## Alternative 1 – Direct Effects

Alternative 1 assumes the FAA lighting circular would be revised. Alternative 1 would cause short- to long-term major adverse impacts to migratory birds, although less than under the No Action Alternative. Bird mortality from collisions with towers and guy wires would be expected to increase in proportion to the number of towers being built, but the increase would be reduced by an estimated 50 to 70 percent due to revisions to the FAA lighting circular under which no future registered towers would use red steady-burning lights.

Under Alternative 1, bird mortality from new towers would decrease by 50 to 70 percent as a result of revisions to the FAA lighting circular when compared to the No Action Alternative (from approximately 6.6 million in the year 2021 to approximately 5.5 million to 5.8 million) assuming 2,800 new towers are built annually. Furthermore, if the FAA permits them to do so, owners of existing towers with red steady-burning lights would have an incentive to change to lighting styles without red steady-burning lights, both to reduce their costs for electricity and replacing lighting equipment and to reduce the effects of their towers on migratory birds. Assuming that the owners of 50 percent of existing registered towers with red steady-burning lights extinguish those lights or change them to red flashing lights (and that these towers are evenly distributed across tower heights), this would reduce bird mortality from existing towers by an estimated 25 to 35 percent. Under this scenario, annual bird mortality from existing towers would be expected to decrease from 5 million currently to between 3.2 million and 3.8 million birds in the year 2021, and total mortality from existing and new towers in 2021 would be estimated at between 3.7 and 4.6 million birds.

## Alternative 1 – Indirect Effects

Indirect effects (habitat and site abandonment) on migratory birds under Alternative 1 would be similar to the No Action Alternative. Based on the limited scientific evidence available, no RF radiation impacts on migratory birds are anticipated under Alternative 1.

## Alternative 2 Option A – Direct Effects

Alternative 2 Option A would require an EA for all new towers outside of an antenna farm submitted for registration – regardless of location, height, use of guy wires, or lighting scheme – and for tower replacements or modifications that involve a substantial increase in size. The only ASR applications that would be categorically excluded from preparation of an EA under this option would be those that propose: (1) a change from red steady-burning to flashing lights or removal of lighting on an existing tower; (2) a replacement or modification of an existing tower that does not involve a substantial increase in size; (3) construction in an antenna farm that does not involve a substantial increase in size over existing towers; or (4) a minor action. Applicants would have an incentive to make changes to existing towers, where feasible, rather than construct new towers. Further, applicants would be required to consider, and to mitigate where appropriate, the effects that proposed towers have on migratory birds.

Without changes to the FAA lighting circular, Alternative 2 Option A would cause short- to long-term major adverse impacts to migratory birds; however, Option A would result in somewhat less bird mortality than what would be expected under the No Action Alternative. By requiring EAs for all new construction, Option A would afford an opportunity to identify ways to avoid or mitigate impacts on migratory birds through the regulatory review of the EA. Also, applicants would have incentive to make changes to existing towers rather than construct new towers. However, in many instances the factors contributing to migratory bird deaths would likely be difficult to avoid.

If the FAA revises its lighting circular, Alternative 2 Option A would cause short- to long-term major adverse impacts to migratory birds, but would result in slightly less bird mortality than Alternative 1. Because no new towers would have red steady lights in any event, Option A would not reduce the number

of migratory bird deaths due to lighting. By requiring EAs for all new construction, Option A would afford an opportunity to identify ways to avoid or mitigate impacts on migratory birds due to features other than lighting through the regulatory review of the EA. However, none of these features appear to be as important a contributor to migratory bird mortality as red steady-burning lights. Moreover, factors contributing to migratory bird deaths other than lighting typically will be difficult to avoid.

### Alternative 2 Option A – Indirect Effects

With or without revisions to the FAA lighting circular, indirect effects (habitat and site abandonment) on migratory birds under Alternative 2 Option A would be somewhat less than those described under the No Action Alternative, because EAs requiring case-by-case review would be required for all new tower construction. Based on the limited scientific evidence available, no RF radiation impacts on migratory birds are anticipated under Option A.

### Alternative 2 Option B – Direct Effects

Under Alternative 2 Option B, a proposed new tower would require preparation of an EA only under certain combinations of location and structural and lighting features. Any proposed new registered tower that requires an EA under the existing rules or that is located within 660 feet (201 meters) of a Bald Eagle nest or 0.6 mile (1 kilometer) of a Golden Eagle nest would require an EA. Other locational features for which a project may require an EA would include ridgelines, coastal zones, and bird staging areas or colonial nesting sites. If any of those locational features are present, and a tower would be more than 450 feet (137 meters) tall, would use a red steady-burning lighting scheme, or would use guy wires, an EA would be required. Towers that are not proposed within any of these locations or that do not have any of these structural or lighting features would continue to be categorically excluded.

Without changes to the FAA lighting circular, Option B would cause short- to long-term major adverse impacts to migratory birds. By establishing clear guidelines and aligning tower owners' economic incentives with the protection of migratory birds, Option B would reduce annual bird mortality compared to the No Action Alternative to an extent at least comparable to Option A. Option B provides an incentive to applicants to avoid siting projects that are over 450 feet (137 meters) tall, use red steady lighting, or use guy wires on ridgelines or in coastal zones, bird staging areas, and colonial nesting sites, and in riparian zones within wetlands and floodplains. Thus, within the locations that are most sensitive to migratory birds, Option B provides applicants an incentive to reduce the heights of the tallest towers and avoid the use of guy wires where feasible, which would reduce avian mortality. Given the substantially higher number of bird deaths at towers above 950 feet (290 meters) tall, the lack of studies at towers between 550 and 950 feet (168 and 290 meters), and the mixed findings of the limited evidence for towers between 400 and 550 feet (122 and 168 meters), it appears that 450 feet (137 meters) is a reasonable threshold for reducing impacts on migratory birds. Nonetheless, applicants' ability to avoid tall towers and the use of guy wires is likely very limited. In many instances, especially at taller towers, it is economically infeasible to avoid guy wires without compromising structural safety. In addition, particularly for broadcast towers, it is unlikely in most instances that a tower over 450 feet (137 meters) tall could be reduced appreciably in height and still be able to meet coverage requirements.

To the extent applicants cannot avoid building towers that are more than 450 feet (137 meters) tall, use red steady lighting, or use guy wires, Option B provides an incentive to locate these towers away from ridgelines, coastal zones, bird staging areas and colonial nesting sites, and riparian zones within wetlands and floodplains, thereby reducing the number of migratory birds likely to be affected by these towers. However, the degree of mortality reduction from re-siting proposed towers would be limited by applicants' ability to avoid these locations, as well as by protection already provided under FCC rules for areas that overlap (e.g., floodplains and wetlands). 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. Colonial nesting sites are typically located in remote areas, so few towers are placed in colonial nesting sites and it

is unlikely that this would change under Option B. 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 birds.

If the FAA does not revise its lighting styles that currently include red steady-burning lights, under Option B tower owners would be able to avoid the use of red steady-burning lights only by using white strobe lights. It is anticipated that requiring an EA for towers using red steady-burning lights on ridgelines or in coastal zones, bird staging areas and colonial nesting sites, as well as requiring a detailed analysis of effects on migratory birds for such towers in riparian zones within wetlands and floodplains, would lead some tower owners to choose this option. However, given that the use of white strobe lights raises other environmental concerns, and is often prohibited by local land use regulations, many projects would still use red steady-burning lights.

If the FAA revises its lighting styles, the requirement to prepare an EA for certain towers using red steady-burning lights would no longer be applicable because future towers would not use red steady-burning lights. Under this circumstance, Option B would cause short- to long-term major adverse impacts to migratory birds, but by establishing clear guidelines and aligning tower owners' economic incentives with the protection of migratory birds, it would result in less bird mortality than Alternative 1 and at least a comparable reduction in bird mortality to what would be expected under Alternative 2 Option A.

### Alternative 2 Option B – Indirect Effects

With or without revisions to the FAA lighting circular, indirect effects (habitat and site abandonment) on migratory birds under Alternative 2 Option B would be slightly less than under the No Action Alternative due to the preparation and review of EAs for towers meeting certain criteria. However, the reduction would be less than under Option A, which would require case-by-case review of EAs for all new towers. Based on the limited scientific evidence available, no RF radiation impacts on migratory birds are anticipated under Option B.

### Alternative 2 Option C – Direct Effects

Under Option C, an EA would be required for any proposed new tower, or replacement or modification of an existing tower that involves a substantial increase in size, that is more than 450 feet (137 meters) AGL, regardless of location, lighting scheme, or use of guy wires. Towers less than or equal to 450 feet (137 meters) would be categorically excluded from preparation of an EA, provided that they do not meet any of the criteria that currently require an EA.

Without changes to the FAA lighting circular, Option C would cause short- to long-term major adverse impacts to migratory birds. Under Option C, bird mortality would decrease when compared with the No Action Alternative, but not as much as with Alternative 2 Option A, which requires more EAs, or Option B, which provides incentives to place new towers that are over 450 feet (137 meters) tall, use red steady lighting, or use guy wires away from areas important to migratory birds, as well as to reduce the heights of the tallest towers and avoid use of red steady-burning lights and guy wires within these areas where feasible. Applicants may try to reduce tower heights if possible to avoid preparing an EA and thereby reduce their application costs and agency approval times. However, particularly for broadcast towers, it is typically unlikely that a tower over 450 feet (137 meters) tall could be reduced appreciably in height and still be able to meet coverage requirements. While in some cases it may be possible to reduce towers that would otherwise have been slightly over 450 feet (137 meters) to a level just below that threshold, such a limited reduction in height is unlikely to have much impact on avian mortality. Option C would also have some beneficial effect on avian mortality by requiring consideration of the effects that proposed towers over 450 feet (137 meters) would have on migratory birds through the EA process.

If the FAA revises its lighting circular, Alternative 2 Option C would cause short- to long-term major adverse impacts to migratory birds. Option C would result in less bird mortality than Alternative 1, but the decrease would be less than under Option A because fewer EAs would be prepared, or under Option B

which provides incentives to place towers that are over 450 feet (137 meters) tall or use guy wires away from resources important to migratory birds, and to reduce tower heights and avoid guy wires within these areas if feasible. However, opportunities for significant reductions in height are very limited.

### Alternative 2 Option C – Indirect Effects

With or without revisions to the FAA lighting circular, indirect effects (habitat and site abandonment) on migratory birds under Alternative 2 Option C would be slightly reduced compared to the No Action Alternative, due to the case-by-case review of EAs required for towers over 450 feet (137 meters) tall, but the reduction would be less than under Option A or Option B. Based on the limited scientific evidence available, no RF radiation impacts on migratory birds are anticipated under Option C.

### *5.4.3.4 Bald and Golden Eagles*

Breeding, feeding, and sheltering activities of Bald and Golden Eagles can be disturbed by construction of new tower facilities within their ranges, while Bald Eagles nesting on or near existing communications towers can be disturbed by tower maintenance activities. These disturbances could agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment.

Under the Bald and Golden Eagle Protection Act, significance of environmental effects is related to population impacts. The BGEPA prohibits anyone without a permit from "taking" Bald and Golden Eagles, including their parts, nests (active and inactive) or eggs, by pursuit, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting or disturbing. The definition of "disturb" under BGEPA includes: "to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In late 2009, the USFWS proposed two new regulations to authorize limited take of eagles by means of "disturbance," "take resulting in mortality," and take of eagle nests for health and safety reasons. Under these regulations, where an activity will "take" Bald Eagles – either through "disturbance" or by lethal means – an individual "take" permit under BGEPA is required to be in compliance with the law. For Golden Eagles, USFWS will likely only consider programmatic "take" permits (authorized under 50 CFR 22.3 for "take that is recurring, is not caused solely by indirect effects, and that occurs over the long term or in a location or locations that cannot be specifically identified"). Guidance for implementing individual and programmatic take permits is presently being developed (USFWS 2011a).

