U.S. Fish and Wildlife Service

Final
Environmental Assessment
2024 Eagle Take Permit Rulemaking

Prepared by

U.S. Fish and Wildlife Service
Migratory Birds and Habitat Program

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Contents

TABLES

FIGURES

ABBREVIATIONS

2009 Eagle Rule	Eagle Permits; Take Necessary to Protect Interests in Particular Localities; Final Rules. (74 FR 46836, September 11, 2009)
2016 Eagle Rule	Eagle Permits: Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (81 FR 91494, December 16, 2016)
A&M	avoidance and minimization
ANPR	Advance Notice of Proposed Rulemaking
APHIS	Animal and Plant Health Inspection Service
APLIC	Avian Power Line Interaction Committee
BAEA	bald eagle
BCC	Birds of Conservation Concern
CET	Cumulative Effects Tool
CFR	Code of Federal Regulations
CRM	collision risk model
DOI	Department of Interior
EA	environmental assessment
Eagle Act	Bald and Golden Eagle Protection Act
ECP	Eagle Conservation Plan
EMU	eagle management unit
EPOP	Eagle Protection and Offset Program
ERA	Eagle Relative Abundance
ESA	Endangered Species Act
FR	Federal Register
GOEA	golden eagle
GPP	General Permit Program
GPS	Global Positioning System
GSM	Global System for Mobile communications
HPAI	Highly Pathogenic Avian Influenza
HV	Hazardous Volume
ILF	in-lieu fee
IMR	Injury and Mortality Reporting

IPaC	Information for Planning and Consultation
IPM	Integrated Population Model
km	kilometers
km^2	square kilometer
km^3	cubic kilometer
LAP	local area population
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NGO	non-governmental organization
PEIS	Programmatic Environmental Impact Statement for the Eagle Rule Revision (USFWS 2016a)
NER	National Eagle Repository
NHPA	National Historic Preservation Act
NOI	Notice of Intent
REA	Resource Equivalency Analysis
ROD	Record of Decision
Service	U.S. Fish and Wildlife Service
UAV	Unmanned Aerial Vehicle
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Environmental Assessment Overview

We, the U.S. Fish and Wildlife Service (Service or USFWS), are proposing to revise the eagle permit regulations that authorize the incidental take of bald eagles and golden eagles and take of eagle nests pursuant to the Bald and Golden Eagle Protection Act (Eagle Act; 16 United States Code [U.S.C.] §§ 668–668d). The Service's proposal to revise these regulations is a discretionary Federal action that is subject to the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.). This Environmental Assessment (EA) is tiered to the Final Programmatic Environmental Impact Statement, which analyzed the impacts of the 2016 Eagle Rule Revision (PEIS; USFWS 2016a; https://www.fws.gov/media/final-programmatic-environmental-impact-statement-eagle-rule-revision).

Our preferred alternative is to revise our eagle permit regulations to include a general-permit option for land-based wind energy facilities, power line entities, activities with the potential to disturb eagles, and nest removal activities. This is Alternative 4 below. Eligibility for general permits would be different for each activity type. Specific permits would be required for any applicant whose project or activity does not qualify for a general permit, and an option for any applicant that does not wish to obtain a general permit. There are three alternatives to the proposed action analyzed in this EA. Alternative 1 is to leave existing regulations "as is," also called the No Action Alternative. Alternative 2 is to revise regulations to include a general permit available for land-based wind energy facilities only, with eligibility based on a project's distance from eagle nests and compensatory mitigation requirements in the form of a flat, per-project fee for mitigation. Alternative 3 is to revise regulations to include a general permit available for land-based wind energy facilities only, with eligibility based on eagle relative abundance and distance from nests and mitigation fees based on the hazardous area of the project. None of these alternatives propose to alter the management framework for eagle permits set forth in the 2016 PEIS that ensures authorized take is compatible with the preservation of bald eagles and golden eagles as required by the Eagle Act and defined at 50 Code of Federal Regulations (CFR) 22.6.

