, guy wires, and other birds (Seeman 2000).

In the first controlled studies where tower lights were intentionally extinguished on foggy nights, birds were observed to avoid previously lit towers and continue on their migration paths. When the lights were turned back on, birds were observed to immediately begin circling around the same towers in large numbers (Cochran and Graber 1958, Avery et al. 1976). Gauthreaux and Belser (1999) observed that, in these fog conditions, a greater number of birds were attracted to red strobe lights than to white strobe lights, and that both red and white strobe lights attracted more birds than did unlit control towers, which attracted no birds. When weather conditions and visibility improved, in all cases reported in the literature the birds left the lighted towers, apparently continuing on their migration paths (Gauthreaux and Belser 1999).

Many of the general results of these earlier studies of bird behavior around aviation obstruction marking lights have been corroborated, but others have been called into question, by Evans et al. (2007). According to Evans et al. (2007), there was no direct evidence for bird attraction because a light was red – in spite of the fact that red light had been previously blamed for bird mortality at tall TV towers. Rather, Evans et al. found that for birds migrating within clouds, steady-burning blue, green, or white lights were more attractive to birds than red lights. They also reported that any flashing lighting scheme, regardless of color, would cause less bird aggregation than continuous lighting. Evans et al. also provided strong circumstantial evidence that flashing white light does not attract birds, and this result corresponds with evidence these researchers also cite that no large kills have yet been documented at tall broadcast towers with white strobe lighting.

Gehring et al. (2009) and Longcore et al. (2008) report that lighting types and schemes may be the most important factors contributing to bird kills at towers. In a study conducted in Michigan, Gehring et al. (2009) collected avian fatality data simultaneously at 24 towers on consecutive days during peak songbird migration in spring and fall. They report that towers lit at night with only flashing lights (regardless of whether they were red or white) were involved in significantly fewer avian fatalities than towers with current FAA-recommended lighting styles that combine red flashing and red steady-burning lights. Their results suggest that avian fatalities could be reduced by 50 to 70 percent at guyed communications towers by removing red steady-burning lights.

Removing red steady-burning lights would likely reduce avian mortality more than changing tower location or reducing tower heights or the number of guy wire sets. However, under the current FAA lighting circular, red steady lights are still required at towers that rely on red lighting. Unless the FAA revises the current lighting circular, tower owners would be prohibited from using only red flashing lights or turning off red steady-burning lights. Although the FAA lighting styles permit use of white flashing or strobe lights without steady lighting, white lights typically are not preferred by neighboring residents, and their use is often restricted by local law.

***Species-specific Effects***

As described in Section 4.6.3.10, Longcore et al. (2011b in preparation) have proposed that mortality at communications towers is not equal across all avian taxa. Observed mortality is highest for neotropical migrants, and for some of these species mortality has been estimated to be more than 1 percent of the species' population, which the authors term "biologically significant." The birds that appear to be most vulnerable to communications towers include thrushes, vireos, and warblers, which migrate at night and are therefore susceptible to collisions with towers, especially on foggy nights or on nights with low cloud ceilings during spring and fall migrations (Manville 2001). Longcore et al. (2011b in preparation) estimate that 95 percent of tower mortality consists of passerines (songbirds), and that among passerines, mortality rates are highest for warblers, vireos, sparrows, and thrushes. The authors suggest that mortality may be more than 1 percent of the species population for 12 species (range 1-8 percent), eight of which are warblers. One of the 12 is endangered, and eight are birds of conservation concern. However, as noted above in Section 4.6.3.1, Longcore et al. (2011b in preparation) results were based on a meta-analysis of existing studies that were not designed to address species-specific effects. In the absence of peer review, the conclusions that Longcore et al. draw from these studies are not accorded significant weight. In addition, the analysis carries an inherent bias by including an overrepresentation of extreme episodic events that skew the mortality estimates. Therefore, the evidence is insufficient to support a finding that the effects of towers on individual species of migratory birds may be significant.

