Draft Programmatic Environmental Assessment of the Antenna Structure Registration Program

Responsible Agency:

FEDERAL COMMUNICATIONS COMMISSION
445 12th Street, SW
Washington, DC 20554

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PROGRAMMATIC ENVIRONMENTAL ASSESSMENT OF THE ANTENNA STRUCTURE REGISTRATION PROGRAM

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Responsible Agency:

Federal Communications Commission
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Draft Programmatic Environmental Assessment

of the

Antenna Structure Registration Program

Responsible Agency:	Federal Communications Commission
Affected Location:	Nationwide
Proposed Action:	Review the existing ASR Program and NEPA compliance procedures to evaluate their effects on migratory birds and other environmental resources
Report Designation:	Draft Programmatic Environmental Assessment
Date:	August 26, 2011
Comments Due:	October 3, 2011

All comments must be submitted in WT Docket No. 08-61 and WT Docket No. 03-187 (for electronic comments) or must reference both WT Docket No. 08-61 and WT Docket No. 03-187 (for paper comments). All comments regarding this document should be submitted as follows.

Electronic comments (preferred):	http://www.fcc.gov/cgb/ecfs/
U.S. Postal Service Mailed paper comments:	Secretary Federal Communications Commission 445 12th Street, SW Washington, DC 20554
Commercial Overnight Mailed paper comments:	Secretary Federal Communications Commission 9300 East Hampton Drive Capitol Heights, MD 20743
Messenger-delivered or Hand-delivered paper comments:	FCC Headquarters 445 12th Street, SW Room TW-A325 Washington, DC 20554

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AGL	Above Ground Level
ASR	Antenna Structure Registration
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DAS	Distributed Antenna System
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
MBTA	Migratory Bird Treaty Act
MHz	megahertz
MOA	Memorandum of Agreement
MPE	Maximum Permissible Exposure
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPA	Nationwide Programmatic Agreement
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PEA	Programmatic Environmental Assessment
PEIS	Programmatic Environmental Impact Statement
PIF	Partners In Flight
PL	Public Law
RF	Radio Frequency
SHPO	State Historic Preservation Office
T&E	Threatened & Endangered
THPO	Tribal Historic Preservation Office
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
WOUS	Waters of the United States

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INTRODUCTION

This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the environmental impacts of the Antenna Structure Registration (ASR) Program administered by the Federal Communications Commission (FCC or the Commission). The ASR Program is the process under which each antenna structure that requires Federal Aviation Administration (FAA) notification must be registered with the FCC by its owner. The ASR requirements only apply to those antenna structures that may create a hazard to air navigation due to height (generally, structures more than 200 feet [61 meters] tall) or proximity to an airport runway. The current ASR Program does not routinely require an applicant to prepare an EA to evaluate potential impacts to migratory birds.

The U.S. Court of Appeals for the District of Columbia Circuit in *American Bird Conservancy, Inc. v. FCC* (2008) determined that the FCC has not adequately evaluated the potential effects that its current ASR program has on threatened and endangered species and migratory birds. The court further stated that the Commission could begin its evaluation of these effects with a PEA. In addition, the court required the Commission to provide notice of pending ASR applications that would ensure meaningful public involvement in the agency's National Environmental Policy Act (NEPA) procedures.

In partial response to the court's decision, the FCC has prepared and sought comment on draft procedures designed to help ensure that the environmental effects of proposed communications towers, including their effects on migratory birds, are fully considered prior to construction. The draft procedures, if adopted, would require:

- Applicants for new tower registration to provide a 30-day opportunity for public comment on the environmental effects of the proposed construction; and
- On an interim basis, pending completion of environmental review of the ASR program, preparation of an Environmental Assessment (EA) for a proposed tower more than 450 feet (137 meters) in height to address its potential impact on migratory birds.

PROPOSED ACTION

The Proposed Action consists of reviewing the existing ASR Program and NEPA compliance procedures to evaluate their effects on migratory birds and other environmental resources, in compliance with the 2008 court decision. Because of the nature of the projects under the ASR Program and in response to the 2008 court decision, this PEA primarily focuses on potential impacts to migratory birds.

PURPOSE AND NEED FOR THE ACTION

The ASR Program promotes air safety by requiring the registration of antenna structures that may create a hazard to air navigation due to their height or proximity to an airport runway. The purpose of the Proposed Action is to examine how potential environmental impacts are evaluated as part of the ASR Program and associated NEPA review and documentation. To ensure that the FCC complies with its obligations under NEPA, there is a need to consider whether the current program should be revised to require applicants to provide more comprehensive evaluations of potential impacts on resources, especially migratory birds.

ALTERNATIVES

The alternatives considered include a No Action Alternative, Alternative 1 that assumes a change in the FAA's permitted lighting configurations, and three options of Alternative 2 that require greater consideration of the effects of proposed towers on migratory birds and other environmental resources than the No Action Alternative.

The Commission's draft procedures (FCC 2011a), if adopted, would require applicants for new tower registration to provide a public notice and 30-day opportunity for comment on the environmental effects

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of the proposed construction. The No Action Alternative, Alternative 1, and Alternative 2 each assume that the public notice and comment procedures will be adopted and remain in place.

The draft procedures also, as an interim measure, require applicants to prepare an EA for proposed towers that are more than 450 feet (137 meters) in height to address potential impacts on migratory birds. Alternative 2 Option C considers the effects of adopting this requirement on a permanent basis.

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 completion of a conspicuity study, the FAA may consider revisions to the circular that would allow lighting schemes that use red flashing lights without red steady-burning lights.

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.

Alternative 1 – Existing ASR Program with FAA Lighting Changes

Alternative 1 is the 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, along with the potential changes to the FAA's permitted lighting configurations under which future towers that use red flashing lights would not also have red steady-burning lights.

Alternative 2 – Modifications to the ASR Program

Under Alternative 2, the FCC would revise its NEPA compliance procedures for the ASR Program to require more comprehensive assessments of potential environmental impacts from new towers and tower modifications involving a substantial increase in size, particularly for potential effects to migratory birds. Alternative 2 would not change the procedures for tower modifications or replacements that do not involve a substantial increase in size, for certain lighting changes, or for minor ASR actions, including administrative changes, changes in ownership, dismantling of towers, and minor changes/corrections to existing towers. It also would not affect activity at registered towers that does not require action in the ASR system, such as tower repair and replacement of tower parts.

There are three options under Alternative 2 for determining the level of NEPA review that would be required for a project.

Alternative 2 Option A

Alternative 2 Option A would require an EA for all new registered towers outside of an antenna farm, regardless of height, use of guy wires, or lighting scheme. Towers in an antenna farm, replacement towers, and modifications of existing towers would require an EA if they involve a substantial increase in size over the existing tower or towers. An EA would also be required for changes to existing towers involving: (1) a change to steady-burning lighting; (2) a change to high-intensity white lighting in a residentially zoned neighborhood; (3) addition of lighting; or (4) human exposure to levels of radio frequency (RF) radiation in excess of the limits in 47 CFR §§ 1.1310 and 2.1093. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds and Bald and Golden Eagles.

Under Option A, the only projects that would be categorically excluded from preparation of an EA would be those that propose: (1) a change from red steady-burning to flashing lights or removal of lighting on an existing tower (depending upon potential revisions to the FAA lighting circular); (2) replacement or

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modification of an existing tower that involves no 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.

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. 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.

Towers in an antenna farm, replacement towers, and modifications to existing towers would require an EA under the same circumstances as new towers if they involve a substantial increase in size. An addition of red steady-burning lights to an existing tower would also require an EA if the tower is located in a ridgeline, coastal zone, bird staging area, or colonial nesting site.

Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds and Bald and Golden Eagles. If the tower is in a wetland or floodplain and is over 450 feet (137 meters) tall, uses red steady lights, or uses guy wires, the FCC would expect the applicant to either provide evidence that it is not in a riparian zone or a detailed analysis of its effects on migratory birds.

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) above ground level (AGL), regardless of location, lighting scheme, or use of guy wires.

Towers less than or equal to 450 feet (137 meters) AGL would be categorically excluded from preparation of an EA unless a condition requiring an EA under the existing program is present.

Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds and Bald and Golden Eagles.

Alternatives Considered and Dismissed

Various alternatives for changes to the ASR Program were examined but dismissed as not feasible, including: prohibiting all new tower construction; prohibiting all towers that exceed a certain height; prohibiting all towers in certain locations; and prohibiting guy wires on all new towers.

ENVIRONMENTAL CONSEQUENCES

The ASR program is national in scope, and the environmental impacts of each individual tower may vary greatly depending on local conditions. Therefore, this PEA does not assess the environmental impacts of any particular tower. Rather, the PEA focuses on the broad, programmatic impacts of the ASR program in a national context. In addition, the PEA considers whether the FCC's processes, including its criteria for determining which towers are categorically excluded and which require an EA, ensure that potentially significant impacts of individual towers will be identified and considered. If an individual tower may have potentially significant environmental impacts, those impacts would be addressed in site-specific EA prepared for that tower.

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Impacts (or effects) can be categorized by description (beneficial or adverse), context (site-specific, local, regional, or national), intensity (negligible, minor, moderate, or major), and duration (short- or long-term). NEPA requires consideration of all categories of impacts that apply to a proposed action, including direct, indirect, and cumulative impacts.

According to the Council on Environmental Quality (CEQ) regulations (40 CFR Section 1508.27), assessment of an impact's significance under NEPA requires consideration of both its context and its intensity.

For purposes of evaluating the impacts of the ASR program as a whole, as addressed in this PEA, the relevant context is generally national or international in scope. In project-specific EAs, the discussion of impacts would be more local in context.

Intensity refers to the severity of impact. This PEA uses impact threshold definitions that take into consideration the characteristics of communications towers:

- Negligible – The impact is barely perceptible or measurable and remains localized and confined.
- Minor – The impact is slight but perceptible and measurable and remains localized and confined.
- Moderate – The impact is readily apparent and sufficient to cause a change in the character-defining features of a resource. It generally does not affect the resource's viability.
- Major – The impact results in a substantial and highly noticeable change in character-defining features or involves an individually important feature of a resource. A major impact may, but does not necessarily, affect the resource's viability.

The intensity of the ASR Program's impacts to various resources is summarized in Table 1 at the end of this Executive Summary.

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

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

Negligible, minor, and moderate impacts are generally not significant. However, a moderate impact may be significant if its importance is magnified by the context in which it occurs. Major impacts are often significant, but are not necessarily so when considered in context.

Several resources were determined to not be affected by or to be affected negligibly by the No Action Alternative, Alternative 1, and the three options under Alternative 2. These resources include: geology, soils, farmlands, groundwater, coastal zones/barriers, designated wilderness areas (which are already protected under FCC rules), air quality, noise, and land use. However, because coastal zones and barriers contain important habitats for migratory birds, these resources are addressed as part of the discussion of impacts to migratory birds.

FINDINGS

Environmental impacts from towers are dependent on a variety of factors including location, height, structural support system, and lighting scheme. The principal adverse impact of communications towers is on birds, especially migratory birds, and tower lighting is the primary contributor to bird mortality from

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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.

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 when existing ASR program criteria are triggered. This requirement ensures that potentially significant local effects on environmental resources other than migratory birds will be identified and considered.

No Action Alternative

The No Action Alternative would have no significant adverse environmental impacts at the national level to any resources, 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 due to 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, 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 under 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.

Alternative 1 – Existing ASR Program with FAA Lighting Changes

Under Alternative 1 there would be no significant adverse environmental impacts at the national level to any resources, including migratory birds. Major adverse impacts on 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

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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. Additionally, 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, the impact to migratory birds 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 Eagle nests from a proposed tower that would not be addressed.

Alternative 2 – Modifications to the ASR Program

Alternative 2 Option A

Alternative 2 Option A would have no significant adverse environmental impacts at the national level to any resources, 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, 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. Also, 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 or without revisions to the FAA lighting circular, the impact to migratory birds at the national level is not significant.

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 the effects that the project would have on migratory birds and 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.

Alternative 2 Option B

Under Alternative 2 Option B, there would be no significant adverse environmental impacts at the national level to any resources, 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

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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. In addition, 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, the impact to migratory birds under Option B without revisions to the FAA lighting circular 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 more than 450 feet (137 meters) tall or use guy wires in areas important to migratory birds, and would attempt 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. 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.

Alternative 2 Option C

Under Alternative 2 Option C, there would be no significant adverse environmental impacts at the national level to any resources, 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

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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. Therefore, under Option C 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 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 the 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 a proposed tower that would not be addressed.

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 affect migratory birds. Migratory bird deaths due to collisions with communications towers are currently estimated at 5 million per year, and, depending on the alternative considered, 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 either 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 upon 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.

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 would 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

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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 to 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.

The impacts of the ASR Program on resources other than migratory birds are not significant. 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 a proposed tower would ensure that potentially significant effects on local migratory bird populations and individual Bald and Golden Eagles would be considered. Under the No Action Alternative, Alternative 1, and Option C of Alternative 2, significant impacts on local migratory bird populations and Bald and Golden Eagles may not be addressed.

MITIGATION

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 U.S. Fish and Wildlife Service (USFWS) to consider potential further measures to protect threatened and endangered (T&E) species. The FCC encourages tower owners and applicants to consider additional measures that may further mitigate any environmental effects.

Table 1 summarizes impacts by resource for the No Action Alternative, Alternative 1, and Alternative 2 Options A, B, and C.