1.2 Background

The Eagle Act prohibits take of bald eagles and golden eagles except pursuant to federal regulations. The Eagle Act allows the Secretary of the Interior to issue regulations that authorize the "taking" of eagles for various purposes, including the protection of "other interests in any particular locality." The PEIS (USFWS 2016a) described the specific laws affecting eagles and other environmental resources in Section 1.6, which we incorporate here by reference as these laws and resources have not changed since 2016. Some state and Tribal designations for eagles have changed slightly since 2016. Currently, two states still list the bald eagle as endangered, and seven consider it threatened. Three states consider the golden eagle endangered, and one state considers it a candidate for listing. One Tribe has listed both bald and golden eagles as endangered.

The Service promulgated regulations establishing two new permit types for the take of eagles and eagle nests in 2009 (74 FR 46836, September 11, 2009, "2009 Eagle Rule"), then revised those regulations in 2016 (81 FR 91494, December 16, 2016, "2016 Eagle Rule" (USFWS

2016b)). The purpose of these incidental-take permit regulations was to authorize take of bald eagles and golden eagles that met the following criteria: compatible with the preservation of the bald eagle and the golden eagle; necessary to protect an interest in a particular locality; associated with, but not the purpose of, an activity; and cannot practicably be avoided. Section 1.2 of the PEIS contains a full background of eagle incidental take regulations prior to the 2016 Eagle Rule (USFWS 2016a).

The Record of Decision (ROD) for the 2016 Eagle Rule (USFWS 2016c) described the Service's decision to revise various aspects of our eagle-management program, as described in Alternative 5 of the PEIS. The 2016 Eagle Rule and PEIS established the following:

- Eagle management units (EMUs) for bald eagles were aligned with the Atlantic, Mississippi, Central, and Pacific flyways used by the Service and its partner agencies to manage other species of birds, with the Pacific Flyway divided into three EMUs: southwest, mid-latitude, and Alaska. EMUs for golden eagles also follow the flyways, with the Mississippi and Atlantic flyways combined into one EMU.
- Unmitigated take limits set at 0% of the population for golden eagles and 6% of the population for bald eagles in most EMUs, with lower rates for bald eagles in the Southwest (3.8%).
- Incidental take permits can be issued for up to 30 years, with permit reviews every five years.
- Compensatory mitigation is required for take authorization that exceeds EMU take limits and may be required for some permits authorizing take that exceeds local-area-population (LAP) take limits. Compensatory mitigation is also required if necessary for the permit to be compatible with the preservation of eagles.
- Compensatory mitigation is required to offset take at a minimum ratio of 1:1 for bald eagles and 1.2:1 for golden eagles for take that exceeds EMU take limits.
- The definition of "compatible with the preservation of eagles" was modified to incorporate greater protection for local populations.
- The LAP cumulative-effects analysis was incorporated into the regulations.
- The permit administration fee to support the Service's ability to conduct the five-year evaluations for longer-term permits is $8,000 every five years (changed from $15,000 in the May 6, 2016, proposed rule).

The 2016 Eagle Rule and PEIS also described several other amendments to the regulations.

Evaluation of an eagle-incidental-take-permit application requires project-specific review with additional review required for permits with a duration longer than five years (long-term permits), typically including review of an applicant-written Eagle Conservation Plan (as described in the Eagle Conservation Plan Guidance for land-based wind energy facilities (USFWS 2013)). This plan aids applicants in conserving bald and golden eagles during the siting, construction, and operation of wind energy facilities. Service Assessment of collision risk for eagles at wind energy facilities includes the use of a Bayesian collision risk model (CRM; New et al. 2021). This model estimates, while accounting for uncertainty, the annual number of eagle fatalities based on several factors: eagle use of a project area; collision probability; amount of hazardous space created by turbines; turbine operational time; and estimated past fatalities. During review of permit applications, the Service sets project-specific conditions, which typically fall into five

different categories: limits to take authorizations; avoidance and minimization (A&M) of take; compensatory mitigation; fatality monitoring; and adaptive management. For all permits with a duration longer than five years, qualified, independent third parties approved by the Service must monitor to assess project impacts to eagles and the effectiveness of A&M measures. Applications for eagle incidental take permits for wind facilities must also include pre-construction eagle survey information collected according to standards set in the regulations, subject to waiver by the Service under exceptional circumstances.