For both species, permits will only be issued where the breeding population of the raptor is stable or increasing. Because construction of communications towers may result in the take of Bald and Golden Eagles under BGEPA and USFWS guidance, USFWS suggests that tower owners and/or operators contact the nearest USFWS Ecological Service's Field Office for guidance on eagle issues and permitting. If USFWS determines that eagle habitat is present and the project area could contain a nest, it would advise the tower owner to arrange for a qualified biologist to conduct nest clearance surveys for Bald and Golden Eagles if construction would occur within the nesting season. If active nests are identified, USFWS would advise the tower owner to coordinate with USFWS to develop appropriate measures to reduce impacts to nesting eagles by implementing spatial buffers and/or temporal restrictions on construction activities.

## No Action Alternative

Because the current ASR Program does not require an EA for projects located near Bald or Golden Eagle nests, projects located near these nests would continue to be categorically excluded under the No Action Alternative if no other criteria requiring an EA are present. Construction activities near active nests would continue to cause adverse impacts on Bald and Golden Eagles due to disturbance of breeding, nesting, feeding, and sheltering activities. Newly constructed towers may also provide new nest sites for Bald Eagles, which may then be disturbed by subsequent tower maintenance activities. Although these disturbances would be limited to the period of construction or maintenance, they may have a readily apparent impact on individual Bald and Golden Eagles. Therefore, the No Action Alternative would continue to cause short-term minor to moderate adverse impacts on Bald and Golden Eagles.

## Alternative 1

Alternative 1 would be expected to have similar impacts on Bald and Golden Eagles as described under the No Action Alternative.

## Alternative 2 Option A

Alternative 2 Option A requires an EA for all new towers outside of an antenna farm and for certain changes to existing towers, regardless of location. Under Option A, applicants would need to take into account effects on Bald and Golden Eagles, and to consult with USFWS when Bald and Golden Eagles would be affected, when preparing the EA. USFWS would be expected to note the presence of nearby Bald and Golden Eagle nests, and to recommend appropriate actions to reduce impacts. Therefore, under Option A, short-term minor adverse impacts to Bald and Golden Eagles are anticipated,

## Alternative 2 Option B

Option B of Alternative 2 requires that an EA be prepared for projects within 660 feet (201 meters) of a Bald Eagle nest or 0.6 mile (1 kilometer) of a Golden Eagle nest. Towers located more than these distances away from Bald and Golden Eagle nests would be categorically excluded from preparation of an EA if no other criteria requiring an EA are present. Applicants would have an incentive under Option B to locate towers away from eagle nests where feasible. Furthermore, towers located near eagle nests would be reviewed by USFWS, which would be expected to note the presence of nearby Bald and Golden Eagle nests, and to recommend appropriate actions to reduce impacts. Therefore, under Option B, short-term minor adverse impacts to eagles are anticipated. It is anticipated that the reduction in impacts on Bald and Golden Eagles under Option B, compared to the No Action Alternative, Alternative 1, or Alternative 2 Option C, would be at least comparable to Option A.

## Alternative 2 Option C

Under Alternative 2 Option C, an EA that considers effects on migratory birds is required for new towers that are more than 450 feet (137 meters) tall. Therefore, these towers, which may have the greatest potential impact on Bald and Golden Eagles due to their size, would be reviewed for effects on Bald and Golden Eagles during the EA process. The EA requirement for towers over 450 feet (137 meters) tall may cause a limited reduction of tower heights for some towers, which may benefit Bald Eagles by making them less attractive as nesting sites, depending on other site characteristics. Under Option C there would be no incentive to move towers away from areas occupied by Bald or Golden Eagle nests. Therefore, Option C would be expected to cause short-term, minor to moderate adverse impacts to Bald and Golden Eagles, although to a slightly lesser degree than under the No Action Alternative or Alternative 1.

### 5.4.4 Cultural Resources

Section 106 of the NHPA directs the Federal Government to consider the effects of its undertakings on historic properties through a four-step decision-making and compliance process. The law does not mandate preservation of historic properties; rather, it mandates that Federal agencies consider the effect of their undertakings on historic properties. The four steps of the Section 106 compliance process are:

- Establish whether a proposed action constitutes an undertaking
- Identify National Register-listed or eligible properties
- Assess effects of a proposed action on eligible historic properties
- Resolve adverse effects to eligible historic properties through consultation with the State/Tribal Historic Preservation Office (SHPO/THPO) and the Advisory Council on Historic Preservation, as necessary

In September 2004, the Advisory Council on Historic Preservation, the National Conference of SHPOs, and the FCC executed a *Nationwide Programmatic Agreement for Review of Effects on Historic Properties for Certain Undertakings Approved by the Federal Communications Commission* (FCC 2004). This Nationwide Programmatic Agreement streamlines and tailors the Section 106 review process for undertakings involving the construction and modification of communications facilities. Under the NPA, almost all towers are subject to Section 106 review, with limited defined exceptions. Most collocations are exempt from Section 106 review under an earlier Collocation Agreement that was incorporated into the NPA. The NPA does not apply on Tribal lands.

The Section 106 process must be completed before a project can be determined to be categorically excluded or a FONSI can be issued. The Section 106 process is considered complete if there is a finding of No Historic Properties Affected or No Adverse Effect. If there is an adverse effect, the FCC executes a Memorandum of Agreement (MOA) to complete the process, and then it requires an EA to be prepared. Provided the agreement document has been executed, the actions outlined in the MOA do not have to be completed before the EA is finalized.

#### No Action Alternative

Because most new tower construction involves some level of ground-disturbing activities (e.g., construction of the tower, utility infrastructure, and access roads), construction of new towers has the potential to affect archaeological resources. Any tower projects that would involve renovations to buildings or structures that are either historic properties or within historic districts have the potential to affect architectural resources. Both types of projects have the potential to affect Traditional Cultural Properties and Native American religious and cultural sites. Because they involve structures that in most instances project 200 feet (61 meters) or more AGL, most ASR Projects also have the potential to impose visual adverse effects on resources of any type for which visual setting or visual elements are character-defining features of eligibility.

Under the NPA, once Areas of Potential Effect (for direct and visual effects) have been established for a particular undertaking, the applicant is directed to take specific steps to identify historic properties and assess effects on those properties. These steps include reviewing publicly available sources identified by the SHPO/THPO, gathering information from Indian Tribes and Native Hawaiian organizations, and inviting public and local government participation. Fieldwork will usually be required to identify archaeological resources and may be required for other resources. Upon completion of the applicant's identification and assessment efforts, its work will be reviewed by the SHPO/THPO. The FCC is committed to engage in government-to-government consultation with federally recognized Indian Tribes that have an interest in a proposed construction unless the Tribe has agreed that consultation is unnecessary.

In general, ASR Program actions have the potential to affect historic properties if they may visually affect buildings, sites, structures, landscapes, districts, and objects eligible for or listed in the NRHP. Actions also have the potential to affect archaeological resources if they involve excavation, grading, or other modifications to land. While unusual, it is also possible for an ASR Program action to affect historic properties if it involves structural modification, maintenance, rehabilitation and renovation, or the sale or lease of a historic property. The FCC is responsible to ensure that its licensees and those constructing for a licensee properly undertake the Section 106 review process to identify historic properties, determine the effects of undertakings on identified historic properties, and resolve adverse effects of their undertakings to historic properties. Under current ASR Program rules, an EA must be prepared for tower projects that cause adverse effects to historic properties. It is the FCC's practice that applicants should complete the Section 106 process before preparing an EA to ensure that effects to historic properties have been taken into account in the NEPA process.

As a result of the process that the FCC requires its applicants to follow under Section 106 of the NHPA, and in accordance with the NPA, it is expected that the ASR program would have short- to long-term negligible to minor adverse impacts on cultural resources under the No Action Alternative.

### Alternative 1

Under Alternative 1, impacts to archaeological and architectural resources and Native American religious and cultural sites would be similar to the No Action Alternative

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

Under all options of Alternative 2, impacts to archaeological and architectural resources and Native American religious and cultural sites would be similar to the No Action Alternative.

## 5.4.5 Other Visual and Aesthetic Resources

New tower sites could be placed within a variety of settings, including recreation areas; parks and preserves; commercial areas; or urban, suburban, or rural residential areas. The potential for impacts from construction of new towers is greater for some of these types of settings than others, with the nature and extent of site-specific impacts being related to the degree to which the structures associated with a proposed action contrast with the features in the existing landscape. In general, the impacts on visual resources are likely to be greater in undeveloped rural or natural settings than suburban, urban, or commercial settings, where towers and antennas are more common. The degree of impact might also be greater at a specific time of day or year. Tower features are generally more visible during the day, thereby causing greater impacts; however, tower lighting would contribute to visual impacts at night as well. Impacts on visual resources would be short-term (due to construction activity) and long-term (due to presence of a new tower in the landscape).

### No Action Alternative

Residential neighborhoods and other local land uses are typically governed by local comprehensive plans that specify the allowable types and locations of future land use. New towers would continue to be subject to review by local jurisdictions and a continuation of the existing ASR Program would not affect those reviews. Tower construction would also remain subject to other Federal, state, and local laws protecting particular viewsheds. In addition, as discussed in Section 5.4.4, the FCC's review process under Section 106 of the NHPA would require consideration of visual impacts to historic properties. The FCC's rules require preparation of an EA when a tower would use high-intensity white lights in a residentially zoned neighborhood.

Short-term and long-term, minor to moderate adverse impacts on visual resources would be expected under the No Action Alternative. There are several potential sources of short-term impacts on visual resources, including the clearing and grading of land for the tower site footprint, the construction of infrastructure necessary to install and operate the tower (access road, utility corridor, and staging areas), and the construction of the tower and equipment building. Permanent features that might create a long-term contrast with the existing environment would include the tower, the access road, the fenced perimeter of the site, the building housing the generator and electronics, and overhead transmission lines if required for power or communications (as opposed to buried lines).

The short-term impacts on visual resources resulting from construction activities and the long-term impacts resulting from the placement of potentially contrasting visual features into the existing landscape would be expected to be adverse and range from minor to moderate, depending on the degree of contrast that the change represents relative to the existing landscape.

Potential impacts on visual resources could be avoided or minimized through selection of sites, where possible, that lie in areas with substantial existing visual clutter (such as commercial areas) and that have existing roads and utility corridors that could be used to service the site. Other methods of mitigation might include use of vegetation screening or differences in topography to reduce the visual contrast of the permanent features at the site. In some instances, the locations of new sites could also be consolidated with other contrasting visual elements (e.g., existing utility towers, water towers, communications towers) to reduce visual sprawl and disturbance related to lighting, or the features of towers could be designed to blend more effectively with the forms and lines found in the existing landscape (for example, painting towers, fences, or concrete foundations with earth-tone paint or stain to reduce contrasts, or using rustic designs and native materials).

### Alternative 1

Impacts to visual resources under Alternative 1 would be similar to those described under the No Action Alternative

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

Impacts to visual resources under all options of Alternative 2 would be similar to those described under the No Action Alternative.

## 5.4.6 Economics

The No Action Alternative, Alternative 1, and all options of Alternative 2 assume adoption of the notice and public comment procedures set forth in the FCC's draft rules. Due to the need to provide notice, there would likely be a negligible increase in the cost to comply with NEPA requirements for a typical tower, and thus in the total costs that an applicant would incur to plan, site, and construct a tower.

### No Action Alternative

Under the No Action Alternative, economic impacts would remain the same, other than the negligible increase in cost due to the notice requirement under the FCC's draft procedures. The No Action Alternative would have a short- to long-term minor adverse economic impact on applicants proposing new towers for registration.