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Table 1: Summary of Impacts by Resource for All Alternatives

Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
Surface Water	Short- and long-term negligible to minor adverse impacts from increases in sedimentation and impervious surface area and minor modifications of stream channels due to construction activities. Fuel spill/leak from backup generator during site operation may result in short-term negligible to minor adverse impacts.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.
Wetlands/ Waters of the U.S.	Short- and long-term negligible to minor adverse impacts from increases in sedimentation and impervious surface area and potential wetland fill or disturbance due to construction activities.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
Floodplains	Short- and long-term negligible to minor adverse impacts due to the potential for construction activities to increase floodwater flows downstream of the project site.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.
Vegetation and Wildlife (other than T&E Species/Critical Habitat and Migratory Birds)	Short- and long-term negligible to minor adverse impacts due to vegetation disturbance/removal, some direct mortality to less mobile wildlife, habitat fragmentation, and introduction of non-native invasive species.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.
T&E Species/ Critical Habitat	Short- to long-term negligible to minor adverse impacts because FCC's procedures for implementing the Endangered Species Act (ESA) ensure that adverse effects to T&E species will be avoided or mitigated.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
Migratory Birds	**Direct:** Short- to long-term major adverse impact. Annual bird mortality expected to increase from approximately 5 million currently to approximately 6.6 million in the year 2021, based on an estimated 2,800 new towers built annually. **Indirect:** Short- to long-term minor impacts (habitat and site abandonment). Evidence does not support determination of RF radiation impacts.	**Direct:** Short- to long-term major adverse impact. Mortality from new towers would decrease by 50 to 70 percent as a result of revisions to the FAA lighting circular when compared to No Action (from approximately 6.6 million in the year 2021 to approximately 5.5 million to 5.8 million) based on an estimated 2,800 new towers built annually. In addition, assuming owners of 50 percent of existing towers extinguish red steady-burning lights or change them to red flashing lights (and that these towers are evenly distributed across tower heights), annual bird mortality from existing towers would be reduced by an estimated 25 to 35 percent. This would	**Direct (*without revisions to FAA lighting circular*):** Short- to long-term major adverse impact. Mortality expected to decrease somewhat compared to No Action. Review of EAs expected to lead to adoption of mitigating measures in some cases and 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. **Direct (*with revisions to FAA lighting circular*):** Short- to long-term major adverse impact. Mortality expected to decrease slightly compared to Alternative 1.	**Direct (*without revisions to FAA lighting circular*):** Short- to long-term major adverse impact. Reduction in annual bird mortality compared to No Action because of incentives to place new towers that are over 450 feet tall, use red steady lights, or use guy wires outside of coastal zones, ridgelines, bird staging areas/colonial nesting sites, and riparian zones within wetlands and floodplains, 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. Reduction would be limited by applicants' ability to avoid these areas and features, as well as	**Direct (*without revisions to FAA lighting circular*):** Short- to long-term major adverse impact. Annual bird mortality expected to decrease compared to No Action, but not as much as with Option A (which requires more EAs) or Option B (which provides incentives to place new towers that are over 450 feet tall, use red steady lights, or use guy wires away from resources important to migratory birds, and to reduce tower heights and avoid red-steady lights and guy wires within these areas if feasible). Applicants would have an incentive to reduce heights of new towers, where feasible, and review of EAs for towers greater than 450 feet

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
		reduce total bird mortality from existing and new towers from 5 million currently to between 3.7 million and 4.6 million in the year 2021. **Indirect:** Similar to No Action.	Review of EAs expected to lead to adoption of mitigating measures in some cases and 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, particularly since steady lighting would no longer be a factor. **Indirect (*with or without revisions to FAA lighting circular*):** Somewhat reduced impacts (habitat and site abandonment) compared to No Action due to case-by-case review of EAs. Evidence does not support determination of RF radiation impacts.	protection already provided under FCC rules for areas that overlap (e.g., floodplains and wetlands). Moving a tower off of ridgeline may require a taller tower or multiple towers, which may cause other environmental impacts that offset the potential beneficial impact to birds. Some use of white flashing lights instead of red steady-burning lighting may occur, provided local land use regulations allow it. Overall, by establishing clear guidelines and aligning tower owners' economic incentives with the protection of migratory birds, reduction in bird mortality expected to be at least comparable to Option A.	(137 meters) is expected to lead to adoption of mitigating measures in some cases. However, opportunities for significant reductions in height are very limited. **Direct (*with revisions to FAA lighting circular*):** Short- to long-term major impact. Reduction in annual bird mortality expected to be more than under Alternative 1, but not as much as under Option A (because fewer EAs would be prepared) or Option B (which provides incentives to place new towers that are over 450 feet tall or use guy wires away from resources important to migratory birds, and to reduce tower heights and avoid

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
				Direct (*with revisions to FAA lighting circular*): Short- to long-term major adverse impact. Reduction in annual bird mortality compared to Alternative 1 because of incentives to place new towers that are over 450 feet tall or use guy wires outside of coastal zones, ridgelines, bird staging areas/colonial nesting sites, and riparian zones within wetlands and floodplains, as well as to reduce the heights of the tallest towers and avoid guy wires within these areas where feasible. Reduction would be limited by applicants' ability to avoid these areas and features, as well as protection already provided under FCC rules for areas that	guy wires within these areas if feasible). Applicants would have an incentive to reduce heights of new towers, where feasible, and review of EAs for towers greater than 450 feet (137 meters) is expected to lead to adoption of mitigating measures in some cases. However, opportunities for significant reductions in height are very limited. **Indirect (*with or without revisions to FAA lighting circular*):** Slightly less impact (habitat and site abandonment) than No Action, due to case-by-case review of EAs for towers more than 450 feet (137 meters) tall, but reduction would be less than under

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
				overlap (e.g. floodplains and wetlands). Moving a tower off of ridgeline may require a taller tower or multiple towers, which may cause other environmental impacts that offset potential beneficial impact to birds. Overall, by establishing clear guidelines and aligning tower owners' economic incentives with protection of migratory birds, reduction in bird mortality expected to be at least comparable to Option A. **Indirect (*with or without revisions to FAA lighting circular*):** Slightly less impact (habitat and site abandonment) than No Action, but less reduction in impact	Option A or B. Evidence does not support determination of RF radiation impacts.

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
				than Option A. Evidence does not support determination of RF radiation impacts.	
Bald/Golden Eagles	Short-term minor to moderate adverse impacts due to tower construction and operation disturbances to eagle breeding, nesting, and feeding activities.	Similar to No Action.	Short-term minor adverse impacts due to tower construction and operation disturbances to eagle breeding, nesting, and feeding activities. Impacts expected to be minor because preparation and review of EAs would require coordination with USFWS, which would likely recommend actions to reduce impacts to Bald and Golden Eagles.	Short-term minor adverse impacts due to tower construction and operation disturbances to eagle breeding, nesting, and feeding activities. Impacts expected to be minor because of incentives to place new towers away from eagle nests, in addition to preparation and review of EAs for towers to be located near nests. EAs would require coordination with USFWS, which would likely recommend actions to reduce impacts to Bald and Golden Eagles. Reduction in impacts is likely to be at least comparable to Option A.	Short-minor to moderate adverse impacts due to tower construction and operation disturbances to eagle breeding, nesting, and feeding activities. There may be a slight reduction in impact compared to No Action and Alternative 1 due to preparation and review of EAs for towers more than 450 feet (137 meters) AGL and incentive to construct shorter towers, which may not be as attractive to nesting Bald Eagles, depending on other site characteristics.

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
Cultural Resources	Short- and long-term, negligible to minor impacts anticipated based on Nationwide Programmatic Agreement (NPA).	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.
Other Visual and Aesthetic Resources	Short- and long-term, minor to moderate adverse impacts due to presence of new towers and lighting in landscape.	Similar to No Action.	Similar to No Action.	Similar to No Action.	Similar to No Action.
Economics	Short- to long-term minor adverse impact on applicants due to continuation of cost and schedule requirements for applicants to prepare and FCC to review an estimated 65 to 75 EAs annually.	Similar to No Action.	Short- to long-term moderate adverse impacts on applicants due to increased costs for applicants to prepare an estimated 2,800 EAs annually. Construction of towers may be delayed by the time necessary for the applicant to prepare and FCC to review 2,800 EAs a year, to the extent these tasks cannot be completed concurrently with other pre-construction	Short- to long-term minor adverse impacts on applicants due to increased costs for applicants to prepare an estimated 190 to 265 EAs annually. Construction of towers may be delayed by the time necessary for the applicant to prepare and FCC to review 190 to 265 EAs a year, to the extent these tasks cannot be completed concurrently with other pre-	Short- to long-term minor adverse impacts on applicants due to increased costs for applicants to prepare an estimated 130 to 140 EAs annually. Construction of towers may be delayed by the time necessary for the applicant to prepare and FCC to review 130 to 140 EAs a year, to the extent these tasks cannot be completed concurrently with other pre-

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Resource	No Action Alternative	Alternative 1	Alternative 2 Option A	Alternative 2 Option B	Alternative 2 Option C
			activities. To maintain current processing timelines, FCC would need to reallocate staff from existing duties to review/process EAs or obtain funds to hire more staff; otherwise, there would be extensive delays in EA processing times.	construction activities. To maintain current processing timelines, FCC would need to reallocate staff from existing duties to review/process EAs or obtain funds to hire more staff; otherwise, there could be delays in EA processing times.	construction activities. FCC would require additional staff time to review/process those EAs, which may result in a minor increase in processing time.
RF Radiation (human exposure)	No impact anticipated.	No impact anticipated.	No impact anticipated.	No impact anticipated.	No impact anticipated.

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CHAPTER ONE INTRODUCTION

1.1 INTRODUCTION

This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the potential environmental impacts of the Antenna Structure Registration (ASR) Program administered by the Federal Communications Commission (FCC or the Commission).

The ASR Program is the process under which each antenna structure that requires Federal Aviation Administration (FAA) notification must be registered with the FCC by its owner. The ASR requirements only apply to those antenna structures that may create a hazard to air navigation due to height (generally, structures more than 200 feet [61 meters] tall) or proximity to an airport runway. The current ASR Program does not routinely require an applicant to prepare an EA to evaluate potential impacts to migratory birds.

The U.S. Court of Appeals for the District of Columbia Circuit in *American Bird Conservancy, Inc. v. FCC* (2008) determined that the FCC has not adequately evaluated the potential effects that its current ASR program has on threatened and endangered species and migratory birds. This court decision stated that in order for the FCC to comply with its obligations under the National Environmental Policy Act of 1969, as amended (NEPA), and the Endangered Species Act of 1973 (ESA), the Commission must consider whether the potential significant environmental impacts from the ASR program require preparation of a Programmatic Environmental Impact Statement (PEIS), as well as reconsider whether potential effects on threatened and endangered species require programmatic consultation with the U.S. Fish and Wildlife Service (USFWS) under the ESA. The court further stated that the Commission could begin this evaluation with a PEA. In addition, the court required the Commission to provide notice of ASR applications that would ensure meaningful public involvement in NEPA review.

In partial response to the court's decision, the FCC has prepared and sought comment on draft procedures designed to help ensure that the environmental effects of proposed communications towers, including their effects on migratory birds, are fully considered prior to construction. The draft procedures, if adopted, would require:

- Applicants for new tower registration to provide a 30-day opportunity for public comment on the environmental effects of the proposed construction; and
- On an interim basis, pending completion of this PEA, preparation of an Environmental Assessment (EA) for a proposed tower more than 450 feet (137 meters) in height to address its potential impact on migratory birds.

This PEA has been prepared in accordance with NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500–1508), and the FCC regulations for implementing NEPA (47 CFR 1.1301-1.1319). This PEA will also serve as a means to address the FCC's obligations under other Federal statutes, including the ESA.

The scope of this PEA includes an evaluation of the range of potential environmental impacts associated with towers requiring registration under the FCC's ASR Program. Because of the nature of the projects under the ASR Program and in response to the 2008 court decision, this PEA primarily focuses on potential impacts to migratory birds.

1.2 BACKGROUND

The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite, and cable. The FCC's jurisdiction includes the 50 states, the District of Columbia, and all U.S. possessions.

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The ASR program was instituted by the FCC in 1995 and is the process by which any antenna structure more than 200 feet (61 meters) above ground level (AGL) and certain antenna structures located within the landing slope of an airport runway, as defined under the FAA's rules, must be registered with the FCC. (The FCC's online calculator TOWAIR may be used to help determine whether an antenna structure requires registration.) The ASR system includes existing antenna structures that meet the criteria for registration as well as newly proposed towers. The tower owner is responsible for registering the antenna structure and for maintaining any required painting and/or lighting. As of June 28, 2011, there were 85,261 structures classified as towers, poles, or masts in the FCC ASR database (FCC 2011b). This number does not include antennas that are placed on buildings, bridges, water towers, and other structures.

Communications towers serve various industries and agencies, including radio, television, cellular phone, paging, microwave, public safety communications (such as police/fire dispatch), and national defense, as well as other advanced and emerging services. National defense and other systems operated by Federal agencies are not licensed by the FCC, and their towers are not required to be registered unless they are also used for FCC-licensed services.

Although new communications antennas can often be collocated on existing towers or other structures such as buildings, in many instances the deployment of services requires construction of a new tower. Several factors, such as construction costs, government regulations, the availability of a willing landowner, and the engineering requirements of a service provider, can influence the decision whether to collocate a new communications antenna on an existing structure or construct a new tower.

Designs of communications towers may differ. For instance, communications towers may be supported by guy wires or can be self-supporting, depending on various engineering, economic, environmental, or historic preservation factors. A guyed tower is a straight tower supported by guy wires to the ground, which anchor the tower. Self-supporting tower styles include monopoles (single tube towers with one foundation) and lattice towers (typically three-sided with a triangular base). Communications towers range widely in height, with many less than 200 feet (61 meters) above ground level (AGL), others over 1,000 feet (305 meters) AGL, and various heights in between. Typically the tallest communications towers are guyed, but there are guyed towers at almost any tower height.

The Commission and the FAA each have statutory responsibilities related to ensuring that antenna structures do not present a hazard to air safety. Specifically, Section 303(q) of the Communications Act of 1934, as amended, authorizes the Commission to prescribe painting and/or illumination of an antenna structure when there is a "reasonable possibility" that it may cause a hazard to air navigation, and requires permittees, licensees, and tower owners to maintain such lighting and/or illumination. Section 1501 of the Federal Aviation Act authorizes the FAA to require that persons proposing to erect a structure provide notice to the FAA when such notice will promote air safety. Under current rules, each tower owner proposing to construct or alter an antenna structure that is more than 200 feet (61 meters) AGL, or that may interfere with the approach or departure space of a nearby airport runway, must notify the FAA of the proposed construction and subsequently register the tower with the Commission's ASR Program.