## Declining Mortality Hypothesis

The declining mortality hypothesis is described in detail in Section 4.6.3.10. Over the last five decades of monitoring bird populations, the number of bird mortalities at towers is reported to be decreasing while the number of towers is increasing. Morris et al. (2003) reported a significant decrease in the number of birds salvaged at four towers in New York and Ohio over the 30-year period from 1970-1999. Morris et al. also note that other long-term studies consistently show a similar decline in total bird mortality (with other factors remaining equal, e.g., tower height).

While there is some compelling data suggesting an overall reduction in bird mortality at towers over the last five decades, this trend is best viewed as being hypothetical because it has been observed at only a few towers. Therefore, additional research on the declining mortality hypothesis is needed.

## Indirect Effects

Indirect effects to migratory birds from individual or groups of towers may include habitat and site abandonment, habitat loss and fragmentation, attraction to modified habitats, reduced breeding/nesting density, loss of population vigor and overall density, effects on predator/prey relationships, effects on behavior including stress, and possibly RF radiation. Of these, habitat and site abandonment have been the subject of the most research; there is only limited European research available on RF radiation effects on birds. This PEA addresses the indirect effects of habitat and site abandonment and what little is known about effects on birds from RF radiation.

Habitat and site abandonment around towers and other vertical structures has been found to be occurring, specifically with western prairie grouse species which include Lesser and Greater Prairie-Chickens, Sage Grouse, and Sharp-tailed Grouse. Two recent studies cited regularly regarding human disturbance and its effects on Lesser Prairie-Chickens are Robel et al. 2004 and Pitman et al. 2005. These studies showed that Lesser Prairie-Chickens generally avoid vertical structures, with non-breeding birds generally keeping at least 0.37 mile (0.60 kilometer) from buildings and transmission lines and towers. Most nests were found to be placed at least 0.78 mile (1.26 kilometers) from buildings, 0.49 mile (0.79 kilometer) from improved roads, and 0.22 mile (0.35 kilometer) from transmission lines. However, Pitman et al. 2005 also found that distance to various disturbance types was a poor predictor of nest success, which is apparently more dependent on various vegetative characteristics.

The precise mechanism controlling grouse and prairie-chicken abandonment of otherwise suitable habitat in the presence of tall towers is currently unknown. Similarly, it is unknown whether, in time, local bird populations may become acclimated to elevated structures and return to the area. However, it has been speculated that the presence of towers increases predator perching or that predators may increase in areas that host tall towers. The USFWS has argued that, because prairie grouse evolved in habitats with few vertical structures for predators to perch upon, placement of tall man-made structures (such as wind turbines and communications towers) in prairie grouse habitat may result in habitat degradation (Manville 2004). Several studies have shown that prairie grouse avoid other anthropogenic features, such as roads, power lines, oil and gas wells, and buildings (Robel et al. 2004, Holloran 2005, Pruett et al. 2009). For example, Greater Sage-Grouse populations have declined in the vicinity of oil and gas development projects, although declines may not occur until four years post construction (Naugle et al. 2009). Similarly, Harju et al. (2010) suggested that there is a 2- to 10-year delay before measurable effects on grouse breeding manifest themselves.

A lek is a traditional site commonly used year-after-year by males of certain species of birds (e.g., greater and lesser prairie-chickens, sage and sharp-tailed grouse), within which the males display communally to attract and compete for female mates, and where breeding occurs. In the wind industry, the results of Robel et al. 2004, Pitman et al. 2005, and other studies have led several state agencies to recommend that wind turbine towers be sited at least 1 mile (1.6 kilometers) from Lesser Prairie-Chicken lek sites. Similarly, the USFWS currently recommends that wind turbine towers be placed at least 5 miles (8 kilometers) from grouse lek sites (Manville 2004). USFWS also recommends that a minimum 2-mile (3.2-kilometer) radius of sagebrush be protected around known leks for non-migratory populations; protection buffers may have to increase for migratory populations (Braun et al. 1977, Connelly et al. 2000).

Some researchers have suggested that indirect effects on migratory birds also may include possible effects from RF radiation. At relatively low levels of exposure to RF radiation, the evidence for harmful biological effects on wildlife is unproven and there is little data available from which to draw any conclusions. However, the USFWS has expressed concerns that non-ionizing RF radiation, even at levels too low to cause thermal effects, could be harmful to migratory birds.