Under the No Action Alternative, the existing ASR program would continue and EAs would typically be required only for new towers that have features for which the FCC currently requires an EA. As a result of the notice process, the proportion of new towers requiring EAs is likely to increase slightly, although this could be offset by a decrease in the number of towers constructed. The FCC therefore estimates that

the total number of EAs will be similar to the recent range of 65 to 75 per year. The estimated typical cost of EA preparation for a tower would continue to range from approximately $5,000 to $15,000 depending on the complexity of issues and resources to be addressed. The FCC expects no increase in the time for applicants to complete an EA in the typical case because notice and comment would occur simultaneously with other processes. It is anticipated that the FCC would not require additional staff time to review and process a filed EA (typically 40 to 50 days).

### Alternative 1

Alternative 1 would have a short- to long-term minor adverse economic impact on applicants proposing new towers for registration, similar to that described under the No Action Alternative. Because Alternative 1 would not change the situations for which an EA is required, the number and typical cost of EAs is expected to be the same as under the No Action Alternative.

### Alternative 2 Option A

Alternative 2 Option A would have a short- to long-term moderate adverse economic impact on applicants proposing new towers for registration.

Option A would require an EA for all new towers outside of an antenna farm submitted for registration – regardless of location, height, use of guy wires, or lighting scheme – and for certain replacement towers and changes to existing towers. Additional costs to applicants would result from the increased number of EAs that would be required under Option A. As described in Section 4.2.4, it is conservatively estimated that 2,800 new registered towers would be constructed each year over the next 10 years; under Option A, each of these applications would require preparation of an EA. The estimated typical cost of EA preparation for a tower would continue to range from approximately $5,000 to $15,000 depending on the complexity of issues and resources to be addressed.

Construction of towers may be delayed by the time necessary for the applicant to prepare an EA for each tower and for the FCC to process the filed EAs (typically 40 to 50 days), to the extent these tasks cannot be completed concurrently with other pre-construction activities. The FCC would require substantial additional staff time to review and process an estimated 2,800 EAs a year. To maintain current processing timelines, the FCC would need to reallocate staff from existing duties to review and process EAs or obtain additional funds to hire more staff. If neither of these occurs, there would likely be extensive delays in EA processing times.

### Alternative 2 Option B

Alternative 2 Option B would have a short- to long-term minor adverse economic impact on applicants proposing new towers for registration.

Additional costs to applicants would result from the increased number of EAs that would be required under this option. There may also be costs associated with construction of lattice towers to avoid having to prepare EAs for guyed towers, but few applicants would likely find it technically feasible or cost-effective to make this change merely to avoid completing EAs.

Currently, an estimated 60 percent of registered towers use red steady-burning lights (FCC 2011b), including most towers over 200 feet (61 meters). While the FCC does not currently track the number of towers that employ guy wires, it estimates that roughly 50 percent do so, including most towers over 300 feet (91 meters) and virtually all towers over 450 feet (137 meters). Because there is a substantial overlap among towers that are over 450 feet (137 meters), use red steady-burning lights, and use guy wires, the FCC estimates that roughly 70 percent of registered towers have one or more of these features. This number is reduced to 65 percent for purposes of calculating the number of EAs, under the assumption that some applicants that otherwise would have used red steady-burning lighting schemes will choose white

strobe lighting (if permitted by local regulations), or in rare instances reduce the height of towers to below 450 feet (137 meters) or eliminate the use of guy wires, to avoid having to prepare EAs.

Further, the FCC assumes that roughly 10 percent of registered towers would be in locations where Option B requires an EA for towers that are over 450 feet (137 meters) tall, use red steady-burning lights, or use guy wires – on a ridgeline, in a coastal zone, or in a bird staging area/colonial nesting site. It is assumed that the number of towers constructed within 660 feet (201 meters) of a Bald Eagle nest or 0.6 mile (1 kilometer) of a Golden Eagle nest would be negligible.

It is conservatively estimated that a total of 2,800 new registered towers would be constructed each year over the next 10 years. An estimated 65 to 75 of these towers would require EAs under the No Action Alternative, and would also require EAs under Option B. If the FAA advisory circular is not revised, the FCC estimates that 65 percent of 10 percent of the towers not requiring an EA under the No Action Alternative would require an EA under Option B, or between 160 and 190 towers. Adding the 65 to 75 EAs required under the No Action Alternative to this estimate means that between 225 and 265 EAs would be prepared each year.

If the FAA changes its advisory circular, no EAs would be prepared for towers using red steady lights. Taking into account only towers that are over 450 feet (137 meters) tall or use guy wires, 50 percent of 10 percent of the towers not requiring an EA under the No Action Alternative would require an EA under Option B, or between 125 and 150 towers. Adding the 65 to 75 EAs already required under existing conditions means between 190 and 225 EAs would be prepared each year.

The estimated typical cost of EA preparation for a tower would continue to range from approximately $5,000 to $15,000 depending on the complexity of issues and resources to be addressed. Construction of towers may be delayed by the time necessary for the applicant to prepare an EA and for the FCC to process the filed EA (typically 40 to 50 days), to the extent these tasks cannot be completed concurrently with other pre-construction activities. The FCC would require additional staff time to review and process an estimated 160 to 225 EAs a year. To maintain current processing timelines, the FCC would need to reallocate staff from existing duties to review and process EAs or obtain additional funds to hire more staff. If neither of these occurs, there could be delays in EA processing times.

### Alternative 2 Option C

Alternative 2 Option C would have a short- to long-term minor adverse economic impact on applicants proposing new towers for registration.

Under Option C, proposed towers less than or equal to 450 feet (137 meters) AGL that have features for which the FCC currently requires an EA and all towers over 450 feet (137 meters) AGL would require an EA. Additional costs to applicants would result from the increased number of EAs that would be required under Option C. The FCC anticipates that the number of EAs prepared in recent years for towers less than 450 feet (137 meters) tall would remain the same (65 to 75 EAs). Based on the number of applications for new towers over 450 feet (137 meters) AGL in the past five years, the FCC estimates that approximately 65 new tower applications for towers over 450 feet (137 meters) tall would be submitted to the FCC annually. Altogether, the FCC assumes that under Option C, approximately 130 to 140 EAs would be prepared every year. The estimated typical cost of EA preparation for a tower would continue to range from approximately $5,000 to $15,000 depending on the complexity of issues and resources to be addressed. The FCC expects no increase in the time for applicants to complete an EA in the typical case because notice and comment would occur simultaneously with other processes. The FCC would require additional staff time to review and process approximately 130 to 140 EAs per year. This may result in a minor increase in the time required to process a filed EA (typically 40 to 50 days).

### 5.4.7 Radio Frequency Radiation

No RF impacts on human populations are expected from the No Action Alternative, Alternative 1, and all options of Alternative 2. Under all alternatives, the FCC would require an EA when RF exposure from a tower would exceed either the occupational or general population MPE limits. In practice, licensees and tower owners invariably design their facilities so that the MPE limits will not be exceeded. The FCC expects that this practice will continue under any alternative.

Potential impacts of RF radiation on migratory birds are discussed in Section 5.4.3.3.

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# CHAPTER SIX CUMULATIVE IMPACTS

## 6.1 INTRODUCTION

CEQ defines cumulative effects as the "*impact on the environment, which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions*" (40 CFR 1500). Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (Federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

To identify cumulative effects, the analysis needs to address two fundamental questions:

1. Does a relationship exist such that affected resource areas of a proposed action or alternatives might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
2. If such a relationship exists, then are there any potentially significant impacts not identified when a proposed action is considered alone?

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur, as well as a description of what resources could potentially be cumulatively affected.

When applying the concept of cumulative impacts to a programmatic analysis, some additional consideration must be given to existing uncertainty associated with specific locations that will be selected in the future. Communications towers could be proposed anywhere within the United States including its territories. Therefore, this PEA addresses cumulative impacts qualitatively.

The No Action Alternative, Alternative 1, and all options of Alternative 2 will result in negligible, minor, or moderate adverse impacts to all resources addressed in this PEA, except for migratory birds. Under all alternatives impacts to migratory birds at the national level would be major and adverse. The FCC concludes that the negligible, minor, and moderate impacts of the ASR Program on resources other than migratory birds, when viewed in the context of all impacts on each resource, are not cumulatively significant. Therefore, only migratory birds (including any listed as threatened or endangered) are addressed in detail in terms of potential cumulative impacts. Because of the importance of tower lighting to impacts to migratory birds, this chapter discusses cumulative impacts with and without the potential FAA lighting changes. Only direct impacts (bird mortality due to collisions with communications towers) are addressed in this cumulative analysis. As discussed in Chapter 5, indirect adverse impacts to migratory birds due to site and habitat abandonment are minor, and the evidence is insufficient to support a finding of potentially significant environmental impacts on migratory birds due to RF radiation emissions.

It should be noted that lighting on new towers must conform to the requirements of the current FAA Advisory Circular 70/7460-1K Obstruction Marking and Lighting (USDOT/FAA 2007). The FCC cannot enforce lighting schemes that are not in compliance with this circular. Currently the FAA does not allow lighting configurations that use red flashing lights without also requiring the presence of red steady-burning lights. Pending the results of a conspicuity study, the FAA may consider revisions to the circular under which new communications towers that use red flashing lights would not also have red steady-burning lights.

## 6.2 PAST, PRESENT, AND REASONABLY FORESEEABLE PROJECTS AND ACTIONS CONSIDERED

Communications towers comprise part of the built environment that causes impacts to birds. The projects and actions considered as part of the cumulative impact analysis include:

- Existing communications towers
  - ✓ Those registered in the ASR Program
  - ✓ Those not required to be registered in the ASR Program (including towers used solely by federal agencies)
- Reasonably foreseeable future communications tower construction
- Other sources of avian mortality and conditions that affect birds
  - ✓ Collisions with buildings, windows, and wind turbines
  - ✓ Collisions with power lines
  - ✓ Collisions with motor vehicles
  - ✓ Predation by cats
  - ✓ Global warming/climate change

## 6.3 GEOGRAPHIC EXTENT AND TIME FRAME

The geographic extent of the cumulative impact analysis includes the area under the jurisdiction of the ASR program – the United States and its territories. Since the cumulative impact analysis includes other recent past, present, and reasonably foreseeable future actions, the FCC has set a timeframe for the cumulative analysis. This analysis includes past actions from 1995 when the ASR Program was established and future projects until the year 2021.

## 6.4 CUMULATIVE IMPACTS TO MIGRATORY BIRDS

There are numerous anthropogenic and natural sources of mortality to migratory birds. The sections below first review the expected direct impacts on migratory birds from existing towers and new registered towers under each of the program Alternatives, then describe the direct impacts on migratory birds from climate change and other activities that cause bird mortality. The final section summarizes the overall cumulative impacts on migratory birds from all of these actions and sources.

Direct adverse impacts to migratory birds occur when birds collide with the tower structure, supporting guy wires, or each other. High avian mortality at towers is usually episodic and typically occurs under inclement weather conditions during the spring and fall migration seasons when steady-burning lights attract birds to a tower.

### 6.4.1 Impacts from Existing Towers

As of June 28, 2011, there were 85,261 communications towers nationwide, including in the five U.S. territories, registered under the existing ASR Program (FCC 2011b). Avian mortality from collisions with existing communications towers is conservatively estimated at approximately 5 million birds annually (Manville 2001, Gehring et al. 2011 in press, Longcore et al. 2011a in preparation). Data do not exist to distinguish the number of birds killed at registered towers from those killed at towers that do not require registration. However, because towers used by FCC licensees that do not require registration are less than 200 feet (61 meters) in height and there are relatively few towers used solely by federal agencies, it is reasonable to assume that substantially all of the 5 million bird deaths occur at registered towers.

Migratory songbirds comprise approximately 95 percent of the avian mortality at communications towers. Total population estimates for migratory birds range from approximately 10 to 20 billion (USFWS 2002b), with songbirds comprising more than 50 percent of the species represented (Blancher et al. 2007). Conservatively assuming a total migratory bird population of 10 billion birds, communications tower collisions currently cause no more than 0.05 percent annual mortality to the total migratory bird population.