As part of its review, the FAA considers whether the proposed structure constitutes a potential hazard, and may recommend appropriate painting and lighting for the structure. Current FAA guidelines ordinarily require lighting for communications towers over 200 feet (61 meters) tall, as well as for some towers in the approach or departure space of a nearby runway. Such lighting must conform to one of the six FAA Lighting Styles for communications towers. While some of these FAA Lighting Styles rely solely on white flashing lights, all styles that use red flashing lights also use red steady-burning lights. The FAA is in the final stages of conducting a conspicuity study that specifically addresses the use of red flashing lights instead of red steady-burning lights. Depending on the results of that study, the FAA may consider revising its lighting circular to allow lighting schemes that use red flashing lights without red steady-burning lights.

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In a Report and Order released November 30, 1995, the Commission adopted rules implementing the ASR Program and began requiring antenna structure owners (instead of licensees) to register antenna structures with the Commission. The towers registered in ASR include towers constructed prior to the 1995 Report and Order that meet the criteria for registration as well as those constructed since. In a Memorandum Opinion and Order on Reconsideration released March 8, 2000, the Commission clarified several registration requirements. In a Notice of Proposed Rulemaking released April 20, 2010, the Commission sought comment on proposed procedural and other changes to the ASR process.

The number of towers constructed annually increased dramatically beginning in the early 1980s through about the year 2000 (FCC 2011b). Since 2000, the annual number of registered towers constructed has decreased, but still remains at levels above those in the early 1990s.

1.2.1 Court Cases and FCC Proceedings

In the Migratory Bird Notice of Inquiry (NOI) released in August of 2003 (WT Docket No. 03-187, Effects of Communications Towers on Migratory Birds), the Commission launched an inquiry regarding the impact that collisions with communications towers may have on migratory birds. The NOI requested information supported by scientific evidence on a number of topics in three general categories:

- the number of migratory bird collisions with communications towers;
- the role that certain factors such as lighting, height and type of antenna structure, weather, tower location, and bird migration paths might play in such collisions; and,
- the effectiveness of any measures to mitigate migratory bird collisions with communications towers.

Based on the record developed in response to the NOI, the Commission stated that it would consider whether further action was warranted, including possible amendments of the environmental rules.

To assist the Commission in evaluating the quality and sufficiency of the existing research, FCC hired an environmental consulting firm, Avatar Environmental LLC (Avatar). After Avatar furnished a report with its findings and recommendations (Avatar et al. 2004), the FCC's Wireless Telecommunications Bureau issued a Public Notice seeking comments and reply comments in response to the report's findings.

In its Notice of Proposed Rulemaking in November of 2006, the FCC sought comments on whether the Commission should take measures to reduce the number of instances in which migratory birds collide with communications towers.

In *American Bird Conservancy, Inc. v. FCC* (2008), the U.S. Court of Appeals for the District of Columbia Circuit determined that the FCC has not adequately evaluated the potential effects that its current ASR program has on threatened and endangered (T&E) species and migratory birds. The court decision held that in order for the FCC to comply with its obligations under NEPA and the ESA, the Commission must consider whether the potential significant environmental impacts from the ASR program require preparation of a PEIS. The court stated that the Commission could begin this evaluation with a PEA. The court also instructed the FCC to reconsider whether potential effects on threatened and endangered species require programmatic consultation with the USFWS under the ESA. In addition, the court required the Commission to provide notice of ASR applications that would ensure meaningful public involvement in NEPA review.

On May 2, 2008, a group of trade associations filed a Petition for Expedited Rulemaking regarding how the Commission should provide pre-approval public notice and opportunity for comment as required under *American Bird Conservancy, Inc. v. FCC*. The FCC then opened Docket No. WT 08-61 (National Environmental Policy Act Compliance for Proposed Tower Registrations) to address the court's decision. The FCC sought comment on the trade associations' petition.

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On April 29, 2009, the FCC issued a Public Notice seeking comments on a petition for expedited rulemaking and other relief filed on April 14, 2009, by the American Bird Conservancy, Defenders of Wildlife, and National Audubon Society. The petitioners requested that the Commission adopt on an expedited basis new rules that they assert are necessary to comply with NEPA, ESA, the Migratory Bird Treaty Act (MBTA), and the FCC's implementing regulations, and to carry out the court's mandate in *American Bird Conservancy, Inc. v. FCC*.

1.2.2 Draft Procedures

The FCC, pursuant to CEQ rules, has prepared and sought comment on draft procedures designed to help ensure that the environmental effects of proposed communications towers, including their effects on migratory birds, are fully considered prior to construction. Under CEQ rules, before adopting procedures implementing NEPA, an agency must publish its draft procedures in the Federal Register for comment, and CEQ must determine that the procedures conform to NEPA and CEQ regulations. Comments on the draft procedures were due on or before May 5, 2011.

The draft procedures, if adopted, would require:

- Applicants for new tower registration to provide a 30-day opportunity for public comment on the environmental effects of the proposed construction; and
- On an interim basis, pending completion of this PEA, preparation of an EA for a proposed tower more than 450 feet (137 meters) in height to address its potential impact on migratory birds.

1.3 REGULATORY FRAMEWORK

This PEA has been prepared in accordance with NEPA, CEQ regulations for implementing NEPA (40 CFR 1500-1508), and FCC regulations for implementing NEPA (47 CFR 1.1301-1.1319). CEQ regulations mandate that all Federal agencies use a systematic interdisciplinary approach to environmental planning and the evaluation of actions that might significantly affect the human environment. According to Section 1508.14 of the CEQ regulations, "human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. A determination of "significance" according to Section 1508.27 of the CEQ regulations requires consideration of both context and intensity.

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

Intensity refers to the severity of impact and includes: consideration of both beneficial and adverse impacts; effects on public health or safety; unique characteristics of the geographic area; the degree to which impacts are likely to be highly controversial, highly uncertain, or involve unique or unknown risks; the degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration; whether the action is related to other actions with individually insignificant but cumulatively significant impacts; the degree to which the action may adversely affect cultural resources protected by the National Historic Preservation Act (NHPA) or T&E species protected by the ESA; and whether the action would violate a Federal, state, or local law that protects the environment.

The intent of NEPA is to protect, restore, or enhance the human environment through well-informed Federal decisions. This PEA evaluates the environmental effects of the ongoing ASR Program (the No Action Alternative) and several alternatives. If the FCC decides to adopt an alternative for which the PEA determines that the environmental effects are not potentially significant, a Finding of No Significant

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Impact (FONSI) will be issued. Otherwise, a Notice of Intent to prepare a PEIS will be published in the Federal Register.

NEPA requires consideration be given to all aspects of the human environment through a systematic, interdisciplinary approach to agency decision-making (PL 91-190 42 U.S.C. § 4332). This interdisciplinary approach ensures balanced consideration of various resources. The review of actions under an array of other Federal environmental statutes can also be incorporated into the NEPA process. Much of the research, planning, and consultation that occur under these other laws can take place at the same time that the evaluation and assessment is done for the NEPA document, thus avoiding duplicate data collection and analysis. It is highly recommended, and in some cases required, to document compliance with other Federal laws and Executive Orders (EOs) in the NEPA document.

This PEA will address the FCC's obligations under these other Federal environmental statutes. Although the FCC as an independent agency is not subject to most EOs, in some instances the FCC considers the effects on the subjects of EOs as part of its evaluation of effects on the human environment under NEPA (e.g., floodplains as set forth in EO 11988 and wetlands as set forth in EO 11990). Where useful to provide better understanding, key provisions of relevant statutes and EOs are discussed in more detail in the text of the PEA.

Under Section 7 of the ESA, as amended (U.S.C. 1531-1544), Federal agencies, in consultation with the USFWS or the National Marine Fisheries Service (NMFS), are required to evaluate the effects of their actions on special status species of fish, wildlife, and plants, and their habitats, and to take steps to conserve and protect these species. Special status species are defined as plants or animals that are candidates for, proposed as, or listed as sensitive, threatened, or endangered by USFWS or NMFS. Because towers registered under the ASR Program are not located in marine environments, this PEA discusses ESA matters only in terms of those species regulated by the USFWS.

The MBTA (16 U.S.C. 703-712) was enacted to ensure the protection of shared migratory bird resources. A migratory bird is any species that lives, reproduces, or migrates within or across international borders at some point during its annual life cycle. The MBTA prohibits the take and possession of any migratory bird, its eggs, or nests, except as authorized by a valid permit or license. Courts have rendered differing decisions regarding the scope of the MBTA's application to Federal agencies, as well as whether a party may be liable under the MBTA for the unintentional, incidental death of a migratory bird.

EO 13186, Protection of Migratory Birds, directs Federal agencies whose activities have or are likely to have a measurable, negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with USFWS to promote the conservation of migratory birds.

The FCC has not yet resolved the nature and scope of its responsibilities, if any, under the MBTA, and as an independent agency, the FCC is not subject to the terms of EO 13186. However, because migratory birds are part of the human environment that is considered under NEPA, they are addressed in this PEA.

Under the current ASR program, tower registration applications are categorically excluded from the requirement to prepare an EA unless the proposed facility:

- Would be located in an officially designated wilderness area or wildlife preserve.
- 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.
- May affect resources listed or eligible for listing in the National Register of Historic Places (NRHP) or Native American religious and cultural sites.
- Would be located in a floodplain.

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- Would involve significant changes in surface features (e.g., wetland fill, deforestation, or water diversion).
- Would be equipped with high intensity white lights and located in a residentially zoned neighborhood.
- Would cause human exposure to levels of RF radiation in excess of limits established in 47 CFR §§1.1310 and 2.1093.

In these cases, the applicant must prepare an EA that includes sufficient analysis to support a determination that the proposed tower would or would not have a significant environmental impact.

The FCC will also require an EA if the processing Bureau, in response to a petition or on its own motion, determines that an otherwise categorically excluded action may have a significant environmental impact. In addition, the FCC's draft NEPA notice procedures provide for public notice and a 30-day opportunity for public comment on the environmental effects of the proposed construction. The applicant would not be permitted to certify that the project is categorically excluded until after the FCC has confirmed that it has identified no reason to require an EA in light of any comments it has received.

1.4 PROPOSED ACTION

The Proposed Action consists of reviewing the existing ASR Program and NEPA compliance procedures to evaluate their effects on migratory birds and other environmental resources, in compliance with the 2008 court decision.

1.5 SCOPE OF THE PEA

CEQ regulations (40 CFR §§ 1500.4(i), 1502.4, and 1502.20) encourage the development of program-level NEPA documents to focus on the issues specific to a proposed action. This PEA will also address other environmental regulations by providing a framework for assessing impacts of proposed future, individual projects.

A programmatic environmental document, such as this PEA, is prepared when an agency is proposing to carry out a broad action, program, or policy. The existing ASR Program, which the court ordered the FCC to review, is a broad action with nationwide implications. The programmatic approach creates a comprehensive, global analytical framework that assesses impacts expected from the program (or changes to the program) as a whole. It also supports subsequent environmental evaluations, such as stand-alone, site-specific EAs that may be required to determine the nature and extent of impacts resulting from individual towers at specific locations. It also allows the FCC to identify those project types that are unlikely to have significant adverse impacts on the environment, and therefore can be categorically excluded from preparation of an EA.

The scope of this PEA includes an evaluation of the range of potential environmental impacts associated with existing towers and new towers requiring registration under the FCC's ASR Program. The project types examined in this PEA have been categorized into various groups based on height, location, structure type (self-supported versus guy-wired), and lighting scheme. Because of the nature of the projects under the ASR Program and in response to the 2008 court decision, this PEA primarily focuses on potential impacts to migratory birds.

The PEA evaluates the environmental effects of the existing ASR program (No Action Alternative), the existing ASR program with FAA lighting changes (Alternative 1), and modifications to the ASR program (Alternative 2 with three options).

The FCC recognizes that new studies and research are being planned and conducted to examine the environmental impacts of towers, especially related to bird collisions and impacts to migratory birds. Due

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to the changing technology and anticipated new studies examining bird and tower interactions, this PEA encompasses a 10-year planning timeframe, and will be reviewed for adequacy should future major changes to the ASR Program be considered or major changes to environmental conditions occur.

1.6 PUBLIC INVOLVEMENT

NEPA states that "There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to the proposed action." The FCC has engaged stakeholders and the general public in preparing this PEA. Stakeholders include Federal agencies, environmental organizations, industry interests, and the public.

1.6.1 Scoping Process

During the PEA planning process, the FCC provided several opportunities for public and stakeholder involvement. The FCC issued a Public Notice in the Federal Register on November 17, 2010 (Vol. 75, No. 221, pp. 70166-70168), announcing a January 14, 2011, deadline for public scoping comments and three public scoping meetings to be held in December 2010. These meetings were held as follows:

- December 6 in the District of Columbia (this meeting was also available as a webcast)
- December 13 in Tampa, FL
- December 15 in San Diego, CA

The FCC also held meetings with various agencies to discuss the development of the PEA.

- On February 11, 2011, and August 16, 2011, the FCC met with USFWS representatives to discuss migratory bird issues.
- On March 4, 2011, the FCC met with USFWS representatives to discuss threatened and endangered species issues.
- On March 24, 2011, the FCC met with CEQ representatives to discuss the approach being taken for the PEA.

On April 1, 2011, the FCC held a public workshop in the District of Columbia to discuss the project status, proposed action alternatives, available data, and impact evaluation methods.

1.6.2 Draft PEA

The FCC considered information obtained during the scoping process in preparing the Draft PEA. The public was notified of the opportunity to review and comment on the Draft PEA in various ways, including publication of a notice in the Federal Register and the posting of a notice of the availability of the Draft PEA on the FCC website. The FCC also sent e-mail notifications to those individuals who requested to be notified when the Draft PEA was published and provided direct mailings to individuals who requested a copy of the document.