For projects that exceed EMU take limits, compensatory mitigation is required for the permit to be compatible with the preservation of eagles. Examples of compensatory-mitigation activities could include retrofitting power poles to reduce eagle-electrocution rates, removing road-killed animals along roads where vehicles hit and kill scavenging eagles, or reducing lead levels in carrion or offal. To date, the Service has only commonly approved one compensatory-mitigation activity – power-pole retrofits, but we have very recently issued a permit that authorizes the use of lead abatement as compensatory mitigation. We are diligently working to assess other activities and expect to approve other methods in the future based on what we learn from case-by-case approvals. The Service, in partnership with the Department of Interior (DOI) Office of Policy Analysis, developed a Resource Equivalency Analysis (REA) tool for calculating the compensatory mitigation needed to offset permitted take (via direct mortality, disturbance, or territory loss) using power-pole retrofits. The REA outputs estimate the eagle credits (calculated as a credit in Present Value Bird-Years) produced from any mitigation method that would need to be provided to offset a given number of eagles taken under a permit (calculated as a debit in Present Value Bird-Years). Currently, two programs, the Eagle Protection and Offset Program (EPOP) and the Bald Eagle and Golden Eagle Electrocution Prevention In-lieu Fee Program (Eagle ILF Program) are approved by the Service to sell compensatory mitigation credits that can be used to offset bald and golden eagle take authorized under a permit. We have spoken with three other entities that have expressed interest in establishing in-lieu fee programs. Two of these entities would use lead abatement, and the other would use roadside carcass removal to produce eagle credits. We will diligently work towards finalizing agreements with these three potential in-lieu fee programs, and others as they become known to us.

Permitting projects for long-term incidental take of eagles requires the Service to make a set of recurrent decisions while factoring in uncertainty about siting, design, operation, and compensatory mitigation. The Service attempts to account for uncertainty in those decisions through a process of adaptive management (USDOI 2008). The purpose of adaptive management is to improve long-term management outcomes, by recognizing where key uncertainties impede decision making, seeking to reduce those uncertainties over time, and applying that learning to subsequent decisions (Walters 1986). For long-term, eagle-incidental-take permits, administrative check-ins between the Service and permit holders are currently required at least every five years to determine whether changes are warranted to permit conditions, such as revision of the estimated fatality rate, adjustments to monitoring or compensatory mitigation, and implementation of additional conservation measures.

To date, the Service has issued 42 long-term permits for incidental take (killing/injury) of eagles, including two permits issued under Section 10 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §§ 1531–1543). Ten of these permits were issued under the initial 2009 Eagle Rule – eight to wind facilities and two to military installations. Thirty-two of these permits were issued under the 2016 Eagle Rule to 26 wind energy facilities, one solar energy facility, two reservoirs, and three mines. Our processing of applications for these permits has accelerated in recent years, with 37 of the 42 permits being issued since the beginning of 2019.