Under Alternative 1, if the FAA permits them to do so, owners of existing towers with red steady-burning lights would have an incentive to change to lighting styles without red steady-burning lights, both to reduce their costs for electricity and replacing lighting equipment and to reduce the effects of their towers on migratory birds. Assuming that the owners of 50 percent of registered towers with red steady-burning lights extinguish those lights or change them to red flashing lights (and that these towers are evenly distributed across tower heights), this would reduce bird mortality from existing towers by an estimated 25 to 35 percent. Therefore, under Alternative 1, future avian mortality from existing towers is estimated to be between 3.2 million and 3.8 million birds per year. A similar reduction would occur under all options of Alternative 2 if the FAA revises its lighting circular.

### 6.4.2 Impacts from New Registered Towers

As described in Section 5.3.2, it is assumed that the number of towers to be constructed over the next 10 years under Alternative 1 and all options of Alternative 2 will be similar to the number of new towers under the No Action Alternative. Under the existing ASR Program and FAA lighting circular that currently requires steady-burning lights whenever red flashing lights are used, migratory bird mortality levels at new towers would be expected to be proportional to mortality from existing towers. Approximately 2,800 new registered communications towers are conservatively projected to be constructed annually over the next 10 years. These 28,000 towers represent an approximate 33 percent increase over the 85,261 registered communications towers in the existing environment as of June 28, 2011 (FCC 2011b). Based on the estimated current annual avian mortality of 5 million birds, by the year 2021 the annual avian mortality from new and existing towers would reach 6.6 million under the No Action Alternative.

Under Alternative 1, it is assumed that the FAA will revise its lighting circular so that new towers with red flashing lights will not also use red steady lights. This change would result in a 50 to 70 percent reduction in avian mortality from new towers (Gehring et al. 2009) compared to the No Action Alternative.

As described in Section 5.4.3.3, even if the FAA does not revise its advisory circular, Alternative 2 (all options) would also be expected to reduce the amount of avian mortality from new towers when compared to future conditions under the No Action Alternative, although to a much lesser degree than Alternative 1. Because some or all proposed tower registrations would go through a more rigorous environmental review under all options of Alternative 2, it is expected that some tower owners would consider location or design changes to their proposed towers so that the tower would be categorically excluded from preparation of an EA (under Options B and C), and that the implementation of mitigation measures would reduce effects on migratory birds at towers that cannot be categorically excluded so that a FONSI can be issued (under all options). However, the ability to implement measures that would reduce the direct effects of towers on migratory birds would likely be limited. If the FAA revises its advisory circular so that future towers do not use red steady lights, the reduction in avian mortality from new towers under all options of Alternative 2 would be in addition to the 50 to 70 percent reduction expected under Alternative 1.

### 6.4.3 Effects from Climate Change

Climate change works over a longer timeframe than is covered by the analysis in this PEA but its effects on migratory birds are relevant to a cumulative effects analysis. For example, warmer winters in recent decades have played an important role in shifting winter bird ranges to the north (North American Bird Conservation Initiative 2010). Christmas Bird Count data from the mid-1960s through 2006 show that 170 (56 percent) of the 305 most widespread, regularly occurring species have shifted their ranges to the north, whereas only 71 species (23 percent) have shifted their ranges to the south and 64 species (21 percent) have not shifted their ranges significantly north or south.

The North American Bird Conservation Initiative, U.S. Committee (2010) reported that climate change may interact with and intensify many of the existing stressors on birds. Birds and habitats that are already adversely affected may be highly vulnerable to additional impacts due to climate change.

### 6.4.4 Impacts from Other Sources

As discussed in Section 4.6.3.11, 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 and described the various avian mortality sources and estimated that 500 million to possibly over 1 billion birds are killed annually. They assumed that cat predation accounted for approximately 100 million bird deaths a year and that buildings and windows caused approximately 550 million annual deaths. More recent studies estimate that free-ranging domestic cats and building glass may each kill at least 1 billion birds annually (Dauphiné and Cooper 2009, Klem et al. 2009). Combining these studies, total annual mortality from anthropogenic sources and cat predation exceeds 2 billion birds per year.

Cat predation and avian collisions with buildings and power lines appear to cause the bulk (> 80 percent) of annual avian mortality. Table 6 in Section 4.6.3.11 summarizes the mortality estimates from several sources. 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.

As shown in Figure 15, communications towers contribute a relatively small percentage (0.2 percent) of annual avian mortality when compared to other anthropogenic sources and predation by cats. Under the No Action Alternative, migratory bird mortality levels at towers would be expected to increase in proportion to the number of towers being built. It is anticipated that avian mortality from other anthropogenic sources will also increase in the future as more buildings are constructed, more automobiles and planes are in use, and more transmission lines and wind turbines are constructed. Therefore, the proportion of bird mortality that is from communications towers, as compared to other anthropogenic sources and predation by cats, is expected to remain relatively constant at about 0.2% under the No Action Alternative. This proportion is expected to decrease to at least some extent under Alternative 1 or any option of Alternative 2 because there would be fewer bird deaths at communications towers.

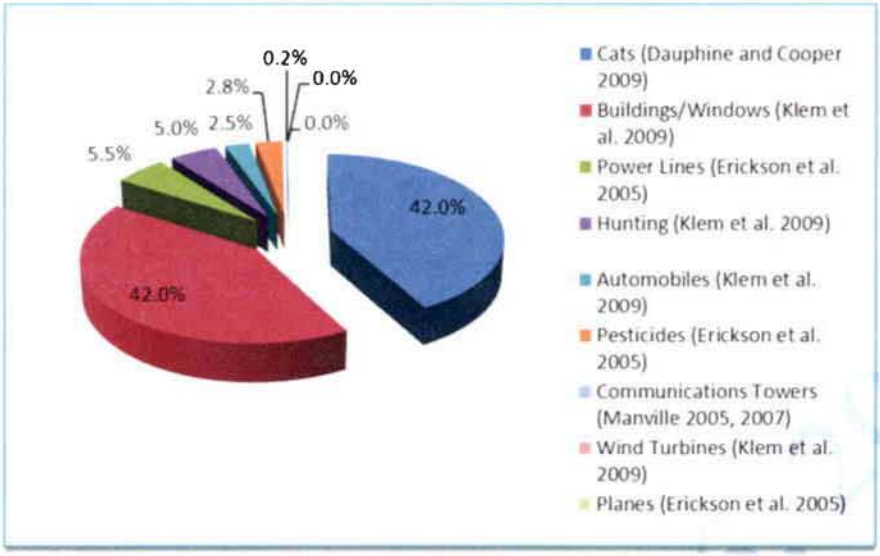


**Figure 15: Summary of Annual Avian Mortality by Source**

Note: Figure 15 is based on the following mortality estimates:

| | |
|---|---|
| Cats (Dauphiné and Cooper 2009) | 1,000,000,000 |
| Buildings/Windows (Klem et al. 2009) | 1,000,000,000 |
| Power Lines (Erickson et al. 2005) | 130,000,000 |
| Hunting (Klem et al. 2009) | 120,000,000 |
| Automobiles (Klem et al. 2009) | 60,000,000 |
| Pesticides (Erickson et al. 2005) | 67,000,000 |
| Communications Towers (Manville 2005, 2007) | 5,000,000 |
| Wind Turbines (Klem et al. 2009) | 400,000 |
| Planes (Erickson et al. 2005) | 25,000 |
| **TOTAL** | **2,382,425,000** |

## 6.5 SUMMARY

Migratory birds experience cumulative adverse impacts from a variety of sources including communications towers registered under the existing ASR Program, cat predation, and collisions with buildings and power lines. Migratory birds are also affected by climate change that is causing shifts in the ranges of some species and changing habitat conditions.

Chapter 7 of this PEA contains findings regarding the significance of the incremental impact of the ASR program when added to other sources of avian mortality. While communications towers contribute to the overall adverse cumulative impacts on bird populations, communications tower collisions annually kill approximately 0.05 percent of the total migratory bird population (5 million out of 10 billion). Furthermore, communications tower collisions are responsible for approximately 0.2 percent of the more than 2 billion annual bird deaths due to cat predation and anthropogenic sources. Although the absolute number of birds killed at communications towers is large, towers are a relatively minor contributor to total avian mortality. Moreover, when compared to the total migratory bird population, the number of deaths caused by collisions with communications towers is small.

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# CHAPTER SEVEN FINDINGS

## 7.1 OVERVIEW

Communications towers exist throughout the United States and territories and will continue to be constructed as they provide a range of public benefits and fulfill a variety of societal needs.

Environmental impacts from towers are dependent on a variety of factors including location, height, structural support system (self-supported or guyed), and lighting scheme (flashing or steady-burning). The principal adverse impact of communications towers is on birds, especially migratory birds, and tower lighting is the primary contributor to bird mortality from towers. Based on a review of the available peer-reviewed literature and the analysis contained in this PEA, the relative severity of impacts on birds is as follows:

- All other factors being equal, taller towers result in higher levels of avian mortality than shorter towers.
- All other factors being equal, towers with guy wires result in higher levels of avian mortality than towers without guy wires.
- All other factors being equal, steady-burning lights on towers result in higher levels of avian mortality than flashing lights.

These factors, as well as other potential impacts, were taken into consideration during the identification and development of alternatives considered in this PEA.

Alternatives evaluated during this PEA process include the No Action Alternative, Alternative 1, and three variations of Alternative 2 (Options A, B, and C). Under the No Action Alternative, the existing ASR Program would continue with the existing FAA-permitted lighting configurations. Alternative 1 would continue the existing ASR Program but assumes that the FAA will change its permitted lighting configurations. Alternative 2 consists of modifications to the ASR Program, with three options proposing different revisions to the NEPA compliance procedures to improve how the potential environmental impacts of proposed communications towers, especially impacts on migratory birds, are evaluated and documented. Because of the importance of tower lighting on migratory birds, this chapter presents a discussion of the options of Alternative 2 evaluated with and without the potential FAA lighting changes.

As described at the beginning of Chapter 5, the significance of an impact must be analyzed in several contexts and will vary with the setting of the action. Both short- and long-term effects are relevant. Once the intensity of 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, which requires considerations of both context and intensity.

As further described in Chapter 5, this PEA primarily considers the environmental effects of the ASR Program at the national level. In addition, the PEA addresses the degree to which the FCC's environmental process ensures that more localized potentially significant environmental effects will be identified and considered at each individual site. As discussed in Chapters 4 and 5, 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 in geographically diverse areas and previously disturbed and undisturbed sites. Because of the wide variety of natural and manmade environments and the complexity of resources that may be affected, it is not possible to provide a detailed comprehensive description of resource impacts at individual sites in this PEA. Existing resources and impacts are instead characterized in general terms and those resources that may require additional site-specific analysis are identified.

As discussed in Chapter 5, under all alternatives the environmental impacts of the ASR Program at the national level on resources other than migratory birds are negligible, minor, or moderate. Taking into

consideration the context and intensity of each of these impacts, the FCC finds that none of them rises to the level of significance. Furthermore, the existing ASR Program and all program alternatives require EAs for towers that: would be located in an officially designated wilderness area or wildlife preserve; may affect listed T&E species or designated critical habitat, or are likely to jeopardize the existence of proposed T&E species or result in destruction or adverse modification of proposed critical habitat; may affect resources listed or eligible for listing in the NRHP or Native American religious and cultural sites; would be located in a floodplain; would involve significant changes in surface features; would be equipped with high intensity white lights and located in a residentially zoned neighborhood; or would cause human exposure to levels of radiofrequency radiation in excess of limits in 47 CFR §§ 1.1310 and 2.1093. This requirement ensures that potentially significant local effects on environmental resources other than migratory birds will be identified and considered. Accordingly, the remainder of Chapter 7 will discuss primarily impacts on migratory birds.

## 7.2 CONSEQUENCES OF THE NO ACTION ALTERNATIVE

The No Action Alternative is defined as continuation of the existing ASR Program and NEPA compliance procedures, including the public notice and 30-day public comment requirement of the FCC's draft procedures, and under the existing FAA-permitted lighting configurations.