The Draft PEA was available for public review between August 26, 2011, and October 3, 2011, via download from the FCC website in ASCII, Microsoft Word®, and Portable Document Format. Paper copies of the Draft PEA were available for public review during regular business hours at the FCC Reference Center, Federal Communications Commission, 445 12th Street, S.W., CY-A257, Washington, D.C., 20554. Accessible formats (computer diskettes, large print, audio recording, and Braille) were available via e-mail requests to fcc504@fcc.gov or via telephone requests to the FCC's Consumer and Governmental Affairs Bureau at (202) 418-0530 (voice) or (202) 418-0432 (TTY).

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1.6.3 Summary

The FCC solicited public and agency review and comment on the environmental impacts of the ASR Program PEA through:

- Public scoping meetings;
- A public workshop;
- Meetings and consultations with Federal agencies;
- Publication of a notice of availability of this Draft PEA in the Federal Register;
- Publication of the Draft PEA on the FCC website for review;
- Placement of the Draft PEA in a public repository for review; and,
- Direct mailing of the Draft PEA to individuals who requested a copy of the document.

Appendix A provides a list of agencies, organizations, and individuals consulted during the NEPA process.

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CHAPTER TWO PURPOSE AND NEED

2.1 PURPOSE

The ASR Program promotes air safety by requiring the registration of antenna structures that may create a hazard to air navigation due to their height (greater than 200 feet [61 meters] AGL) or proximity to an airport runway. Through the registration process, environmental impacts from proposed towers are evaluated. The current ASR Program does not routinely require an applicant to prepare an EA to evaluate potential impacts to migratory birds.

The purpose of the Proposed Action is to examine how potential environmental impacts are evaluated as part of the ASR Program and associated NEPA review and documentation.

2.2 NEED

The U.S. Court of Appeals for the District of Columbia Circuit in *American Bird Conservancy, Inc. v. FCC* (2008) determined that the FCC has not adequately evaluated the potential environmental effects of its current ASR program on threatened and endangered species and migratory birds. To ensure that the FCC complies with its obligations under NEPA, there is a need to consider whether the current program should be revised to require applicants to provide more comprehensive evaluations of potential impacts on resources, especially migratory birds.

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CHAPTER THREE ALTERNATIVES

The ASR Program is the process under which each antenna structure that requires FAA notification must be registered with the FCC by its owner. The ASR requirements only apply to those antenna structures that may create a hazard to air navigation due to height (generally, structures more than 200 feet [61 meters] tall) or proximity to an airport runway. Under the current ASR program, tower registration applications are categorically excluded from preparation of an EA unless they fall within one of the categories listed in the FCC NEPA regulations found at 47 CFR § 1.1307(a) and (b), which are presented below.

The Proposed Action consists of reviewing the existing ASR Program and NEPA compliance procedures to evaluate their effects on migratory birds and other environmental resources, in compliance with the 2008 court decision.

The Commission's draft procedures (FCC 2011a), if adopted, would require applicants for new tower registration to provide a public notice and 30-day opportunity for comment on the environmental effects of the proposed construction. The applicant would not be permitted to certify that the project is categorically excluded until after the FCC has confirmed that it has identified no reason to require an EA in light of any comments received. For projects requiring an EA, the 30-day opportunity for comment could be provided after the applicant prepares the EA, as occurs under the Commission's existing procedures. After the close of the comment period, the FCC would either issue a FONSI or prepare an EIS. The No Action Alternative, Alternative 1 and Alternative 2 each assume that the public notice and comment procedures will be adopted and remain in place.

The draft procedures also, as an interim measure, require applicants to prepare an EA for proposed towers that are more than 450 feet (137 meters) tall to address potential impacts on migratory birds. Alternative 2 Option C considers the effects of adopting this requirement on a permanent basis.

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 completion of a conspicuity study, the FAA may consider revisions to the circular that would allow lighting schemes that use red flashing lights without red steady-burning lights. Therefore, Alternative 1 considers what the effects of the No Action Alternative would be if the FAA revises its lighting styles. In addition, Chapter 5, Chapter 6, and Chapter 7 describe the effects that each of the options under Alternative 2 would have on migratory birds both with and without revisions to the FAA-permitted lighting schemes.

3.1 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 (Figure 1).

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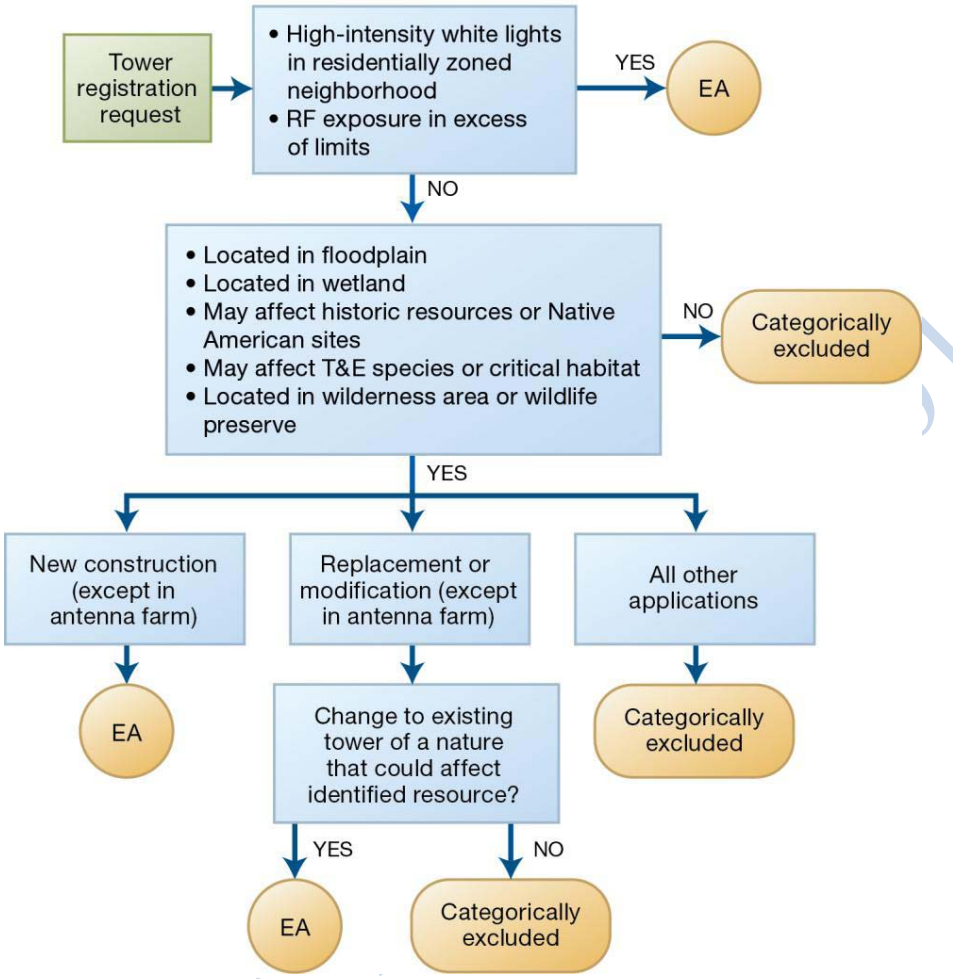

Figure 1: NEPA Flow Chart No Action Alternative

The current ASR Program does not routinely require an applicant to prepare an EA to evaluate potential impacts to migratory birds other than those that are federally listed or proposed as threatened or endangered. Under the current ASR program, new towers are categorically excluded from requirements to prepare an EA unless the proposed facility:

- Would be located in an officially designated wilderness area or wildlife preserve.
- 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.
- 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 (e.g., wetland fill, deforestation, or water diversion).
- Would be equipped with high intensity white lights and located in a residentially zoned neighborhood.

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- Would cause human exposure to levels of RF radiation in excess of limits in 47 CFR §§1.1310 and 2.1093.

In these cases, the applicant must prepare an EA that provides sufficient analysis for FCC staff to reach a determination that the project would or would not have a significant environmental impact. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds, including individual species of migratory birds to the extent that species-specific information exists, and on Bald and Golden Eagles.

3.2 ALTERNATIVE 1 – EXISTING ASR PROGRAM WITH FAA LIGHTING CHANGES

Alternative 1 is the 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, along with the potential changes to the FAA's permitted lighting configurations under which future towers that use red flashing lights would not also have red steady-burning lights (Figure 2).

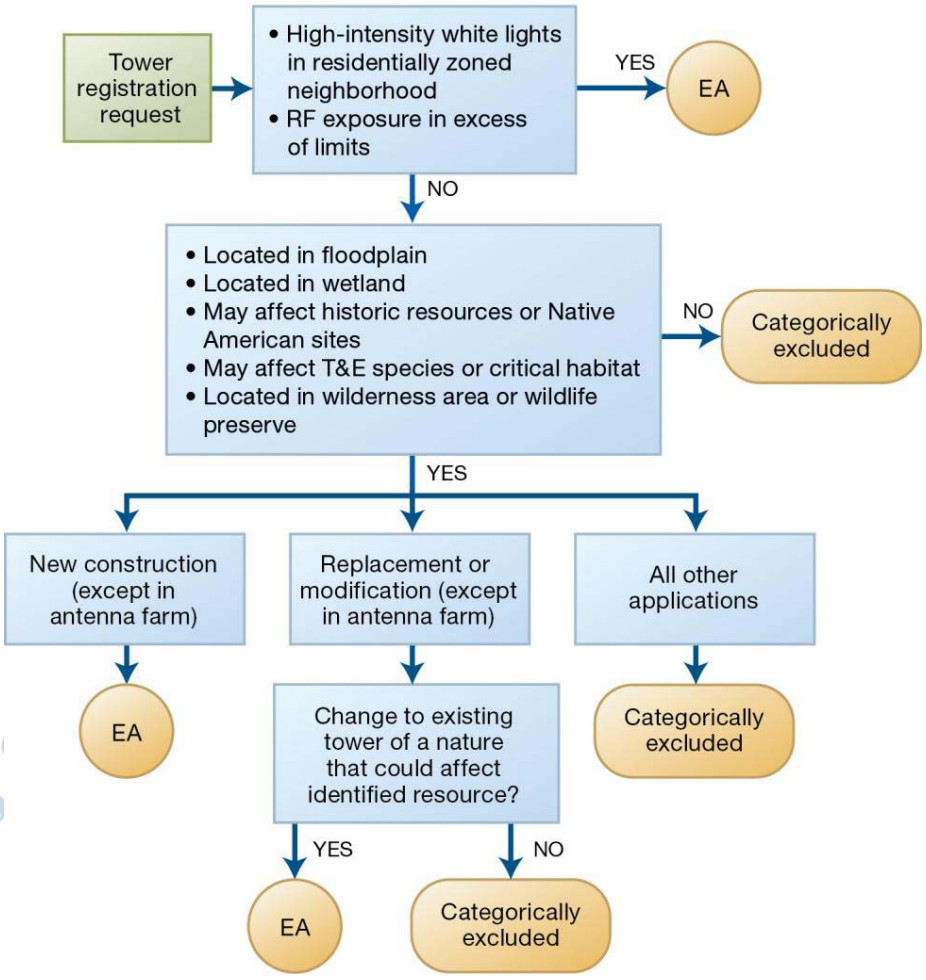

Figure 2: NEPA Flow Chart Alternative 1

The flowchart for Alternative 1 (Figure 2) is the same as for the No Action Alternative (Figure 1) – this is because FCC rules would not change under Alternative 1. The only change that would occur under

Alternative 1 is that tower owners would have different choices in selecting lighting schemes in accordance with the revised FAA circular.

The current ASR Program, and thus the program under Alternative 1, does not routinely require an applicant to prepare an EA to evaluate potential impacts to migratory birds other than those that are federally listed or proposed as threatened or endangered. Under the current ASR program, new towers are categorically excluded from requirements to prepare an EA unless the proposed facility:

- Would be located in an officially designated wilderness area or wildlife preserve.
- 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.
- 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 (e.g., wetland fill, deforestation, or water diversion).
- Would be equipped with high intensity white lights and located in a residentially zoned neighborhood.
- Would cause human exposure to levels of RF radiation in excess of limits in 47 CFR §§1.1310 and 2.1093.

In these cases, the applicant must prepare an EA that provides sufficient analysis for FCC staff to reach a determination that the project would or would not have a significant environmental impact. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds, including individual species of migratory birds to the extent that species-specific information exists, and on Bald and Golden Eagles.

3.3 ALTERNATIVE 2 – MODIFICATIONS TO THE ASR PROGRAM

Under Alternative 2, the FCC would revise its NEPA compliance procedures for the ASR Program to require more comprehensive assessments of potential environmental impacts from new towers and tower modifications involving a substantial increase in size, particularly for potential effects to migratory birds. Alternative 2 would not change the procedures for tower modifications or replacements that do not involve a substantial increase in size, for certain lighting changes, or for minor ASR actions, including administrative changes, changes in ownership, dismantling of towers, and minor changes/corrections to existing towers. It also would not affect activity at registered towers that does not require action in the ASR system, such as tower repair and replacement of tower parts. Under all options, Alternative 2 would include the public notice and 30-day public comment requirement in the FCC's draft procedures.

There are three options under Alternative 2 for determining the level of NEPA review that would be required for a project.

3.3.1 Alternative 2 Option A – Require an EA for All Projects Submitted for Registration Except for Certain Changes to Existing Towers

Under Alternative 2 Option A, an EA would be required 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 as described below (Figure 3).