1.3 Preservation Standard

The Eagle Act authorizes the Secretary of the Interior to issue permits for the taking of bald eagles and golden eagles, but it requires that "the take is compatible with the preservation of the bald eagle and the golden eagle" (16 U.S.C. 668a). This statutory requirement ensures the continued protection of the species while allowing for some impacts to individual eagles. To clarify the statutory language and aid in evaluating whether authorized take meets this criterion, the 2009 Eagle Rule established a regulation clarifying the "preservation standard," to mean "consistent with the goal of stable or increasing breeding populations." The 2016 Eagle Rule updated that definition by providing more detail to aid in application and ensure preservation across the landscape. The 2016 update defined the preservation standard to mean "consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units and the persistence of local populations throughout the geographic range of each species." The revised preservation standard sought to ensure the persistence of bald eagle and golden eagle populations over the long term with sufficient distribution to be resilient and adaptable to environmental conditions, stressors, and likely future altered environments, and to better align with Tribal and State interests in local eagle-population management.

When analyzing the impacts of a project for a potential eagle-incidental-take permit, the Service analyzes the project's expected impact on eagles within the EMU and within the LAP. These scales of analysis were established in the PEIS (USFWS 2016a). If permitting a project would result in the total amount of authorized take exceeding 9% and 7% of the estimated total LAP size for bald eagles and golden eagles, respectively (or 5% of the estimated total LAP size for bald eagles in the southwest EMU), the Service would not authorize that take unless additional analysis demonstrates that permitting take over those percentages is compatible with the preservation standard. In some cases, compensatory mitigation could be required for bald eagles or additional, targeted mitigation within the LAP could be required for golden eagles to meet the preservation standard. *Note: At the time of publication of the PEIS, LAP thresholds were 6% and 5% for bald eagles and golden eagles, respectively, and were 5% for bald eagles in the southwest EMU (USFWS 2016d). These values were recently updated to 9% in all of the United States except for the Southwest bald eagle EMU and 7%, respectively, based on updated population assessments (USFWS 2021a and USFWS 2022, respectively). Updated bald-eagle population estimates did not include data from the southwestern United States, thus, LAP thresholds there remain at 5% for bald eagles.*

1.4 Baseline Population Size and Baseline Take

The baseline population size for both species, which is our threshold for determining if the preservation standard is met, is set at estimated 2009 levels. In other words, we use our 2009 population estimates for both bald eagles and golden eagles to determine if authorized take is (or will be) consistent with stable or increasing breeding populations. Take authorizations that may cause eagle population declines of either species relative to 2009 population estimates would not be consistent with our preservation standard and would require compensatory mitigation before the Service could authorize take. The Service has set take thresholds for each EMU representing take levels that, if exceeded, would be inconsistent with our preservation standard (Section 1.5). Because 2009 population estimates for both species serve as our baseline, any infrastructure that was on the landscape prior to September 11, 2009 (the date the first incidental eagle take regulation was published) and is still operating with the same design and operational practices

since that date is considered "baseline infrastructure." Any eagle take occurring at baseline infrastructure is considered "baseline take." Baseline take, like any take of eagles, remains unlawful and still must be permitted. However, baseline take authorized by the Service does not need to be deducted from EMU thresholds and, thus, authorizations for baseline take do not require compensatory mitigation to meet the preservation standard.

1.5 EMU Thresholds

The 2016 Rule Revision and associated PEIS established species-specific take limits for each EMU (USFWS 2016a, 2016b) over which unmitigated authorized take is not consistent with the preservation of eagles. These limits were set at 0% of the population for golden eagles and 6% of the population for bald eagles in most EMUs, with lower rates in the Southwest (3.8%). Recently, the Service formally updated its population-size and allowable-take estimates (USFWS 2021a) for bald eagles in four of six bald-eagle EMUs. The methods and approaches for these updates are presented in Zimmerman et al. (2022). Population sizes, status, and EMU take limits are discussed in greater details in Chapter 4 of this document.

2.0 Purpose and Need

2.1 Purposes and Need for Federal Action

The purpose of the Service's proposal is to improve the system of regulations for authorizing eagle incidental take and eagle nest take. The Service needs to improve the current regulatory system and thereby improve eagle conservation because, despite previous efforts to improve the permitting program in 2013 and 2016, participation by some industries remains low. Projects that take eagles or have a significant risk of taking eagles are continuing to be built and operated without a permit. This has resulted in an increase in the number of projects that take eagles across the landscape without implementing the A&M measures, mitigation, and monitoring activities that would be required under an incidental-take permit. As with our rule-revision efforts in 2013 and 2016, the Service's purpose here is to increase the conservation benefits provided to both eagle species by encouraging increased participation in eagle incidental-take permitting and improving our efficiency in reviewing permit applications and administering permits.