The No Action Alternative would have no significant adverse environmental impacts at the national level to resources described in Chapter 4, including migratory birds. Major adverse impacts on migratory birds due to construction in areas of heavy migration use (coastal zones, ridgelines, bird staging areas/colonial nesting sites, riparian zones) would continue. Avian mortality would be expected to increase in proportion to the number and types of new towers that are constructed. Current annual avian mortality from existing communications towers is estimated at approximately 5 million birds, the majority of which are migratory birds. Assuming that approximately 2,800 new towers would be constructed annually under the existing ASR Program, avian mortality would increase to an estimated 6.6 million birds by the year 2021 as a result of collisions with communications towers. While this number is large and constitutes a major impact, it is only 0.05 percent of the overall U.S. bird population, which is estimated at 10 billion birds. Furthermore, when evaluated in context with other sources of avian mortality as described in Sections 4.6.3.11 and 6.4.4, towers cause approximately 0.2 percent of annual avian mortality. Thus, in the national context of overall migratory bird abundance and other, greater forces to which migratory birds are subject, the relative impact of communications towers is small. In addition, the available scientific information does not support a finding that tower collisions may have a significant impact on any particular species. Therefore, the impact to migratory birds at the national level from the No Action Alternative is not significant.

In a local context, site-specific EAs are required when existing ASR program criteria are triggered. Migratory bird habitat features (ridgelines, coastal zones, and bird staging areas or colonial nesting sites) and tower features (height, lighting scheme, and guy wires) which are hazardous to migratory birds, as well as proximity to Bald and Golden Eagle nests, are not routinely considered under the current program in determining whether an EA is required. Therefore, there may be instances of significant impacts to a local population of migratory birds or individual Bald and Golden Eagle nests from a proposed tower that would not be addressed.

## 7.3 CONSEQUENCES OF ALTERNATIVE 1

Under Alternative 1, continuation of the existing ASR Program with revisions to the FAA lighting circular, there would be no significant adverse environmental impacts at the national level to resources described in Chapter 4, including migratory birds. Major adverse impacts to migratory birds would continue and avian mortality due to bird collisions with communications towers would increase in proportion to the number and types of new towers that are constructed. However, the increase in avian

mortality due to new tower construction would be greatly reduced by the FAA lighting circular revisions. Under these revisions, future towers that use red flashing lights would not also have steady-burning lights. A tower without red steady-burning lights is estimated to result in 50 to 70 percent less avian mortality than if it uses red steady-burning lights (Gehring et al. 2009). Therefore, bird mortality would decrease under this alternative when compared to future conditions under the No Action Alternative. In addition, tower owners may voluntarily change (or extinguish) red steady-burning lights on existing towers and use flashing lights exclusively, thereby further reducing migratory bird mortality. Therefore, under Alternative 1, the impact to migratory birds at the national level is not significant.

As is the case with the No Action Alternative, site-specific NEPA documents would be required under Alternative 1 when existing ASR program criteria are triggered. Migratory bird habitat features (ridgelines, coastal zones, and bird staging areas or colonial nesting sites) and tower features (height, lighting scheme, and guy wires) which are hazardous to migratory birds, as well as proximity to Bald and Golden Eagle nests, are not routinely considered under the current program in determining whether an EA is required. Therefore, there may be instances of significant impacts to a local population of migratory birds or individual Bald and Golden Eagles from a proposed tower that would not be addressed.

## 7.4 CONSEQUENCES OF ALTERNATIVE 2 OPTION A

Alternative 2 Option A would require an EA for all new towers outside of an antenna farm submitted for registration – regardless of location, height, use of guy wires, or lighting scheme – and for certain structural and lighting changes to existing towers. Because virtually all new proposed tower construction would require an EA, economic impacts on applicants would be adverse and moderate, due to increased EA preparation costs and extended project schedules.

Under Option A, there would be no significant adverse environmental impacts at the national level to resources described in Chapter 4, including migratory birds. Major adverse impacts to migratory birds would continue and avian mortality would be expected to increase in proportion to the number and types of towers that are constructed.

With no revisions to the FAA lighting circular, potential impacts to migratory birds would be reduced to a limited extent when compared with the No Action Alternative because of mitigation measures that would result from the EA process. Therefore, under Option A without revisions to the lighting circular the impact to migratory birds is not significant at the national level for the same reasons as discussed under the No Action Alternative.

Under Option A with potential revisions to the FAA lighting circular, as under Alternative 1, the increase in avian mortality due to new tower construction would be greatly reduced because future towers that use red flashing lights would not also have red steady-burning lights. A tower without red steady-burning lights is estimated to cause 50 to 70 percent less avian mortality than if it uses red steady-burning lights (Gehring et al. 2009). In addition, tower owners may voluntarily change (or extinguish) red steady-burning lights on existing towers and use flashing lights exclusively, thereby further reducing migratory bird mortality. Potential impacts to migratory birds would be further reduced to a limited extent when compared with Alternative 1 because of mitigation measures that would result from the EA process. Therefore, under Option A, with revisions to the FAA lighting circular, the impact to migratory birds is not significant at the national level.

With or without revisions to the FAA lighting circular, under Option A the preparation of site-specific EAs for all new tower construction would include an evaluation of potential impacts to migratory birds, including individual species of migratory birds to the extent that species-specific information exists. The EA would also include an evaluation of potential impacts to Bald and Golden Eagles. This evaluation would ensure that potentially significant environmental impacts from an individual tower on migratory birds would be addressed at the local level.

## 7.5 CONSEQUENCES OF ALTERNATIVE 2 OPTION B

Under Alternative 2 Option B, a proposed new tower would require preparation of an EA only under certain combinations of location and structural and lighting features. Any proposed new registered tower that requires an EA under the existing rules or that is located within 660 feet (201 meters) of a Bald Eagle nest or 0.6 mile (1 kilometer) of a Golden Eagle nest would require an EA. Other locational features for which a project may require an EA would include ridgelines, coastal zones, and bird staging areas or colonial nesting sites. If any of those locational features are present, and a tower would be more than 450 feet (137 meters) tall, would use a red steady-burning lighting scheme, or would use guy wires, an EA would be required. In addition, the FCC would expect the EA for any proposed tower in a wetland or floodplain to include a detailed analysis of the effects on migratory birds if the tower location is in a riparian zone. Due to the additional tower construction projects that would require an EA, economic impacts on applicants arising from EA preparation costs and extended project schedules would be adverse and minor.

Under Alternative 2 Option B, there would be no significant adverse environmental impacts at the national level to resources described in Chapter 4, including migratory birds. Major adverse impacts to migratory birds would continue and avian mortality would be expected to increase in proportion to the number and types of towers that are constructed.

Without revisions to the FAA lighting circular, impacts to migratory birds would be reduced slightly compared to the No Action Alternative, to an extent at least comparable to Option A. Under Option B, applicants would have an incentive to avoid siting towers that are over 450 feet (137 meters) tall, use red steady-burning lights, or use guy wires on ridgelines, in coastal zones, in bird staging areas and colonial nesting sites, and in riparian zones within wetlands and floodplains. Therefore, towers with the features that pose the greatest hazards to migratory birds would be less likely to be constructed in the locations where migratory birds are most prevalent. Applicants would also likely attempt to avoid constructing any towers near Bald and Golden Eagle nests. Potential impacts to migratory birds and Bald and Golden Eagles may be reduced when compared with the No Action Alternative because of mitigation measures that would result from the EA process. Therefore, under Option B without revisions to the FAA lighting circular the impact to migratory birds is not significant at the national level.

With potential revisions to the FAA lighting circular, as under Alternative 1, impacts to migratory birds would be greatly reduced compared to the No Action Alternative because future towers that use red flashing lights would not also have steady-burning lights. A tower without red steady-burning lights is estimated to cause 50 to 70 percent less avian mortality than if it uses red steady-burning lights. Tower owners may also voluntarily change (or extinguish) steady-burning lights on existing towers and use flashing lights exclusively, thereby further reducing migratory bird mortality. Avian mortality would be further slightly reduced because the FCC anticipates that applicants would likely attempt to avoid constructing towers that are taller than 450 feet (137 meters) tall or use guy wires in areas important to migratory birds, and to avoid constructing any towers near Bald and Golden Eagle nests. Overall, migratory bird mortality would be less than under Alternative 1 and comparable to Option A with revisions to the FAA lighting circular. Therefore, under Option B with revisions to the FAA lighting circular the impact to migratory birds is not significant at the national level.

Under Option B, with or without revisions to the FAA lighting circular, EAs would be required for towers with the features that contribute the most to migratory bird deaths if they are located in the areas where migratory birds are most prevalent. These EAs would include an evaluation of potential impacts to individual species of migratory birds to the extent that species-specific information exists. In addition, EAs would be required for all towers in proximity to Bald and Golden Eagle nests. These requirements would ensure that potentially significant environmental effects on migratory birds at the local level would be addressed.

## 7.6 CONSEQUENCES OF ALTERNATIVE 2 OPTION C

Under Alternative 2 Option C, in addition to those towers for which an EA is required under the existing FCC rules, an EA would be required for any proposed new tower, or replacement or modification of an existing tower that involves a substantial increase in size, that is more than 450 feet (137 meters) tall, regardless of location, lighting scheme, or use of guy wires. Towers less than or equal to 450 feet (137 meters) would be categorically excluded unless they have features requiring an EA under existing rules.

Under Alternative 2 Option C, there would be no significant adverse environmental impacts at the national level to resources described in Chapter 4, including migratory birds. Major adverse impacts to migratory birds would continue and avian mortality would be expected to increase in proportion to the number and types of towers that are constructed.

Without revisions to the FAA lighting circular, avian mortality would be reduced compared to the No Action Alternative because applicants would have an incentive to avoid constructing towers over 450 feet (137 meters) tall to the extent practicable. However, in many instances it is unlikely, particularly for broadcast towers, that such a tower could be reduced appreciably in height and still be able to meet service coverage requirements. Because Options A and B would require EAs for more towers that may affect migratory birds, Option C would not reduce potential impacts to migratory birds as much as those two options. However, potential impacts to migratory birds may be reduced when compared with the No Action Alternative because of mitigation measures that would come out of the EA process for towers more than 450 feet (137 meters) tall. Therefore, the impact to migratory birds is not significant at the national level for the same reasons as discussed under the No Action Alternative.

Under Option C, with the potential revisions to the FAA lighting circular, as under Alternative 1, impacts to migratory birds would be greatly reduced compared to the No Action Alternative because future towers that use red flashing lights would not also have steady-burning lights. A tower without red steady-burning lights is estimated to cause 50 to 70 percent less avian mortality than if it uses red steady-burning lights. In addition, tower owners may voluntarily change (or extinguish) steady-burning lights on existing towers and use flashing lights exclusively, thereby further reducing migratory bird mortality. Avian mortality would be further slightly reduced because applicants would have an incentive to avoid constructing towers over 450 feet (137 meters) tall where feasible, and because of mitigation measures that may come out of the EA process for towers more than 450 feet (137 meters) tall. Overall, the reduction in migratory bird deaths would be more than under Alternative 1, but less than under Option A or Option B with revisions to the FAA circular.

With or without revisions to the FAA circular, site-specific NEPA documents would be required under Option C when existing ASR program criteria are triggered or when a proposed tower would be more than 450 feet (137 meters) tall. Except for tower height, migratory bird habitat features (ridgelines, coastal zones, and bird staging areas or colonial nesting sites) and tower features (lighting scheme and guy wires), which are hazardous to migratory birds as well as proximity to Bald and Golden Eagle nests, would not be routinely considered under Option C in determining whether an EA is required. Therefore, there may be instances of significant impacts to a local population of migratory birds or individual Bald and Golden Eagle nests from proposed tower that would not be addressed.