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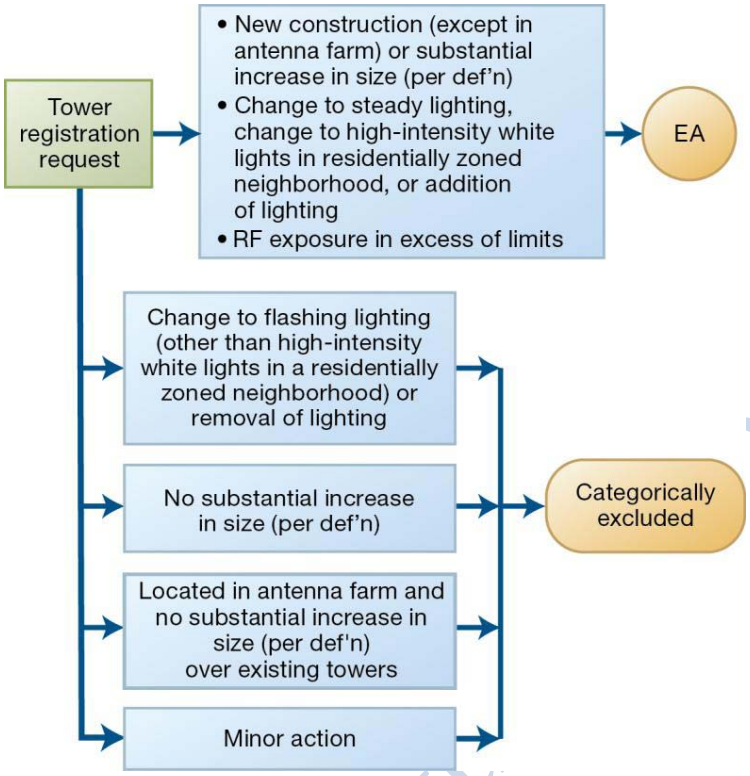

Figure 3: NEPA Flow Chart Alternative 2 Option A

Towers in an antenna farm, replacement towers, and modifications of existing towers would require an EA if they involve a substantial increase in size over the existing tower or towers. A substantial increase in size is defined as: (1) an increase in height of greater than 10 percent over the existing tower height (or the tallest tower in the array) or the height of one additional antenna array with separation from the nearest existing antenna not to exceed 20 feet (6 meters), whichever is greater; (2) a protrusion of more than 20 feet (6 meters) or more than the width of the tower at the height of the protrusion, whichever is greater; (3) the installation of more than four equipment cabinets or one equipment shelter; or (4) excavation more than 30 feet (9 meters) outside the existing tower site. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds, including individual species of migratory birds to the extent that species-specific information exists, and on Bald and Golden Eagles.

An EA would also be required for changes to existing towers involving: (1) a change to steady lighting; (2) a change to high-intensity white lighting in a residentially zoned neighborhood; (3) addition of lighting; or (4) human exposure to levels of RF radiation in excess of the limits in 47 CFR §§ 1.1310 and 2.1093.

Under Option A, the only projects that would be categorically excluded from preparation of an EA would be those that propose any of the following:

- A change from red steady-burning to flashing lights or removal of lighting on an existing tower (depending upon potential revisions to the FAA lighting circular).
- Replacement or modification of an existing tower that involves no substantial increase in size (per definition).
- Construction in an antenna farm that does not involve a substantial increase in size over existing towers.

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- A minor action.

3.3.2 Alternative 2 Option B – Limit which Projects Are Categorically Excluded and Require an EA for the Rest

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 (Figure 4).

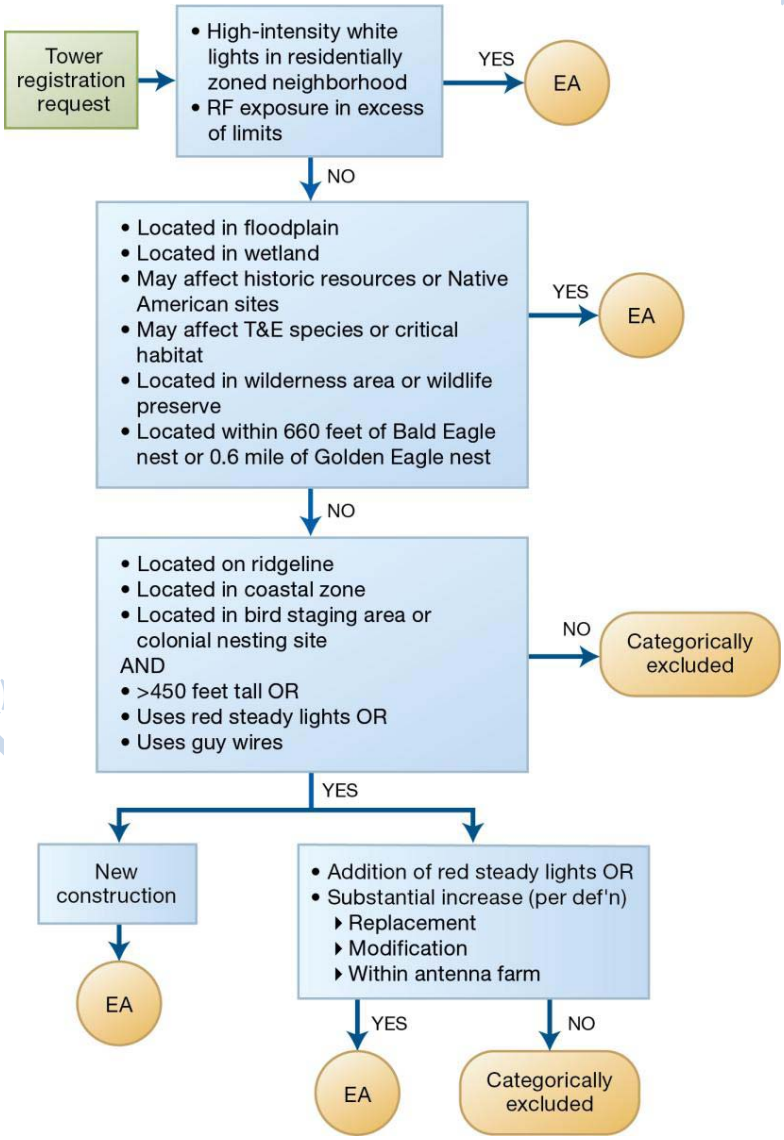

Figure 4: NEPA Flow Chart Alternative 2 Option B

Under Option B, any proposed new tower would be categorically excluded from preparation of an EA unless it:

- Would be located in an officially designated wilderness area or wildlife preserve.
- 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.
- 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 (e.g., wetland fill, deforestation, or water diversion).
- Would be equipped with high intensity white lights and located in a residentially zoned neighborhood.
- Would cause human exposure to levels of RF radiation in excess of limits in 47 CFR §§1.1310 and 2.1093.
- Would be located within 660 feet (201 meters) of a Bald Eagle nest or 0.6 mile (1 kilometer) of a Golden Eagle nest.

OR would be located in an area considered an important resource for migratory birds, including:

- ridgelines
- coastal zones
- bird staging areas or colonial nesting sites

AND would:

- be more than 450 feet (137 meters) tall **OR**
- use a red steady-burning light scheme **OR**
- use guy wires

Towers in an antenna farm, replacement towers, and modifications to existing towers would require an EA under the same circumstances as new towers if they involve a substantial increase in size, as defined under Option A. An addition of red steady-burning lights to an existing tower would also require an EA if the tower is located on a ridgeline or in a coastal zone, bird staging area, or colonial nesting site. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds, including individual species of migratory birds to the extent that species-specific information exists, and on Bald and Golden Eagles. If the tower is in a wetland or floodplain and is over 450 feet (137 meters) tall, uses red steady lights, or uses guy wires, the FCC would expect the applicant to provide either evidence that it is not in a riparian zone or a detailed analysis of its effects on migratory birds.

3.3.3 Alternative 2 Option C – Require an EA for All Projects More Than 450 feet in Height but Otherwise Do Not Change the Categorical Exclusion

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

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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 (Figure 5).

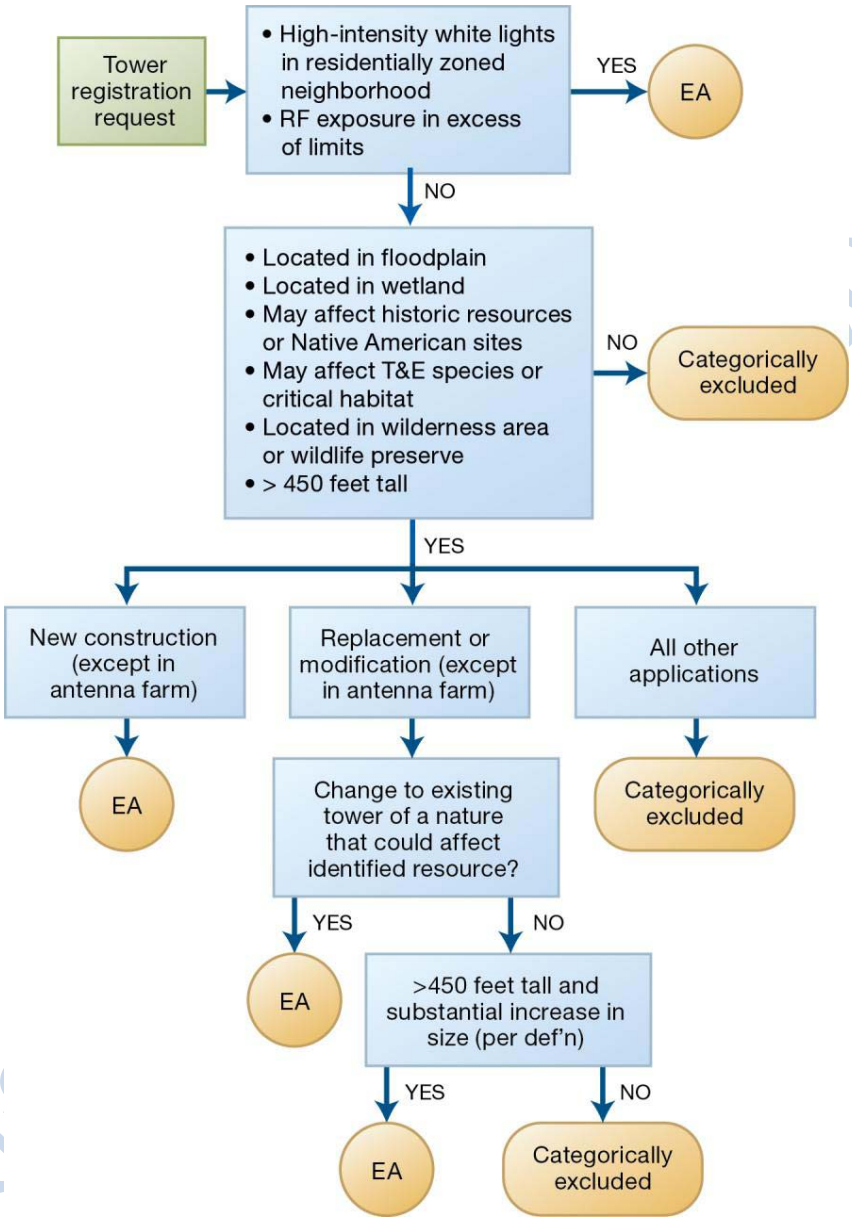

Figure 5: NEPA Flow Chart Alternative 2 Option C

Towers less than or equal to 450 feet (137 meters) AGL would be categorically excluded from preparation of an EA unless the proposed facility:

- Would be located in an officially designated wilderness area or wildlife preserve.
- 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.

- 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 (e.g., wetland fill, deforestation, or water diversion).
- Would be equipped with high intensity white lights and located in a residentially zoned neighborhood.
- Would cause human exposure to levels of RF radiation in excess of limits in 47 CFR §§1.1310 and 2.1093.

In these cases, the applicant must prepare an EA that provides sufficient analysis for FCC staff to reach a determination that the project would or would not have a significant environmental impact. Every EA would need to consider, in addition to other potential environmental effects, the effects that the project would have on migratory birds, including individual species of migratory birds to the extent that species-specific information exists, and on Bald and Golden Eagles.

3.4 ALTERNATIVES CONSIDERED AND DISMISSED

The CEQ regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives to a proposed action and briefly discuss the rationale for eliminating any alternatives that are not considered in detail in the NEPA document. Alternatives may be dismissed if they do not meet the project's purpose and need or if they are considered not feasible. The following alternatives were initially considered but then dismissed for the reasons described below.

3.4.1 Prohibit All New Tower Construction

Due to the demand for services that communications towers support, it is not feasible to consider prohibiting all new tower construction. Therefore, this alternative was dismissed from further consideration.

3.4.2 Prohibit Towers That Exceed a Certain Height

This alternative would prohibit construction of new towers that exceed a certain height (to be determined). However, the height of a communications tower is based on several considerations, including technological requirements for the service to be provided, size of area over which service is to be provided, topography, distance to other towers, and other factors. Due to these considerations, it is not feasible to require all towers to be shorter than a certain height. Therefore, this alternative was dismissed from further consideration.

3.4.3 Prohibit Towers in Certain Locations

This alternative would prohibit construction of new towers in certain locations (to be determined). However, the location of a communications tower is based on several considerations, such as technological requirements for the service to be provided, size of area over which service is to be provided, topography, and distance to other towers. Due to these considerations, it is not feasible to prohibit all towers in certain locations. Therefore, this alternative was dismissed from further consideration.

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3.4.4 Prohibit Guy Wires on New Towers

This alternative would prohibit construction of new towers that require the use of guy wires. However, the need for guy wires on a communications tower is based on several considerations, such as the height of the tower and wind stress. Due to these considerations, it is not feasible to prohibit all towers from using guy wires. Therefore, this alternative was dismissed from further consideration.