Although there have been no published studies on wild breeding birds in North America, some research in Europe has studied bioeffects from RF other than heating on wildlife. This research has been focused in two areas: direct impacts from magnetic fields on avian reproduction; and interruptions to avian navigation since birds are known to navigate using the geomagnetic field.

The presence of electromagnetic fields in the microwave range is considered by some to be a risk factor in the decline of urban bird populations, especially Balmori (2005, 2009), Balmori and Hallberg (2007), and DiCarlo et al. (2002). Specifically, research on wild birds at cellular phone tower sites in Valladolid, Spain, indicated strong negative correlations between levels of tower-emitted microwave radiation and bird breeding, nesting, and roosting in the vicinity of the electromagnetic fields (Balmori 2005). House Sparrows, White Storks, Rock Doves, Magpies, Collared Doves, and other species that had historically been documented to roost and nest in these areas subsequently exhibited nest and site abandonment, plumage deterioration, locomotion problems, and even death among some birds found close to cellular phone antennas. These symptoms were not observed prior to construction of the cellular phone towers.

Balmori and Hallberg (2007) reported that declines of urban House Sparrows in Valladolid, Spain, increased as electromagnetic field strength increased. Similarly, Everaert and Bauwens (2007) found strong negative correlations between the amount of radiation present (both in the 900 and 1800 MHz frequency bands) and the presence of male House Sparrows. Although the existing evidence of correlation is insufficient to establish causation, Everaert and Bauwens (2007) concluded that long-term exposure to higher radiation levels may be affecting bird abundance or bird behavior in this species.

Magnetite, a mineral that is highly sensitive to the electromagnetic frequencies that birds use for navigation, has been discovered in the brains of birds. It has been suggested that RF radiation may act as an attractant to birds (thereby affecting their navigation) since their eye, beak, and brain tissues contain high concentrations of magnetite (Ritz et al. 2004).

In laboratory studies, radiation at the same frequency and intensity as that used in cellular telephones in the United States has appeared to result in the deaths of domestic chicken embryos (DiCarlo et al. 2002, Manville 2009). These laboratory studies have been interpreted to suggest that non-ionizing RF radiation at levels far below the existing exposure guidelines for humans may have harmful effects on wild birds. However, the evidence is insufficient to support a finding that there may be adverse impacts on migratory bird populations due to RF radiation emissions.

## Impacts by Alternative

As discussed below, under the No Action Alternative, Alternative 1, and all options of Alternative 2, the ASR Program would have short- to long-term major and adverse direct effects on migratory birds due to collisions with towers, as well as minor indirect effects due to habitat and site abandonment. Chapter 7 explains that when considered in context, these impacts are not significant at the national level, although depending on the alternative chosen, there may be significant impacts to local populations of migratory birds or individual Bald and Golden Eagles at proposed tower sites.

### No Action Alternative – Direct Effects

Under the No Action Alternative, the current ASR Program and NEPA procedures would continue. As shown on Figure 14, annual bird mortality from collisions with towers and guy wires would be expected to increase in proportion to the number of towers being built, from an estimated 5 million birds currently to approximately 6.6 million birds in the year 2021, based on an estimated 2,800 new towers built annually. The death of millions of birds annually constitutes a substantial change to the resource. Therefore, the No Action Alternative would continue to cause short- to long-term major adverse direct impacts to migratory birds.