## 7.7 CUMULATIVE IMPACTS

From a cumulative impacts perspective, under the No Action Alternative, Alternative 1, or any option of Alternative 2, towers regulated under the ASR Program will continue to cause migratory bird deaths. Migratory bird deaths due to collisions with communications towers are currently estimated at 5 million per year, and depending on the alternative chosen, this number is expected to be between 3.7 million and 6.6 million in 2021. If the FAA does not change its lighting circular, under all alternatives there will be an incremental increase in avian mortality over existing conditions. If the FAA revises its lighting

circular, there may be an increase or a decrease in avian mortality depending on the extent to which tower owners voluntarily change (or extinguish) steady-burning lights on existing towers and use flashing lights exclusively.

In assessing cumulative impacts on a resource, the incremental impacts of the action in question are considered together with the impacts of other past, present, and reasonably foreseeable future actions. Anthropogenic sources and cat predation together annually kill a relatively large percentage of the U.S. migratory bird population (more than 2 billion out of 10 to 20 billion), and an increase in this mortality could therefore be significant. However, the estimated 5 million annual bird deaths caused by communications towers constitute only approximately 0.2 percent of these total bird deaths and approximately 0.05 percent of the migratory bird population. This small incremental contribution to the cumulative impacts of all actions on migratory birds is not significant.

## 7.8 SUMMARY

The impacts of the ASR Program at the national level on all resources, including migratory birds, are not significant.

The best available and most currently cited estimate of avian mortality, primarily to migratory birds, from collisions with communications towers is 5 million birds annually. Tall towers, steady-burning lights, and guy wires are the primary tower characteristics contributing to avian mortality.

Migratory bird mortality from all sources would be expected to increase in the future, with an anticipated increase in the number of vertical structures in the environment as well as continuing impacts from other actions and factors. The construction of new communications towers would contribute incrementally to this future increase in mortality, regardless of whether FAA lighting changes are implemented.

The Commission recognizes that the potential changes to the FAA lighting circular would have the greatest beneficial effect and be the critical element in reducing impacts to migratory birds under any of the alternatives. Under Alternative 1 (which assumes FAA lighting changes will occur) and any of the options under Alternative 2 (if FAA lighting changes occur), the incremental increase in migratory bird mortality from new towers approved under the ASR Program would be substantially reduced due to the use on future towers of red flashing lights exclusively without red steady-burning lights. Studies indicate that the use of flashing lights on towers may reduce bird mortality at towers by 50 to 70 percent (Gehring et al. 2009). In addition, voluntary lighting changes on existing towers from steady-burning to flashing lights would further reduce migratory bird impacts and may possibly reduce the total number of bird deaths from registered towers below current levels.

The Commission acknowledges that the estimated bird mortality as a result of collisions with towers approved under its ASR Program is a large number. However, the anticipated annual bird mortality from existing and future communications towers under any alternative is not significant at the national level, whether considered as a separate, direct impact or as part of a cumulative analysis.

At the site-specific level, under Options A and B of Alternative 2, the requirements to prepare EAs for individual towers would ensure that potentially significant effects on local migratory bird and Bald and Golden Eagle populations would be considered. Under the No Action Alternative, Alternative 1, and Option C of Alternative 2, significant impacts on local migratory bird and Bald and Golden Eagle populations may not be addressed.

# CHAPTER EIGHT MITIGATION

## 8.1 OVERVIEW

Under the No Action Alternative, Alternative 1, and all options of Alternative 2, the FCC would ensure mitigation of environmental effects of individual towers through the preparation and review of EAs. The FCC is also engaged in programmatic consultation with the USFWS to consider potential further measures to protect T&E species. The FCC encourages tower owners and applicants to consider additional measures that may further mitigate any environmental effects.

## 8.2 MITIGATION ARISING FROM THE EA PROCESS FOR INDIVIDUAL TOWERS

Under the No Action Alternative, Alternative 1, and all options of Alternative 2, EAs would be required where certain conditions are met. The EA preparation and review (and any subsequent EIS, where necessary) would include consideration of measures to avoid or mitigate environmental effects that may result from these conditions. The following conditions would require an EA under the No Action Alternative, Alternative 1, and all options of Alternative 2:

- The tower would be located in an officially designated wilderness area or wildlife preserve;
- The tower may affect listed T&E species or designated critical habitat, or is likely to jeopardize the continued existence of proposed T&E species or result in destruction or adverse modification of proposed critical habitat. The FCC requires consultation with the USFWS where there is a potential for such an impact;
- The tower may affect resources listed or eligible for listing in the NRHP. The Nationwide Programmatic Agreement (NPA) sets forth a specific process for considering such effects, including review by the SHPO/THPO, and requires an MOA setting forth mitigation where there would be an adverse effect on historic properties;
- The tower may affect an Indian religious site. The NPA sets forth specific procedures for inviting the participation of federally recognized Indian Tribes and Native Hawaiian organizations. The FCC encourages use of its Tower Construction Notification System to fulfill these requirements;
- The tower would be located in a floodplain;
- The tower would involve significant changes in surface features (e.g., wetland fill, deforestation, or water diversion);
- The tower would be equipped with high intensity white lights and located in a residentially zoned neighborhood; or
- The facility would cause human exposure to levels of RF radiation in excess of the FCC's guidelines.

Under all options of Alternative 2, EAs also would be required in additional circumstances, which would ensure consideration of measures to avoid or mitigate any effects of these towers on migratory birds, including Bald and Golden Eagles. Through review of the EAs, the FCC would ensure consultation with the USFWS in appropriate cases.

Under Option A of Alternative 2, EAs would be required for all new towers and for replacements and modifications of towers that involve a substantial increase in size. This process would afford an opportunity to consider measures to avoid or mitigate any environmental effects.

Under Option B of Alternative 2, EAs would also be required for new towers, and for replacements and modifications of towers that involve a substantial increase in size, under the following circumstances:

- The tower would use guy wires, would be equipped with red steady-burning lights, or would be over 450 feet (137 meters) in height **AND** would be located in a coastal zone, ridgeline, bird staging area, or colonial nesting site; or
- The tower would be located within 660 feet (201 meters) of a Bald Eagle nest or within 0.6 mile (1 kilometer) of a Golden Eagle nest.

In addition, an EA prepared for a tower that is over 450 feet (137 meters) in height, uses red steady-burning lights, or uses guy wires and is located in a riparian zone within a wetland or floodplain would be expected to include a detailed analysis of the tower's effects on migratory birds. This process would ensure consideration of measures to mitigate any environmental effects caused by these conditions, especially effects on migratory birds.

Under Option C of Alternative 2, EAs would also be required for new towers, and for replacements and modifications of towers that involve a substantial increase in size, where the tower would be greater than 450 feet (137 meters) in height.

## 8.3 ADDITIONAL MITIGATING MEASURE BY THE FCC

The FCC has recently entered into programmatic consultation with the 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 the USFWS and the FCC at a less aggregated regional or local scale.

## 8.4 ADDITIONAL RECOMMENDATIONS FOR APPLICANTS

The FCC encourages tower owners and applicants to consider the following measures:

- Eliminate red steady-burning lights on existing towers where permitted by the FAA if lighting circular is revised.
- Where feasible, collocate antenna(s) on existing towers or other structures in place of new tower construction.
- Where feasible, site new towers within an existing antenna farm.
- Minimize tower height and tower foundation footprint to the extent feasible consistent with coverage and structural safety requirements, taking into account that greater tower height may facilitate additional collocations.
- Construct self-supported structures, rather than those that require guy wires, to the extent technically and economically feasible, taking into account that in some situations self-supported structures may have greater visual impacts on cultural or other visual resources.
- Where feasible, avoid siting new towers in avian high use areas, including coastal zones, ridgelines, bird staging areas, colonial nesting sites, and riparian zones.
- Where feasible, protect a minimum 2-mile (3.2-kilometer) radius of sagebrush around known leks for grouse and prairie-chickens.
- Select new tower sites in areas with existing visual clutter where feasible and use vegetative screening to reduce visual impacts.

- Use standard best management practices for sediment erosion control to minimize impacts to downstream surface waters and wetlands.
- Use standard best management practices to prevent or minimize the establishment and spread of non-native invasive species.
- During construction, keep fuel-burning equipment running times to a minimum and properly maintain engines.
- Perform construction activities during day-time business hours.
- Minimize and down-shield security lighting for on-ground facilities and equipment to avoid attracting night-migrating birds.
- Decommission and remove obsolete or unused towers.
- Support research on the effects of towers on birds and other wildlife, including potential RF radiation effects.

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# CHAPTER TEN REFERENCES


Aronoff, A. 1949. The September migration tragedy. Linnaean News-Letter 3(1):2

Avatar Environmental, LLC, EDM International, Inc., and Pandion Systems, Inc. 2004. Notice of Inquiry Comment Review Avian/Communication Tower Collisions. Prepared for Federal Communications Commission. September 30. 223 pp.

Avery, M., P.F. Springer, and J.F. Cassel. 1976. The effects of a tall tower on nocturnal bird migration – a portable ceilometer study. The Auk 93:281-291.

Avery, M., P.F. Springer, and J. F. Cassel. 1977. Weather influences on nocturnal bird mortality at a North Dakota tower. Wilson Bulletin 89:291–299.

Avery, M.L., P.F. Springer, and J. F. Cassel. 1978. The composition and season variation of bird losses at a tall tower in southeastern North Dakota. American Birds 32:1114-1121.

Avery, M.L., P.F. Springer, and N.S. Dailey. 1980. Avian mortality at man-made structures: an annotated bibliography. USFWS, FWS/OBS-80/54. Washington, DC. 152 pp.

Ball, L.G., K. Zyskowski, and G. Escalona-Segura. 1995. Recent bird mortality at a Topeka television tower. Kansas Ornithological Society Bulletin 46(4):33-36.

Balmori, A. 2005. Possible effects of electromagnetic fields from phone masts on a population of White Stork (*Ciconia ciconia*). Electromagnetic Biology and Medicine 24:109-119.

Balmori, A. 2009. Electromagnetic pollution from phone masts. Pathophysiology 16:191-199.

Balmori, A. and O. Hallberg. 2007. The urban decline of the House Sparrow (*Passer domesticus*): a possible link with electromagnetic radiation. Electromagnetic Biology and Medicine 26:141-151.

Bierly, M.L. 1968. Television tower casualties at Birmingham Alabama. Alabama Birdlife 16:34-35.

Blancher, P.J., K.V. Rosenberg, A.O. Panjabi, B. Altman, J. Bart, C.J. Beardmore, G.S. Butcher, D. Demarest, R. Dettmers, E.H. Dunn, W. Easton, W.C. Hunter, E.E. Iñigo-Elias, D.N. Pashley, C.J. Ralph, T.D. Rich, C.M. Rustay, J.M. Ruth, and T.C. Will. 2007. *Guide to the Partners in Flight Population Estimates Database*. Version: North American Landbird Conservation Plan 2004. Partners in Flight Technical Series No 5.

Brain, M. 2002. *How the Radio Spectrum Works* and *How Cell Phones Work,* http://www.howstuffworks.com/radio-spectrum1.htm and http://www.howstuffworks.com/cell-phone.htm. July.

Caldwell, L. D. and G. J. Wallace. 1966. Collections of migrating birds at Michigan television towers. Jack-Pine Warbler 44:117-123.

Cochran, W.W. 1959. Attraction of nocturnal migrants by lights on a television tower. The Wilson Bulletin 70(4):378-380.

Cochran, W.W. and R.R. Graber. 1958. Attraction of nocturnal migrants by lights on a television tower. Wilson Bulletin 70:378-380.

Collins, D.P. 2010. *2010 Pacific Flyway Data Book*. September 28.

Crawford, R.L. and R.T. Engstrom. 2000. Lights, towers, and avian mortality: where is the science? 2 pp. *in* W.R. Evans and A.M. Manville, II (editors). Transcripts of the proceedings of the workshop on avian mortality at communication towers. August 11, 1999, Cornell University, Ithaca, NY.