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CHAPTER FOUR AFFECTED ENVIRONMENT

4.1 INTRODUCTION

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

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

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

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

4.2 EXISTING COMMUNICATIONS TOWERS

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

4.2.1 General Characteristics

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

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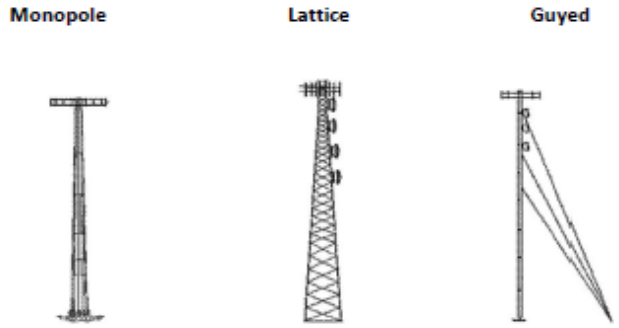

Figure 6: Tower Types

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

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

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

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

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

4.2.2 Number of Existing Towers

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

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

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

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4.2.3 Distribution of Existing Towers

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

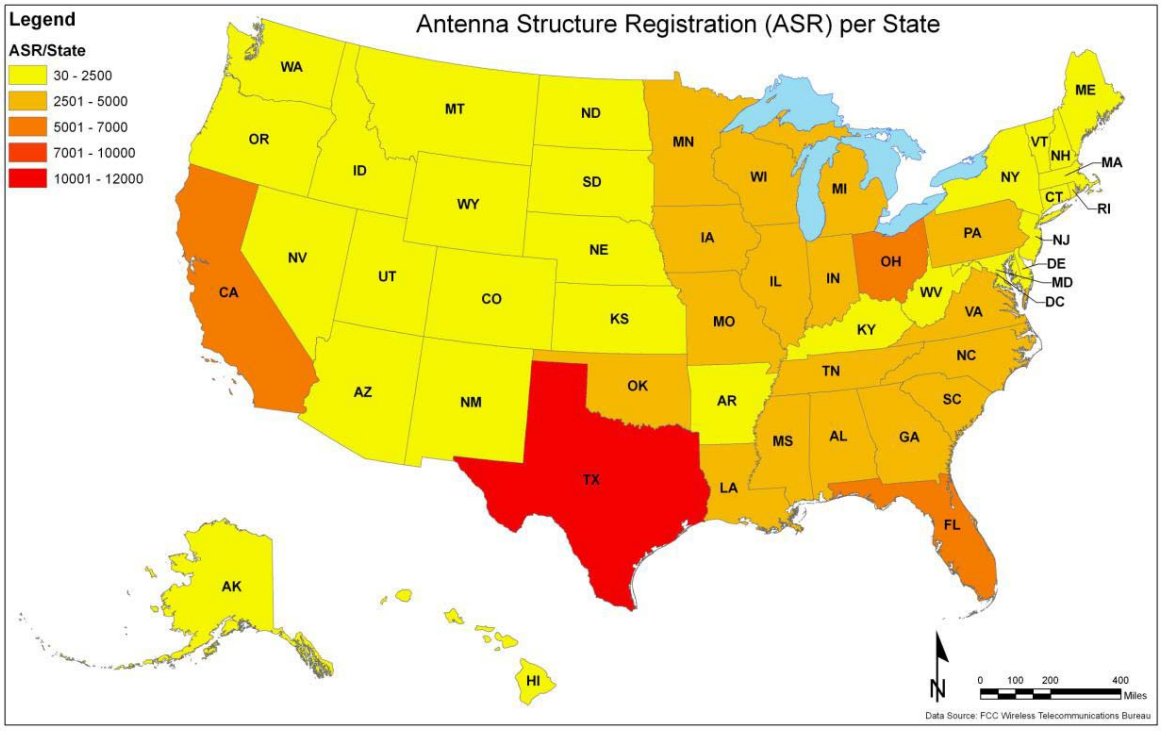

Figure 7: Number of Towers by State
Source: FCC 2011b

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

4.2.4 Future Needs/Trends

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

There are factors suggesting the number of new registered towers constructed each year may continue to decline, as well as factors suggesting the trend might instead level off or even slightly increase. One factor suggesting decline is the continued splitting of cells (the area covered by each base station antenna) to meet needs for capacity. Smaller cells typically require lower antennas, which frequently can either be collocated on existing structures or placed on shorter towers that do not require registration and lighting. Another factor that has reduced the need for towers in recent years is consolidation in the telecommunications industry, which has enabled companies to avoid duplication of facilities. In addition,

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the future need for new towers may be reduced due to the development of distributed antenna system (DAS) technology. Where DAS is deployed, service is provided through a series of antennas typically mounted at a height of about 30 to 40 feet (9 to 12 meters), which eliminates the need for many taller towers. A single neutral-host DAS can accommodate multiple carriers. For economic and other reasons, DAS is not a viable solution for all areas. Where it is deployed, however, fewer registered towers will be necessary to provide cellular or broadband services.

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

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

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

4.3 RESOURCES NOT AFFECTED

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

4.3.1 Geology

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

4.3.2 Soils

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

4.3.3 Farmlands

Prime and unique farmlands and farmlands of state and local importance are protected under the Farmland Protection Policy Act of 1981 (7 U.S.C. § 4201 *et seq*.). Prime farmland is characterized as land with the best physical and chemical characteristics for the production of food, feed, forage, fiber, and oilseed crops. Prime farmland is either used for food or fiber crops or is available for those crops; it is not urban, built-up land, or water areas. Unique farmland is defined as land that is used for the production of

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certain high-value crops, such as citrus, tree nuts, olives, and fruits. Federal agencies must examine the potentially adverse effects to prime or unique farmlands or farmlands of state or local importance before approving any action that would irreversibly convert farmland to non-agricultural uses.

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

4.3.4 Groundwater

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

4.3.5 Coastal Zones/Coastal Barriers

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

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

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

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

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4.3.6 Designated Wilderness Areas

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

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

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

4.3.7 Air Quality

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

4.3.8 Noise

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

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4.3.9 Land Use

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

4.4 WATER RESOURCES

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

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

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

4.4.1 Surface Water

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

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

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

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

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

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

4.4.2 Wetlands and Waters of the United States

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

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

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

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

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

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

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

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

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

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

4.5 FLOODPLAINS

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

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

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

EO 11988 (Floodplain Management) requires Federal agencies to determine whether a proposed action would occur within a floodplain and to take action to minimize occupancy and modification of floodplains. At a minimum, areas designated as floodplains are susceptible to 100-year floods (defined as a flood having a 1 percent chance of occurring in any given year). EO 11988 requires that Federal agencies proposing to site a project in the 100-year floodplain consider alternatives to avoid adverse effects and incompatible development in the floodplain. If no practicable alternatives exist to siting a project in the floodplain, the project must be designed to minimize potential harm to, or within, the floodplain. Furthermore, a notice must be publicly circulated explaining the project and the reasons for its

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siting in the floodplain. As an independent agency, the FCC is not subject to EO 11988; however, the FCC has made a policy decision to consider the effects on 100-year floodplains as part of its evaluation of the effects on the human environment under NEPA.

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

4.6 BIOLOGICAL RESOURCES

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

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

4.6.1 Vegetation and Wildlife

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

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

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

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

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

4.6.2 T&E Species/Critical Habitat

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

The ESA defines an endangered species as any species in danger of extinction throughout all or a significant area of its range and a threatened species as any species likely to become endangered in the near future. Under Section 7 of the ESA, Federal agencies, in consultation with USFWS (for species other

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than marine species which are under the jurisdiction of the National Marine Fisheries Service), must ensure their actions are not likely to jeopardize the continued existence of any T&E species (i.e., a listed species) or to result in the destruction or adverse modification of critical habitat. Critical habitat is defined as a specific geographic area that is essential for the conservation of a T&E species and that may require special management and protection (USFWS 2011b). USFWS is responsible for compiling the lists of T&E species under its jurisdiction.

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

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

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

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

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

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

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

Source: USFWS 2011b

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

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

4.6.3 Migratory Birds

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

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

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

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4.6.3.1 Data Limitations and Uncertainty

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

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

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

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

4.6.3.2 Migratory Bird Abundance

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

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4.6.3.3 Land Birds – Breeding

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

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

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

Table 3: Population Estimates of Land Birds by State

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

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

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

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

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

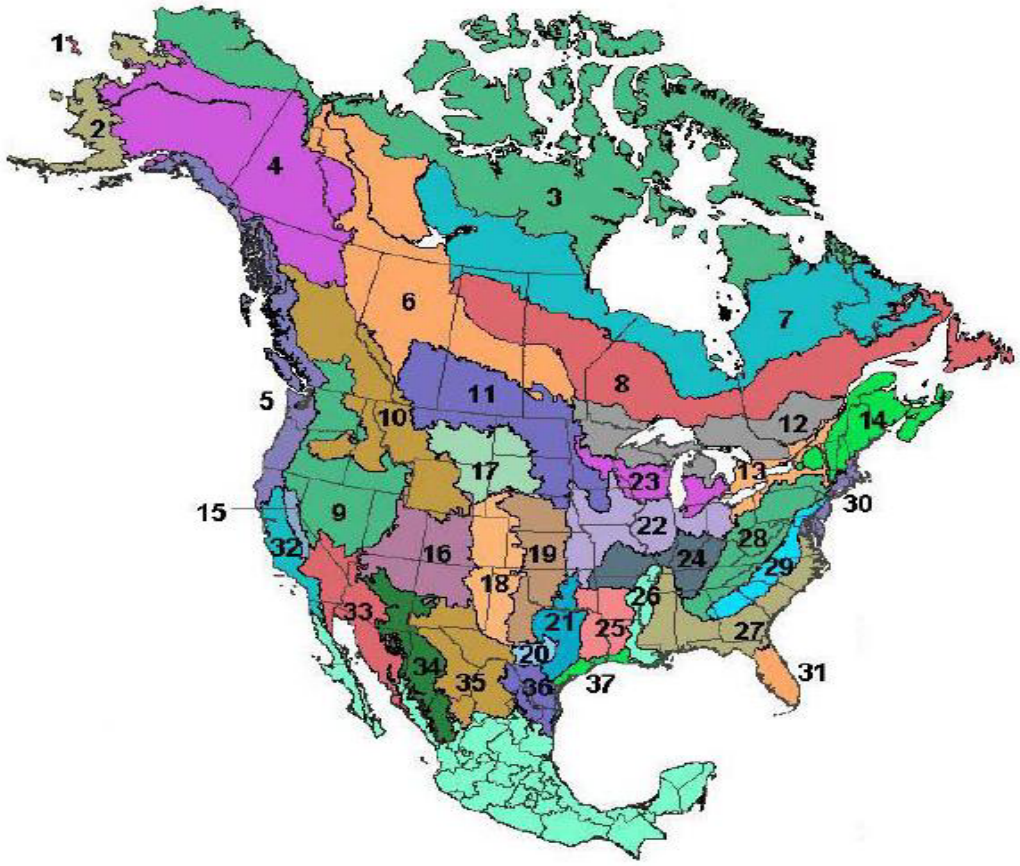

Figure 8: Bird Conservation Regions of the United States

Source: USFWS 2008

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

Table 4: Bird Conservation Regions Population Estimates

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

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Table 4 (continued): Bird Conservation Regions Population Estimates

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

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

4.6.3.4 Land Birds – Wintering

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

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

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

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

4.6.3.5 Waterfowl – Breeding

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

4.6.3.6 Waterfowl – Wintering

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

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4.6.3.7 Migratory Bird Geographic Patterns

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

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

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

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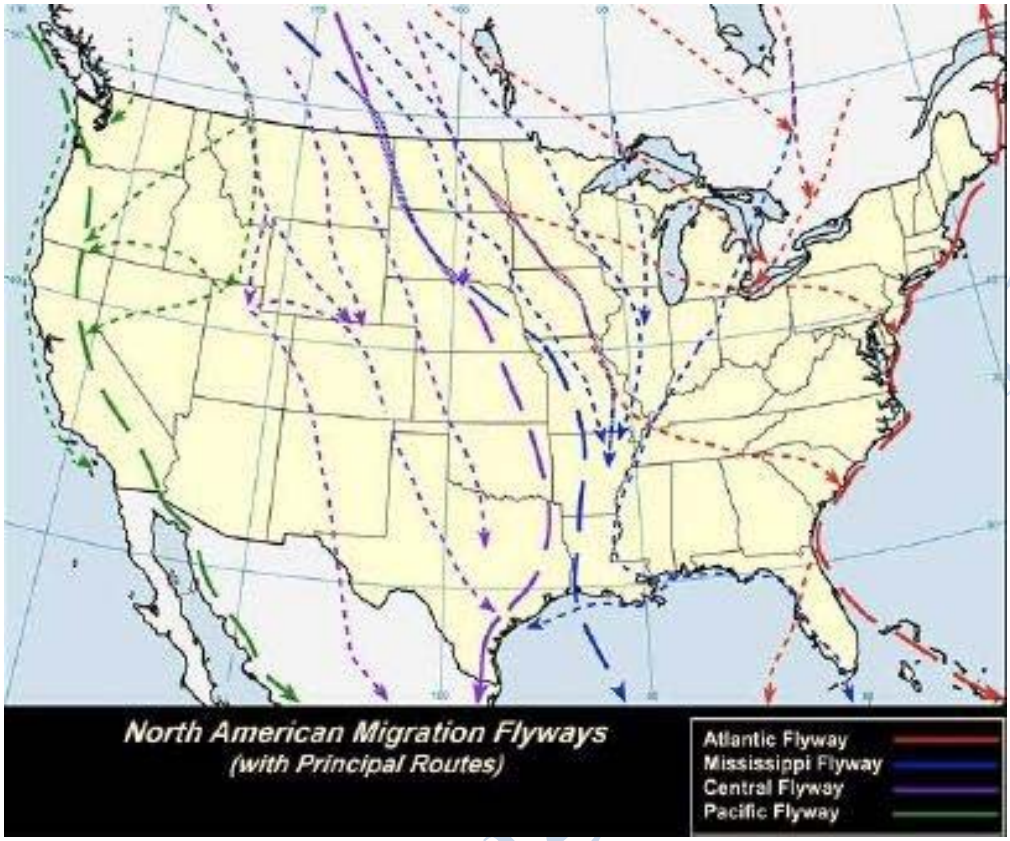