To achieve this purpose, the Service has developed three reasonable alternatives (Action Alternatives) that meet the following criteria:

- Amend aspects of the existing permitting process that do not significantly contribute to eagle conservation and are viewed as barriers to participation by members of the regulated community or that create unnecessary work for the Service, thus improving conservation for both eagle species throughout their ranges by increasing the number of current and future projects and actions on the landscape that are operating under a permit and implementing conservation measures.
- Prioritize Service resources on processing permit applications for projects that have the highest or most uncertain risks to eagles, thus focusing eagle conservation efforts where it will be most beneficial to eagles.
- Reduce Service resources spent processing permit applications for projects where risk to eagles is likely to be low and more predictable, and where permit application review and conditions can be standardized without significantly affecting eagle populations.
- Allow for consistent and efficient administration of the eagle incidental take permitting program by Service staff, and increased predictability and certainty for applicants.
- Encourage siting of wind energy facilities to avoid areas of the country where eagle risk and potential impacts to eagle populations are high.
- Ensure implementation is consistent with the Service's preservation standard, defined at 50 CFR 22.6.
- Use the best available science and data.

2.2 Tiered EA

This EA tiers to the Service's 2016 PEIS (USFWS 2016a). The selected alternative in the 2016 PEIS ensured that permit decisions are consistent with the preservation standard by considering uncertainty and conservatively assessing the risk to eagles. The conservative risk assessment ensures that the effects of eagle take permitting are more likely to be beneficial than harmful to

eagle populations. Any rulemaking action undertaken by the Service must be consistent with the selected Alternative; Alternative 5, described in that PEIS and in the corresponding ROD, which was signed by the Service Director in December 2016 (USFWS 2016c).

We analyze three Action Alternatives in this EA that will achieve the Service's purpose and need. To ensure that the Action Alternatives are consistent with the 2016 PEIS and ROD (i.e., consistent with the regulatory preservation standard) and thus have no significant impacts on bald- and golden-eagle populations, each alternative must also meet the following criteria:

- Implement a permitting framework that will not authorize eagle take in excess of applicable EMU take limits (i.e., will not have a significant impact on bald eagle and golden eagle populations).
- Allow the Service to assess the amount of authorized take at the LAP scale, such that authorized take in excess of 9% or 7% of the LAP, for bald eagles and golden eagles, respectively, is flagged and receives additional analysis by the Service. Compensatory mitigation targeted to a particular LAP may be necessary for authorized take in excess of those thresholds to remain compatible with the preservation standard. *Note: At the time of publication of the PEIS, LAP thresholds were 6% and 5% for bald eagles and golden eagles, respectively (USFWS 2016d). These values were recently updated to 9% and 7% based on updated population assessments (USFWS 2021a and USFWS 2022, respectively)*.
- Require that each permittee avoid and minimize the permitted activity's impacts on bald eagles and golden eagles to the extent practicable.
- Require compensatory mitigation for golden eagles at a minimum ratio of 1.2:1.
- Require implementation of compensatory mitigation using methods that will offset projected take and for which metrics to calculate when that offset is achieved have been analyzed and established.

Based upon this analysis and application of the criteria provided in the PEIS, we have determined that tiering to the PEIS is appropriate and that an EA is an appropriate level of NEPA review for this proposal. We conclude here that none of the Action Alternatives are likely to result in significant impacts to the human environment, as explained below. This EA incorporates the PEIS by reference.