Crawford, R.L., and R.T. Engstrom. 2001. Characteristics of avian mortality at a north Florida television tower: a 29-year study. Journal of Field Ornithology 72:380-388.

Dauphiné, N. and R.J. Cooper. 2009. Impacts of free-ranging domestic cats (*Felis catus*) on birds in the United States: a review of recent research with conservation and management recommendations. Pages 205-219 *in* Proceedings 4th International Partners in Flight Conference, February 2008, McAllen, TX. C.J. Ralph and T.D. Rich, eds.

DiCarlo, A., N. White, F. Guo, P. Garrett, and T. Litovitz. 2002. Chronic electromagnetic field exposure decreases HSP70 levels and lower cytoprotection. Journal of Cellular Biochemistry 84:447-454.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook*. Simon and Shuster, New York. 785 pp.

Erickson, W.P., G.D. Johnson, and D.P. Young, Jr. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. Pages 1029-1042 *in* Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, March 20-24, 2002 Asilomar, CA, Volumes 1 and 2. C.J. Ralph and T.D. Rich, eds. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191. Pages1029-1042.

Evans, W. R., Y. Akashi, N. S. Altman, and A. M. Manville II. 2007. Response of night-migrating songbirds in cloud to colored and flashing light. North American Birds 60:476-488.

Everaert, J. and D. Bauwens. 2007. A possible effect of electromagnetic radiation from mobile phone base stations on the number of breeding House Sparrows (*Passer domesticus*). Electromagnetic Biology and Medicine 26:63-72.

Faaborg, J., R.T. Holmes, A.D. Anders, K.L. Bildstein, K.M. Dugger, S.A. Gauthreaux, Jr., P. Heglund, K.A. Hobson, A.E. Jahn, D.H. Johnson, S.C. Latta, D.J. Levey, P.P. Marra, C.L. Merrord, E. Nol, S.I. Rothstein, T. W. Sherry, T.S. Sillett, F.R. Thompson III, and N. Warnock. 2010. Recent advances in understanding migration systems of New World land birds. Ecological Monographs 80(1): 3-48.

Farmer, C.J., L.J. Goodrich, E. Ruelas Inzunza, and J.P. Smith. 2008. Conservation status of North America's birds of prey. Pages 303- 420 *in* K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza and R.R. Veit (editors). State of North America's birds of prey. Series in Ornith. # 3, Nuttall Ornith. Club and the Am. Ornith. Union.

Federal Communications Commission (FCC). 1999. Office of Engineering and Technology. *Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields*. OET Bulletin 56, Fourth Edition, August.

FCC. 2004. *Nationwide Programmatic Agreement for Review of Effects on Historic Properties for Certain Undertakings Approved by the Federal Communications Commission*. September. Executed by FCC, Advisory Council on Historic Preservation, and National Conference of State Historic Preservation Officers. FCC 04-222.

FCC. 2006. Effects of Communications Towers on Migratory Birds Notice of Proposed Rulemaking. WT Docket No. 03-187. Adopted November 3, 2006, released November 7, 2006. FCC 06-164.

FCC. 2009. Wireless Telecommunications Bureau Seeks Comment on Petition for Expedited Rulemaking and Other Relief Filed on Behalf of American Bird Conservancy, Defenders of Wildlife and National Audubon Society Regarding Commission Implementation of the National Environmental Policy Act, the Endangered Species Act, and the Migratory Bird Treaty Act. WT Docket Nos. 08–61 and 03–187; DA 09-904. April 29.

FCC. 2011a. Wireless Telecommunications Bureau Invites Comment on Draft Environmental Notice Requirements and Interim Procedures Affecting the Antenna Structure Registration Program. 47 CFR Parts 1, 17, 22, 24, 25, 27, 80, 87, and 90 WT Docket Nos. 08–61 and 03–187; DA 11–558. Federal Register Vol. 76 No. 65. April 5.

FCC. 2011b. Antenna Structure Registration Program online database. http://wireless.fcc.gov/antenna/index.htm?job=home.

Fronczak, D. 2010. *Waterfowl Harvest and Population Survey Data*. Revised March 26. 102 pp.

Gauthreaux, S.A., Jr., and C.G. Belser. 1999. The behavioral responses of migrating birds to different lighting systems on tall towers. *In* W.R. Evans and A.M. Manville, II (eds). Transcripts of the proceedings of the workshop on avian mortality at communication towers, August 11, 1999, Cornell University, Ithaca, NY.

Gehring, J., P. Kerlinger and A. Manville. 2009. Communication towers, lights, and birds: successful methods of reducing the frequency of avian collision. Ecological Applications 19(2): 505-514.

Gehring, J., P. Kerlinger, and A. Manville II. 2011(in press). The role of tower height and guy wires on avian collisions with communication towers. J. Wildl. Manage.

Good, R.E., R.M. Nielson, H. Sawyer and L.L. McDonald. 2007. A population estimate for Golden Eagles in the western United States. J. Wildl. Manage. 71:395-402.

Graber, R.R. 1968. Nocturnal migration in Illinois – Different points of view. The Wilson Bulletin 80(1): 36-71.

Harju, S.M., M.R. Dzialak, R.C. Taylor, L.D. Hayden-Wing and J.B. Winstead. 2010. Thresholds and time lags in effects of energy development on Greater-sage Grouse populations. J. Wildl. Manage. 74(3): 437-448.

Harlow, D.L. and P.H. Bloom. 1989. Buteos and the Golden Eagle. Pp. 102-110 *in* B.G. Pendleton, ed. Proceedings of the western raptor management symposium and workshop. Natl. Wildl. Fed. Scien. Tech. Ser. No. 12.

Holloran, M. J. 2005. Sage-grouse population response to natural gas field development in western Wyoming. PhD Dissertation. University of Wyoming, Laramie. 223 pp.

Kemper, C.A. 1996. A study of bird mortality at a west central Wisconsin TV tower from 1957-1995. The Passenger Pigeon 58(3):219-235.

Kerlinger, P. 1995. *How Birds Migrate*. Mechanicsburg, PA. Stackpole Books. 228 pp.

Kerlinger, P., J.L. Gehring, W.P. Erickson, R. Curry, A. Jain and J. Guarnaccia. 2010. *Night migrant fatalities and obstruction lighting at wind turbines in North America*. Wilson Journal of Ornithology. 122(4):744-754.

Klem, Jr., D., C.J. Farmer, N. Delacretaz, Y. Gelb, and P.G. Saenger. 2009. Architectural and landscape risk factors associated with bird-glass collisions in an urban environment. The Wilson Journal of Ornithology. 121(1): 126 – 134.

Kochert, M.N. and K. Steenhof. 2002. Golden eagles of the U.S. and Canada: status, trends and conservation challenges. J. Raptor Res. 36(S1):32-40.

Kochert, M.N., K. Steenhof, C.L. McIntyre and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). In A. Poole and F. Gill (eds). The Birds of North America, # 684. The Birds of North America, Inc. Philadelphia, PA.

Longcore, T., C. Rich, and S.A. Gauthreaux, Jr. 2008. Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: a review and meta-analysis. The Auk 125(2): 486-493.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, B.G. Bert, L.M. Sullivan, E. Mutrie, S. Gauthreaux, M.L. Avery, R.L. Crawford, A.M. Manville, and E.R. Travis. 2011a (in preparation). An estimate of avian mortality at communication towers in the United States and Canada.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, B.G. Bert, L.M. Sullivan, E. Mutrie, S. Gauthreaux, M.L. Avery, R.L. Crawford, A.M. Manville, and E.R. Travis. 2011b (in preparation). Species composition of birds killed at communication towers in North America.

Longcore, T. 2011. Personal communication with Dr. Jeffrey Reidenauer of URS Corporation. July 5.

Manville, A.M. 2000. Avian mortality at communication towers: background and overview. Pp 1-5 *in* W.R. Evans and A.M. Manville, II (editors). Proceedings of the workshop on avian mortality at communication towers.

Manville, A.M., II. 2004. Prairie Grouse Leks and Wind Turbines: U.S. Fish and Wildlife Service Justification for a 5-mile Buffer from Leks; Additional Grassland Songbird Recommendations. Division of Migratory Bird Management, USFWS, Arlington, VA. Peer-reviewed briefing paper. 17 pp.

Manville, A.M., II. 2009. Towers, turbines, power lines, and buildings – steps being taken by the U.S. Fish and Wildlife Service to avoid or minimize take of migratory birds at these structures. *In* C.J. Ralph and T.D. Rich (editors). Proceedings 4th International Partners in Flight Conference, February 2008, McAllen, TX. Pp. 262-272.

Manville, A.M., II. 2011. Personal communication (via e-mail) with Dr. Richard Podolsky of URS Corporation. August 5.

Morris. 1992. *Academic Press Dictionary of Science and Technology*. Christopher Morris, ed. Academic Press, Inc. San Diego, CA.

Morris, S. R., A. R. Clark, L. H. Bhatti, and J. L. Glasgow. 2003. Television tower mortality of migrant birds in western New York and Youngstown, Ohio. Northeastern Naturalist 10:67–76.

National Park Service (NPS). 2008. General Management Plan Dynamic Sourcebook, version 2.1. Appendix I, Impact Analysis. http://planning.nps.gov/GMPSourcebook/appendixes/I1.htm.

National Wind Coordinating Committee (NWCC). 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparison to Other Sources of Avian Collision Mortality in the United States. August. 67 pp.

Nehring, J., and S. Bivens. 1999. A study of bird mortality at Nashville's WSMV television tower. Migrant 70:1–8.

Pagel, J.E., D. M. Whittington, and G.T. Allen. 2010. Interim Golden Eagle inventory and monitoring protocols and other recommendations. Division of Migratory Bird Management, U.S. Fish and Wildlife Service. February.

Palmer, R.S. 1988. Golden eagle. *In* R.S. Palmer (ed.). Handbook of North American birds. Yale Univ. Press.

Phillips, R.L. and A.E. Beske. 1990. Distribution and abundance of golden eagles and other raptors in Campbell and Converse Counties, Wyoming. U.S. Dept. Int. Fish and Wildlife Service Tech. Rept. 27. Washington, DC.

Pitman, J.C., C.A. Hagen, R.J. Robel, T.M. Loughin, and R.D. Applegate. 2005. Location and Success of Lesser Prairie-Chicken Nests in Relation to Vegetation and Human Disturbance. J. Wildl. Manage. 69: 1259-1269.

Pruett, C.L., M.A. Patten, and D.H. Wolfe. 2009. Avoidance behavior by Prairie Grouse: Implications for development of wind energy. Conservation Biology 23(5):1253-1259.

Ritz, T., P. Thalau, J.B. Phillips, R. Wiltschko, and W. Wiltschko. 2004. Resonance effects indicate a radical-pair mechanism for avian magnetic compass. Nature 429:177-180.

Robb, L.A. and M.A. Schroeder. 2005. Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*): a Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region. Accessed on 10 December 2009 at http://www.fs.fed.us/r2/projects/scp/assessments/lesserprairiechicken.pdf.

Robel, R.J., J.A. Harrington, Jr., C.A. Hagen, J.C. Pitman, and R.R. Reker. 2004. Effect of Energy Development and Human Activity on the Use of Sand Sagebrush Habitat by Lesser Prairie-Chickens in Southwestern Kansas. Transactions of the North American Wildlife and Natural Resource Conference 69: 251-266.

Sheppard A.R., M.L. Swicord, and Q. Balzano. 2008. Quantitative evaluations of mechanisms of radiofrequency interactions with biological molecules and processes. Health Phys. 95:365-96.

Smith, J.P., C.J. Farmer, S.W. Hoffman, G.S. Kaltenecker, K.Z. Woodruff, and P.F. Sherrington. 2008. Trends in autumn counts of migratory raptors in western North America. Pages 217-254 in K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza and R.R. Veit (editors). State of North America's birds of prey. Series in Ornith. # 3, Nuttall Ornith. Club and the Am. Ornith. Union.