Figure 9: General Depiction of North American Avian Migratory Flyways

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

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

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

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

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

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

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

4.6.3.8 Migratory Bird Flight Altitudes

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

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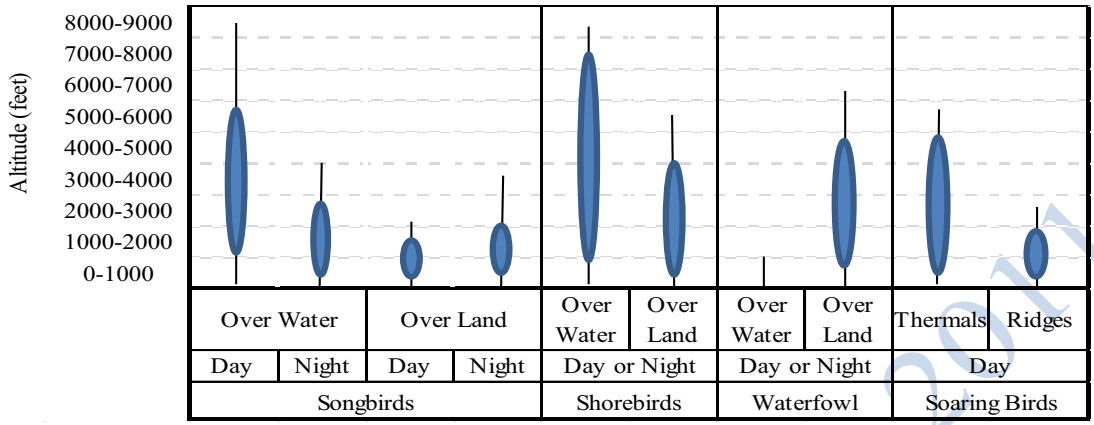

Figure 10: Migratory Flight Altitudes for Various Bird Groups

Source: adapted from Kerlinger 1995

4.6.3.9 Timing of Migration

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

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

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

4.6.3.10 Avian Mortality from Communications Towers

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

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

Geographic Distribution

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

Species-specific Effects

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

Declining Mortality Hypothesis

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

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

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

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

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

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

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

4.6.3.11 Other Sources of Avian Mortality

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

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

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

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

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

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

4.6.4 Bald and Golden Eagles

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

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

Golden Eagle populations are believed to be declining throughout their range in the contiguous United States (Harlow and Bloom 1989, Kochert and Steenhof 2002, Kochert *et al*. 2002, Good *et al*. 2007,

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Farmer *et al*. 2008, Smith *et al*. 2008). Golden Eagles will migrate from the Canadian provinces and northeastern states to areas that are milder in the winter or have less snow cover. Wintering Golden Eagles have been identified in all states in the continental United States. Golden Eagles are not known to roost communally as is common with wintering Bald Eagles in some areas of the U.S, but will gather together if local food sources are abundant (Palmer 1988).

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

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

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

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

4.7 CULTURAL RESOURCES

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

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

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

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

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

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

4.8 OTHER VISUAL AND AESTHETIC RESOURCES

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

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

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

There are no general Federal statutory or regulatory requirements that protect visual resources and aesthetics, but state, regional, or local requirements may apply. The National Scenic Byways Program (P.L. 105–178, 23 U.S.C. §162) protects the viewsheds of national scenic byways, and state laws similarly protect state-designated scenic byways. Consultation with the National Park Service may be

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required for potential impacts on the visual resources in National Parks. Section 6(f) of the Land and Water Conservation Fund Act (16 U.S.C. §460) protects visual resources in some outdoor recreation sites and facilities. In addition, as discussed in Section 4.7, Section 106 of the NHPA requires evaluation of visual impacts on historic properties.

4.9 ECONOMICS

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

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

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

4.10 RADIO FREQUENCY RADIATION

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

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

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

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

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CHAPTER FIVE ENVIRONMENTAL CONSEQUENCES

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

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

5.1 CATEGORIES OF IMPACTS

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

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

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

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

5.2 SIGNIFICANCE OF IMPACTS

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

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5.2.1 Context

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

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

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

5.2.2 Intensity

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

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

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

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

5.2.3 Significance Determination

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

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

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

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

Major impacts are often significant, but are not necessarily so when considered in context. For instance, a major impact would be significant if it threatens the viability of a population so that the population may

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not recover. For example, the deaths of many individual members of a wildlife population, while a major impact, may not constitute a significant impact in the context of a much larger total population that is subject to far greater forces. As explained in Chapter 7, the ASR Program for this reason does not have a significant impact at the national level on migratory birds.

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

5.3 ASSUMPTIONS

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

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

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

5.3.1 Tower Construction Footprints

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

5.3.2 Number of Towers

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

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

5.3.3 Tower Location

It is assumed that tower location is driven by the technological requirements and landscape conditions in a specific area. Because the consideration of areas important to migratory birds is similar under the No Action Alternative, Alternative 1, and Option C of Alternative 2, it is assumed that there likely would be no substantial difference in the locations of towers that would be built under each of these alternatives. It

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is anticipated that under Option B, applicants would attempt where possible to site towers that are over 450 feet (137 meters) tall, have guy wires, or use red steady lighting outside of coastal zones, ridgelines, bird staging areas, and colonial nesting sites, and to site all towers away from Bald and Golden Eagle nests, to avoid having to prepare an EA. Also, under both Option A and Option B some proposed towers may be moved out of avian high use areas as a result of the environmental review process. However, the degree to which towers could be placed to avoid these areas would likely be limited. For example, it is likely that many towers proposed in coastal zones could not be moved out of the coastal zone, since these areas are typically large. Also, moving a tower off a ridgeline may result in the need for a taller tower or multiple towers, which may offset the potential beneficial impacts to migratory birds.

5.3.4 Tower Height

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

5.3.5 Support System

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

5.3.6 Lighting Scheme

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

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new towers will use red steady-burning lights and existing tower owners may choose to remove or turn off red steady-burning lights.

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

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

5.4 IMPACTS BY RESOURCE

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

5.4.1 Water Resources

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

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

5.4.1.1 Surface Water

No Action Alternative

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

Construction of the tower and equipment building would typically result in the disturbance of no more than several acres, and therefore would be expected to result in negligible to minor adverse impacts to surface waters from sedimentation. Construction of any additional roads and utilities that might be

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required could result in minor adverse impacts on surface water resources from sedimentation, depending on site-specific soil conditions, topography, and surface water bodies at any given location.

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

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

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

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

Alternative 1

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

Alternative 2 Options A, B, and C

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

5.4.1.2 Wetlands and Waters of the United States

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

No Action Alternative

Under the No Action Alternative, impacts to wetlands and WOUS would be expected to stay the same. The current ASR Program requires applicants to prepare an EA for proposed towers that would cause a significant change in surface features, including wetland fill. Construction of new towers would be expected to result in short-term and long-term negligible to minor adverse impacts on wetlands and WOUS, due to the potential for construction activities to disturb wetlands or WOUS, cause increased

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sediment runoff into these resources, and create permanent impervious surfaces at the project site. The magnitude of adverse impacts would depend on the specific location and the construction requirements of that location, but in any event should be no greater than negligible to minor due to the small size of the areas to be disturbed or covered with impervious surfaces. Due to the EA requirement, any wetland fill would require approval from the USACE.

Alternative 1

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

Alternative 2 Options A, B, and C

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

5.4.2 Floodplains

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

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

No Action Alternative

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

Alternative 1

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

Alternative 2 Options A, B, and C

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

5.4.3 Biological Resources

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

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

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

No Action Alternative

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

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

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

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

Alternative 1

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

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Alternative 2 Options A, B, and C

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

5.4.3.2 T&E Species and Critical Habitat

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

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

No Action Alternative

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

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

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

The FCC has recently entered into programmatic consultation with USFWS under Section 7(a)(1) of the ESA. This consultation is expected to result in an evaluation of the degree to which the ASR Program

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contributes to furthering the purposes of the ESA, along with possible recommendations to improve or enhance this contribution, as well as a description of any subsequent consultation that may be required between USFWS and the FCC at a less aggregated regional or local scale.

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

Alternative 1

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

Alternative 2 Options A, B, and C

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

5.4.3.3 Migratory Birds

Direct Effects

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

Data Limitations and Uncertainty

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

Overview

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

In September 1948, a 450-foot (131-meter) radio tower in Baltimore, Maryland was the first communications tower documented to kill migratory birds (Aronoff 1949). The first long-term study of the impact of a communications tower on birds was begun in 1955 by the Tall Timbers Research Station in northern Florida. During the 25-year study, 42,384 birds representing 189 species were documented as killed (Crawford and Engstrom 2000). Over the course of a 38-year study at one television tower in Eau Claire, Wisconsin beginning in 1957, Kemper collected approximately 121,560 birds representing 123 species (Kemper 1996). This study includes the all-time record for most birds collected during a single-

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night tower strike – more than 12,000 birds were collected in a single night in 1963 from the base of the tower (Kemper 1996). Another large tower kill occurred in January 1998, when up to 10,000 Lapland Longspurs and several other species died in a one-night, multi-tower incident in western Kansas (Manville 200).

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

Tower Location

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

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

Tower Height

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

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

In a recent study, Gehring et al. (2011 in press) found that tall towers greater than 1,000 feet (305 meters) in height and supported by guy wires accounted for 70 times the bird fatalities when compared to medium-height (380 to 480 feet [116 to 146 meters]) unguyed towers and nearly five times as many as medium-height guyed towers. Nevertheless, the literature as a whole reflects a certain level of bias in the

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research, in that taller towers with large bird kills have been studied more frequently than shorter towers, especially those less than 200 feet (61 meters).