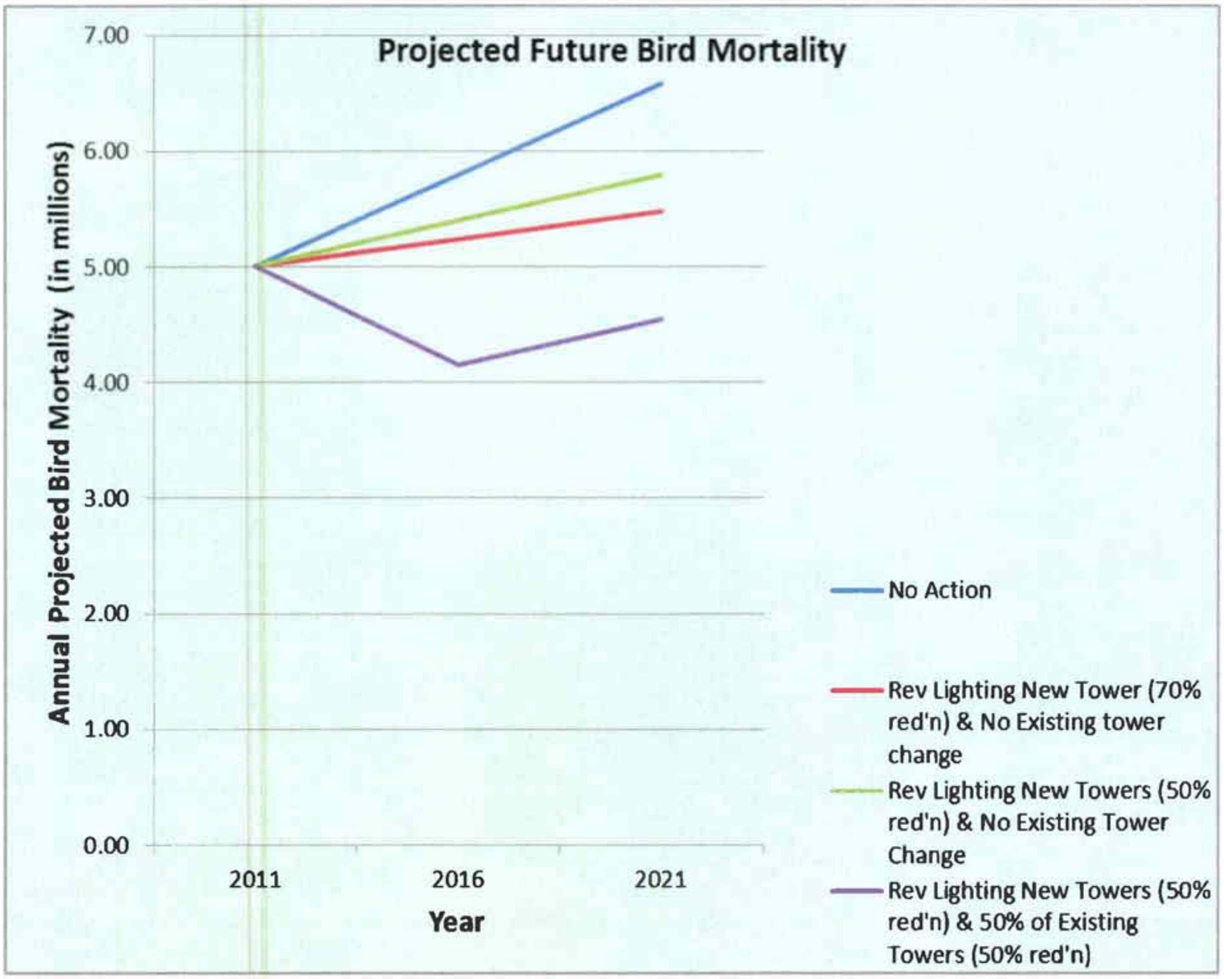


**Figure 14: Projected Future Bird Mortality**

## No Action Alternative – Indirect Effects

Indirect effects (habitat and site abandonment) on migratory birds under the No Action Alternative would not change from existing conditions. Depending on features of the tower and characteristics of the tower location, some migratory bird habitat and site abandonment are expected. Most of the research on habitat and site abandonment due to tall towers has been conducted on grouse and prairie-chicken species in the western United States (not all of which are migratory). These birds build their nests on the ground and are known to abandon or avoid otherwise suitable habitats because of the presence of tall man-made structures (such as wind turbines and communications towers), which increases the number of perching spots for birds of prey. The No Action Alternative is anticipated to cause short- to long-term minor habitat and site abandonment impacts to migratory birds because it is not considered likely that all migratory species would react as grouse and prairie-chickens do by abandoning or avoiding habitat. As recommended in the mitigation measures discussed in Section 8.4, applicants are encouraged, where feasible, to protect a minimum 2-mile (3.2-kilometer) radius of sagebrush around known grouse and prairie-chicken leks.

Based on the limited scientific evidence available, no RF radiation impacts on migratory birds are anticipated under the No Action Alternative.