Sullivan, R.M., J.P. Hughes, and J.E. Lionberger. 2000. Review of the Historical and Present Status of the Lesser Prairie-chicken (*Tympanuchus pallidicinctus*) in Texas. The Prairie Naturalist 32(3):177-188.

Suter, G.W. II, and J.L. Joness. 1981. Criteria for Golden Eagle, Ferruginous Hawk, and Prairie Falcon Nest Site Protection. Raptor Research 15(1):12-18.

Tordoff, H.B. and R.M. Mengel. 1956. Studies of birds killed in nocturnal migration. University Kansas Museum Natural History Publication 10:1-44.

Trapp, J. L. 1998. Bird kills at towers and other human-made structures: An annotated partial bibliography (1960-1998). U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Arlington, VA.

U.S. Court of Appeals for the District of Columbia Circuit. 2008. Petition for Review of an Order of the Federal Communications Commission. American Bird Conservancy, Inc. and Forest Conservation Council, Petitioners v. Federal Communications Commission, Respondent and CTIA – The Wireless Association et al., Intervenors. Argued September 11, 2007, decided February 19, 2008.

U.S. Department of Transportation/Federal Aviation Administration (USDOT/FAA). 2007. Obstruction Marking and Lighting. Advisory Circular AC 70/7460-1K. Effective February 1.

U.S. Fish and Wildlife Service (USFWS). 2002a. Colonial-Nesting Waterbirds: A Glorious and Gregarious Group. http://www.fws.gov/birds/waterbird-fact-sheet.pdf.

USFWS. 2002b. Migratory Bird Mortality: Many Human-Caused Threats Afflict our Bird Populations. January. 2 pp. www.fws.gov/birds/mortality-fact-sheet.pdf.

USFWS. 2007. National Bald Eagle Management Guidelines. May.

USFWS. 2008. *Birds of Conservation Concern 2008*. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management. Arlington, VA. 85 pp. http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf.

USFWS. 2010a. Online National Wetlands Inventory Mapper. http://www.fws.gov/wetlands/Data/Mapper.html.

USFWS. 2010b. *Waterfowl Population Status 2010*. U.S. Department of the Interior, Washington, D.C.

USFWS. 2010c. *Migratory Bird Treaty Act List of Protected Species*. http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtandx.html. Site accessed February 4, 2011.

USFWS. 2011a. Letter to Mr. Aaron Goldschmidt, Esq. Wireless Telecommunications Bureau, Federal Communications Commission from USFWS Division of Migratory Bird Management. *Comments of the U.S. Fish and Wildlife Service's Division of Migratory Bird Management filed electronically, on WT Docket No. 08-61 and WT Docket No. 03-187, Regarding the Environmental Effects of the Federal Communication Commission's Antenna Structure Registration Program*. January 14.

USFWS. 2011b. Online service for information regarding threatened and endangered species final critical habitat designations across the United States. http://criticalhabitat.fws.gov/crithab/.

USFWS 2011c. Summary of Listed Species, Listed Populations, and Recovery Plans. http://ecos.fws.gov/tess_public/pub/boxScore.jsp.

Vermont Fish and Wildlife Department. 2002. Guidelines for protection and mitigation of impacts to great blue heron rookeries in Vermont. Agency of Natural Resources. 13 pp.

Whittington, D.M., J.E. Pagel, R. Murphy, and E.L. Kershner. 2010. Long-term Strategies and Information Needs for Conserving Golden Eagles (*Aquila chrysaetos*) and Bald Eagles (*Haliaeetus leucocephalus*) in an Energy Development Environment. USFWS, Division of Migratory Bird Management, Arlington, VA. Invited Presentation at Raptors & Energy Development Session, September 25. Fort Collins, CO.

Williams, T. C., J. M. Williams, P. G. Williams, and P. Stokstad. 2001. Bird migration through a mountain pass studied with high resolution radar, ceilometers, and census. Auk 118:389–403.

Zimmerman, J.L. 1998. *Migration of Birds*. USFWS Circular 16. http://www.npwrc.usgs.gov/resource/birds/migratio/index.htm#table.

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# Appendix A

## Agencies, Organizations, and Individuals Consulted During the NEPA Process

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## Agencies

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## Organizations

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National Association of Broadcasters

National Association of Tower Erectors

PCIA – The Wireless Infrastructure Association

American Bird Conservancy, Inc. (ABC)

Defenders of Wildlife

National Audubon Society

## Individuals

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# Appendix B

# Avian/Tower Collision Literature Summary

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| AVIAN MORTALITY SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Tower Height AGL feet (meters)** | **State** | **Guyed (Yes/No)** | **Lighting Type** | **Total Number of Sampling Days** | **Number of Years Sampled** | **Number of Bird Fatalities Reported** | **Source** |
| 100 (30.5) | Kansas | Yes | | | 1 | 0 | Young et al. (2000) |
| <150 (46) | Pennsylvania | | | | | 147 - >1,000 | Manville (per. comm.) – unpublished data |
| 197 (60) | Tennessee | Yes | None | 215 | 3.5 | 14 | Nicholson et al. (2005)*** |
| 197 (60) | Wisconsin | | | 180 | 2 | 3 | Travis (2009) |
| 197 (60) | Wisconsin | | | 180 | 2 | 1 | Travis (2009) |
| 259 (79) | Wisconsin | | | 180 | 2 | 8 | Travis (2009) |
| 295 (90) | Florida | Yes | | | 1.5 | 14 | Crawford and Engstrom (2001) |
| 361 (110) | Wisconsin | | | 180 | 2 | 6 | Travis (2009) |
| 358 (109) | Wisconsin | | | 180 | 2 | 7 | Travis (2009) |
| 361 (110) | Wisconsin | | | 180 | 2 | 3 | Travis (2009) |
| 380-479 (116–146)* | Michigan | No | White strobe (L-865) | 40 | 1 | 5 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | No | Red strobe (L-864) | 40 | 1 | 5 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | No | Red flashing incandescent (L-864) | 40 | 1 | 6 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | Yes | White strobe (L-865) | 40 | 1 | 11 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | Yes | Red strobe (L-864) | 40 | 1 | 20 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | Yes | Red flashing incandescent (L-864) | 40 | 1 | 22 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | Yes | Steady-burning, red lights (L-864 and L-810) | 40 | 1 | 55 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | No | Flashing and steady-burning red lights (L-864 and L-810) | 60 | 2 | 17 | Gehring et al. (2009) |

| AVIAN MORTALITY SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Tower Height AGL feet (meters)** | **State** | **Guyed (Yes/No)** | **Lighting Type** | **Total Number of Sampling Days** | **Number of Years Sampled** | **Number of Bird Fatalities Reported** | **Source** |
| 380-479 (116–146)* | Michigan | Yes | Flashing and steady burning red lights (L-864 and L-810) | 60 | 2 | 194 | Gehring et al. (2009) |
| 380-479 (116–146)* | Michigan | No | Flashing and steady burning red lights (L-864 and L-810) | 60 | 1.5 | 14 | Gehring et al. (in press) |
| 380-479 (116–146)* | Michigan | Yes | Flashing and steady-burning red lights (L-864 and L-810) | 100 | 2.5 | 249 | Gehring et al. (in press) |
| 436 (133) | New Hampshire | Yes | | | 2 | 134 | Sawyer (1961) |
| 466 (142) | Wisconsin | | | 180 | 2 | 14 | Travis (2009) |
| 466 (142) | Wisconsin | | | 180 | 2 | 5 | Travis (2009) |
| 528 (161) | West Virginia | Yes | | | 6 | 116 | Herron (1997) |
| 535 (163) | Wisconsin | | | 180 | 2 | 20 | Travis (2009) |
| 605-1588 (184.4 – 484)** | Illinois | Yes | | 13 | 0.5 | 5,465 | Seets and Bohlen (1977) |
| 627 (191) | Florida | Yes | Red and white lights | 1 | 1 | 617 | Roberts and Tamborski (1993) |
| 942 (287) | Tennessee | Yes | | | 19.75 | 253 | Laskey (1960,1962, 1963a,b, 1964, 1967, 1968, 1969a,b, 1971), Goodpasture (1974a, b, 1975, 1976, 1984, 1986); Bierly (1973) |
| 961 (293) | New York | Yes | Red beacon | 4-33 | 30 | 267 | Morris et al. (2003) |
| 981 (299) | Iowa | Yes | | | 2 | 243 | Brewer and Ellis (1958) |
| 984 (300) | Michigan | Yes | | | 4.5 | 44 | Caldwell and Wallace (1966) |

| AVIAN MORTALITY SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Tower Height AGL feet (meters)** | **State** | **Guyed (Yes/No)** | **Lighting Type** | **Total Number of Sampling Days** | **Number of Years Sampled** | **Number of Bird Fatalities Reported** | **Source** |
| 1000 (≥305)* | Michigan | Yes | Flashing and steady-burning red lights (L-864 and L-810) | 40 | 1 | 256 | Gehring et al. (2009) |
| 1000 (≥305)* | Michigan | Yes | Flashing and steady-burning red lights (L-864 and L-810) | 40 | 1 | 164 | Gehring et al. (2009) |
| 1000 (≥305)* | Michigan | Yes | Flashing and steady-burning red lights (L-864 and L-810) | 80 | 2.5 | 416 | Gehring et al. (in press) |
| | | | | | | | |
| 1001 (305) | Wisconsin | Yes | | | 38 | 3,198 | Kemper (1996) |
| 1011 (308) | Florida | Yes | | | 13 | 618 | Crawford and Engstrom (2001) |
| 1059 (323) | New York | Yes | Red beacon | | 30 | 35 | Morris et al. (2003) |
| 1076 (328) | New York | Yes | Red beacon | | 30 | 370 | Morris et al. (2003) |
| 1084 (330) | Ohio | Yes | Red beacon | | 19 | 227 | Morris et al. (2003) |
| 1089 (332) | South Dakota | Yes | | 1 | 1 | >3,750 | Manville (pers comm 2011) |
| 1122 (342) | Michigan | Yes | | | 5.25 | 330 | Caldwell and Wallace (1966) |
| 1188 (362) | North Carolina | Yes | | | 2 | 498 | Carter and Parnell (1976, 1978) |
| 1201 (366) | North Dakota | Yes | | | 2 | 282 | Avery and Clement (1972); Avery et al. (1977) |
| 1201 (366) | Kansas | Yes | | | 1.5 | 83 | Boso (1965) |
| 1280 (390) | Michigan | Yes | | | 5.25 | 757 | Caldwell and Wallace (1966) |
| 1299 (396) | Wisconsin | | | 180 | 2 | 760 | Travis (2009) |
| 1312 (400) | Minnesota | Yes | | | 5 | 701 | Strnad (1962, 1975) |
| 1348 (411) | Massachusetts | Yes | | | 1.5 | 338 | Baird (1970, 1971) |
| 1368 (417) | Tennessee | Yes | | | 29.75 | 689 | Nehring and Bivens (1999) |

| AVIAN MORTALITY SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Tower Height AGL feet (meters)** | **State** | **Guyed (Yes/No)** | **Lighting Type** | **Total Number of Sampling Days** | **Number of Years Sampled** | **Number of Bird Fatalities Reported** | **Source** |
| 1369 (417) | Tennessee | Yes | Red steady and flashing | 6 | 1 | 336 | Ganier (1962) |
| 1424 (434) | Wisconsin | | | 180 | 2 | 237 | Travis (2009) |
| 1440 (439) | Kansas | Yes | | | 2 | 471 | Young and Robbins (2001) |
| 1483 (452) | Florida | Yes | | | 3 | 3,043 | Taylor and Anderson (1973, 1974) |
| 1995 (608) | North Carolina | Yes | | | 2 | 1,111 | Carter and Parnell (1976, 1978) |
| 2001 (610) | Iowa | Yes | | | 1.75 | 2,012 | Mosman (1975) |