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

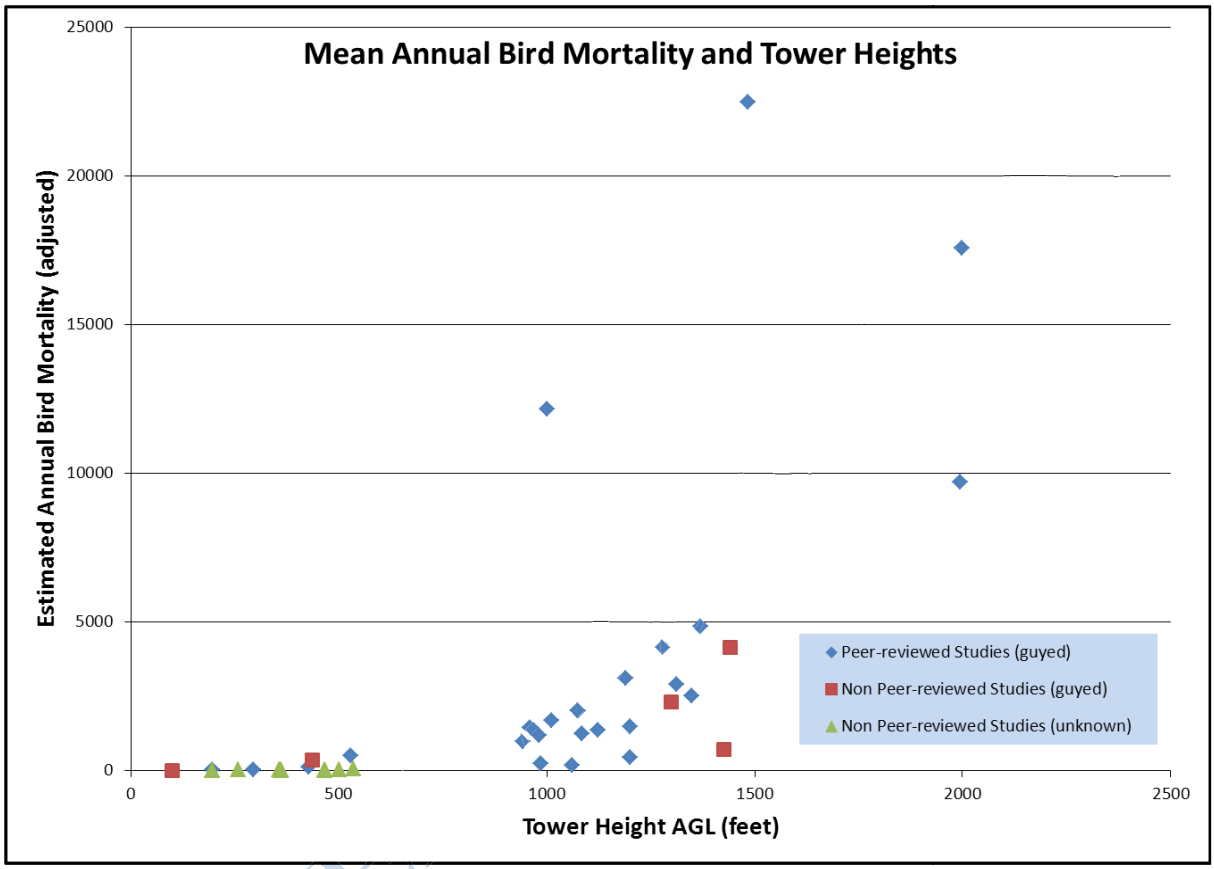

Figure 11: Mean Annual Bird Mortality and Tower Heights

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

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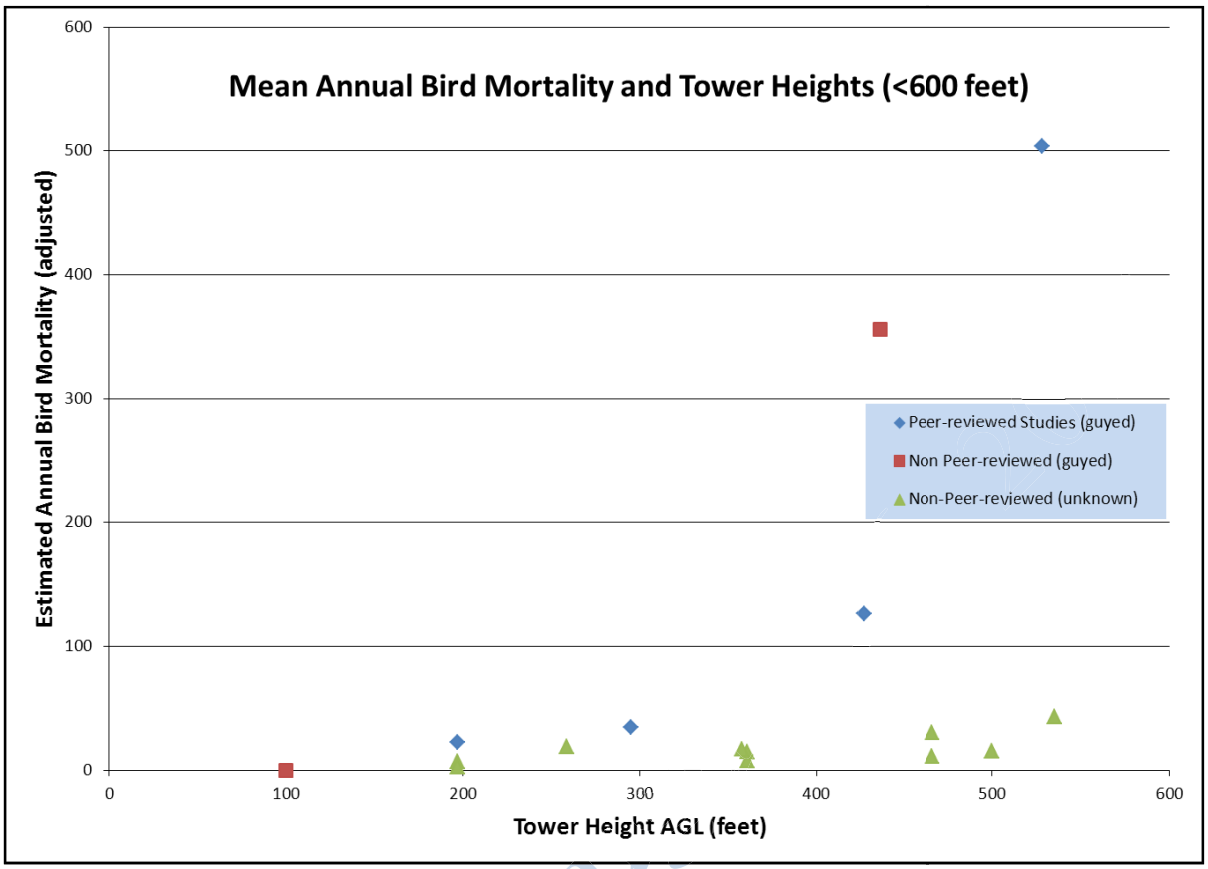

Figure 12: Mean Annual Bird Mortality and Tower Heights (<600 feet)

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

Guy Wires

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

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

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

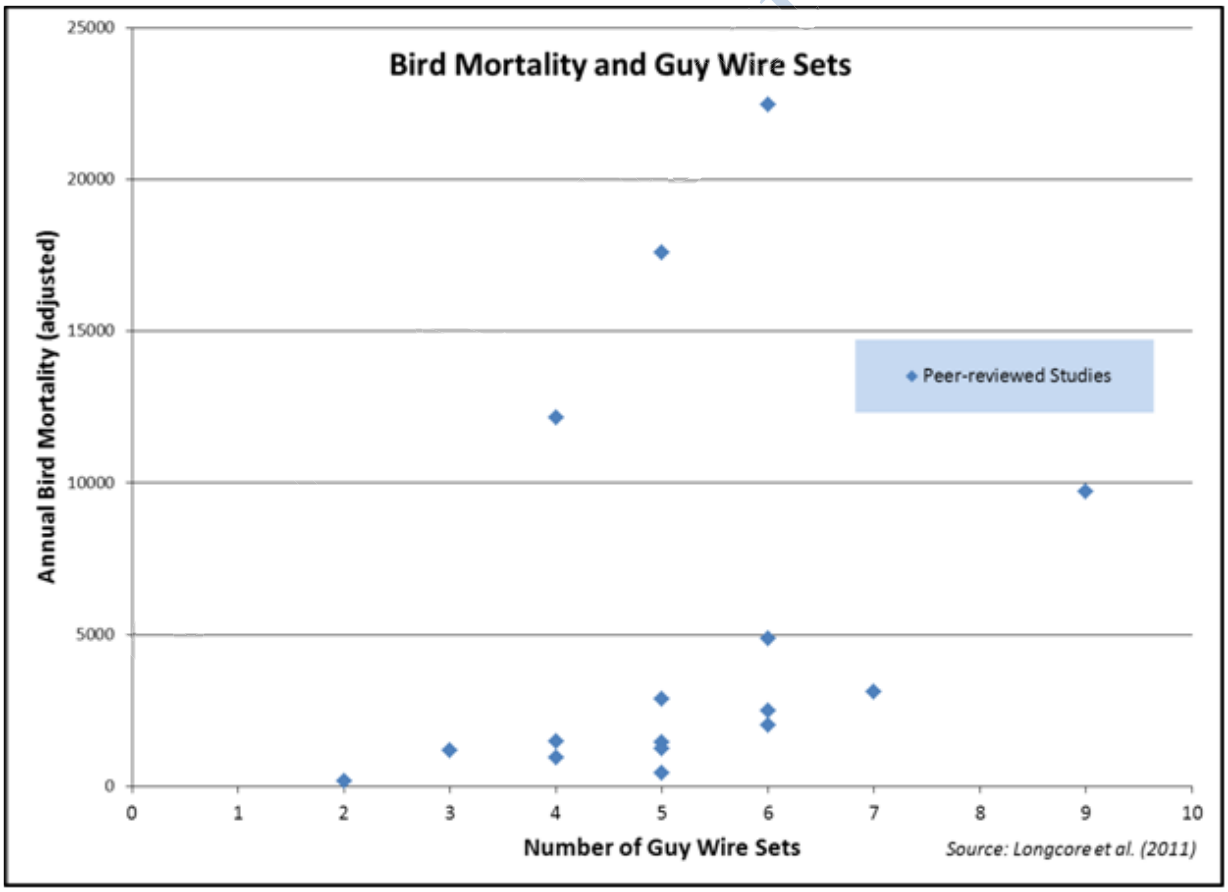

Figure 13: Bird Mortality and Guy Wire Sets

Tower Lighting Schemes

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

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

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

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

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

Removing red steady-burning lights would likely reduce avian mortality more than changing tower location or reducing tower heights or the number of guy wire sets. However, under the current FAA lighting circular, red steady lights are still required at towers that rely on red lighting. Unless the FAA

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revises the current lighting circular, tower owners would be prohibited from using only red flashing lights or turning off red steady-burning lights. Although the FAA lighting styles permit use of white flashing or strobe lights without steady lighting, white lights typically are not preferred by neighboring residents, and their use is often restricted by local law.

Species-specific Effects

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

Declining Mortality Hypothesis

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

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

Indirect Effects

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

Habitat and site abandonment around towers and other vertical structures has been found to be occurring, specifically with western prairie grouse species which include Lesser and Greater Prairie-Chickens, Sage Grouse, and Sharp-tailed Grouse. Two recent studies cited regularly regarding human disturbance and its effects on Lesser Prairie-Chickens are Robel et al. 2004 and Pitman et al. 2005. These studies showed that Lesser Prairie-Chickens generally avoid vertical structures, with non-breeding birds generally keeping at least 0.37 mile (0.60 kilometer) from buildings and transmission lines and towers. Most nests were found

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to be placed at least 0.78 mile (1.26 kilometers) from buildings, 0.49 mile (0.79 kilometer) from improved roads, and 0.22 mile (0.35 kilometer) from transmission lines. However, Pitman et al. 2005 also found that distance to various disturbance types was a poor predictor of nest success, which is apparently more dependent on various vegetative characteristics.

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

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

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

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

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

Balmori and Hallberg (2007) reported that declines of urban House Sparrows in Valladolid, Spain, increased as electromagnetic field strength increased. Similarly, Everaert and Bauwens (2007) found strong negative correlations between the amount of radiation present (both in the 900 and 1800 MHz

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frequency bands) and the presence of male House Sparrows. Although the existing evidence of correlation is insufficient to establish causation, Everaert and Bauwens (2007) concluded that long-term exposure to higher radiation levels may be affecting bird abundance or bird behavior in this species.

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

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

Impacts by Alternative

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

No Action Alternative – Direct Effects

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

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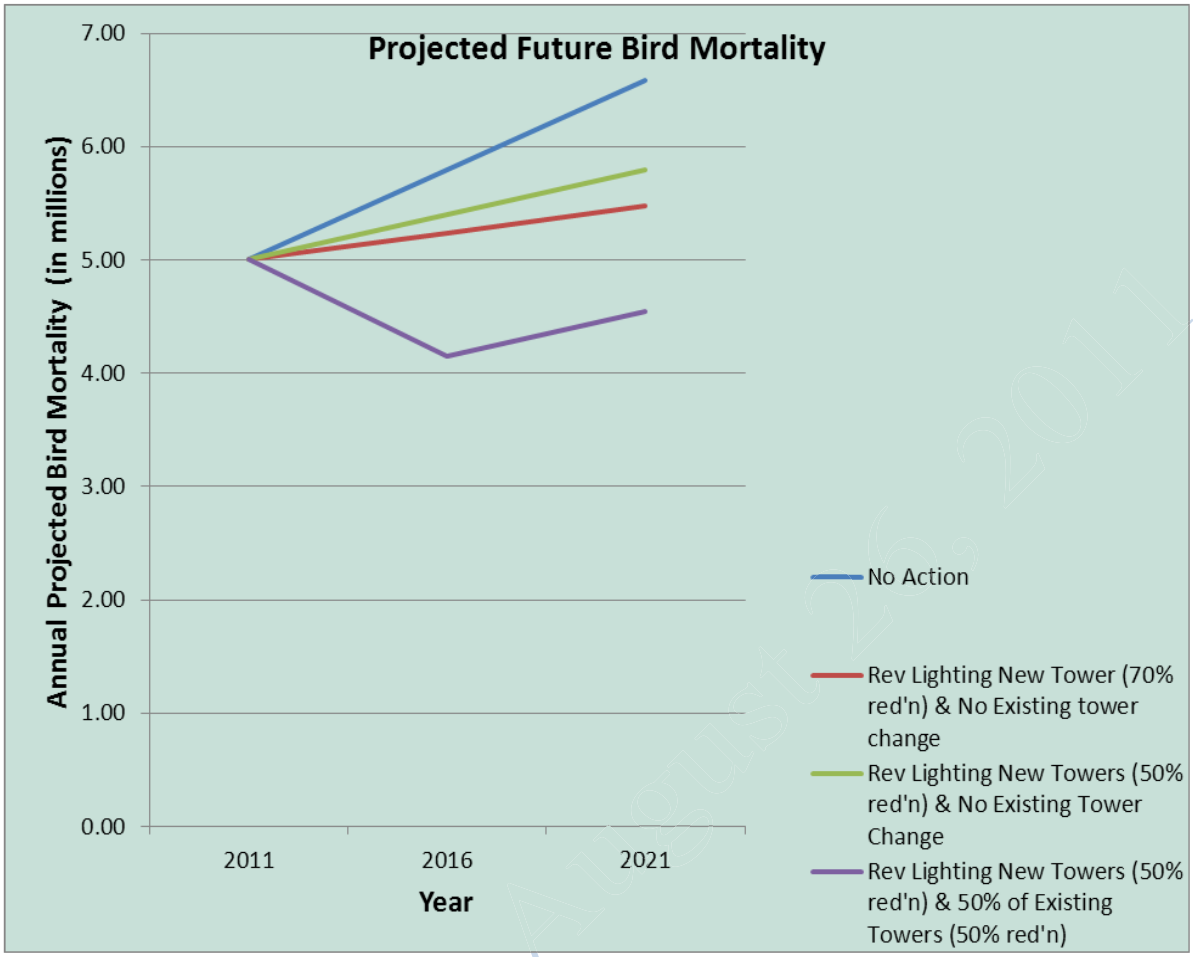

Figure 14: Projected Future Bird Mortality

No Action Alternative – Indirect Effects

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

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

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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

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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

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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

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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.

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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.

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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.

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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.

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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

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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

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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).

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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.

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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.

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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.

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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.

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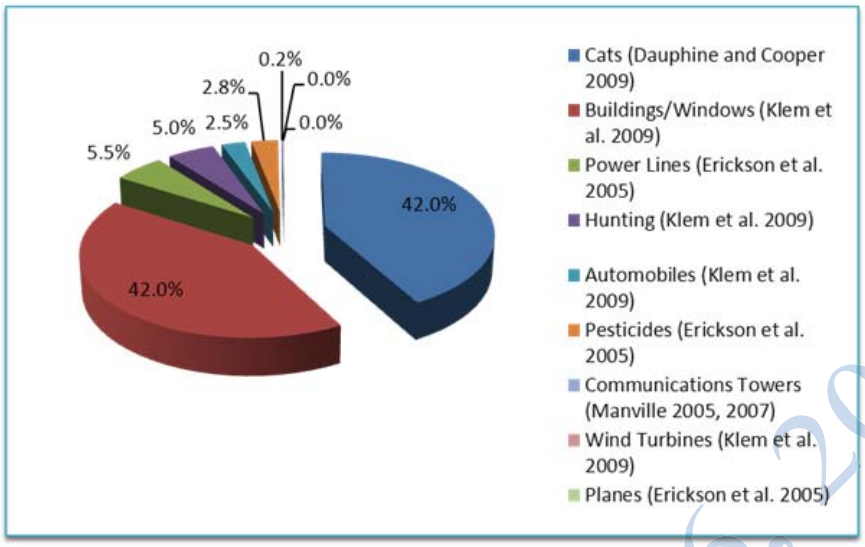

Figure 15: Summary of Annual Avian Mortality by Source

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

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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

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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.

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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.

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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

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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.

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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.

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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.

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- 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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Appendix A

Agencies, Organizations, and Individuals Consulted During the NEPA Process

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Organizations

CTIA – The Wireless Association

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

Travis Longcore, Ph.D., The Urban Wildlands Group

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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)

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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**
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)

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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**
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)

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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**
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)

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