2.3 Authorities and Statutory and Regulatory Framework

The Service has jurisdiction over a broad range of fish and wildlife resources. Service authorities are codified under multiple statutes that address management and conservation of natural resources from many perspectives including, but not limited to, the effects of energy development, construction, and many other impacts to land and water on fish, wildlife, plants, and their habitats. One of those statutes administered by the Service is the Eagle Act. In addition, the PEIS has a list of authorities that may apply to or be affected by this action (Section 1.6, pages 7–12; USWFS 2016a), which are incorporated by reference here.

2.4 Scope of Analysis

This EA considers and analyzes the effects of four alternatives on the natural and human environment. The primary focus of the analysis is on the effects of our rulemaking action on bald

eagles and golden eagles and the Service's continued ability to ensure eagle-incidental-take permitting is consistent with the eagle preservation standard.

2.4.1 Geographic Extent

The effects associated with each alternative are discussed in the context of two geographic scales – both briefly described below and discussed and described in detail in the PEIS. The Service evaluates potential impacts on eagle populations at both scales to determine consistency with our preservation standard.

Eagle management unit (EMU) – An EMU is defined as "a geographically bounded region within which permitted take is regulated to meet the management goal of maintaining stable or increasing breeding populations of bald or golden eagles." The EMU is the largest and primary geographic scale over which permitted take is regulated to meet our management objective (USFWS 2016a). As described in the PEIS, EMUs for both species are defined, with some modifications, by the four administrative flyways used by State and Federal agencies to administer migratory bird resources: the Atlantic, Mississippi, Central, and Pacific flyways. For bald eagles, the Pacific Flyway is divided into three EMUs: southwest (south of 40 degrees N latitude), mid-latitude (north of 40 degrees to the Canadian border), and Alaska. For golden eagles, the Mississippi and Atlantic flyways are combined as one EMU (USFWS 2016a).

Local-area population (LAP) – The LAP is the population of eagles within a set distance from the project footprint. This distance is different for each species and is based on each species' natal-dispersal distance. Details on the selection of these distances can be found in the PEIS (USFWS 2016a). The distances assigned for each species are 138 kilometers (km) (86 miles) for bald eagles and 175 km (109 miles) for golden eagles.

The geographic scope of the analysis of effects on other resources addressed in this EA (see Chapter 4) is based on what is biologically meaningful for each resource in the context of the potential effects of the proposed rulemaking.

2.4.2 Primary Resources Affected

Eagle incidental take permits issued by the Service are not a prerequisite to construction or operation of a project or activity but are required to ensure legal compliance with the Eagle Act if eagle take occurs. Take of eagles without a permit may result in an enforcement action and potential prosecution. Consequently, this rulemaking, regardless of the alternative selected, is not anticipated to affect the number of wind energy facilities, power line projects, or other projects or activities that will be proposed, constructed, and operated on the landscape. Indeed, after over a decade of experience issuing eagle incidental take permits, the Service has infrequently, if ever, observed that project or activity proponents decide not to construct projects or undertake activities because they did not possess an eagle take permit. In our experience, particularly in the case of wind energy facilities, project proponents often elect to construct their projects first, and then apply for a permit (if they apply at all). Given that the ability to implement some conservation measures can be lost when project proponents apply for a permit after construction, one of our primary goals with this rulemaking is to encourage the initial siting of wind projects in localities where eagle abundance is relatively low. As discussed in Chapter 5, we predict this will have a positive impact on eagle populations across the landscape.

We anticipate that our decision and selected alternative will have environmental impacts primarily on two wildlife resources – eagles and migratory birds. These effects are analyzed and

discussed below. Additionally, we discuss the potential effects of our decision on species listed as threatened or endangered, those proposed to be listed as threatened or endangered under the ESA, or candidate species (hereafter listed species), and proposed or designated critical habitat, Tribal and cultural resources, and socioeconomics. We do not anticipate that implementation of the Action Alternatives will have any other effects on the human environment.

2.5 Tribal-Trust Consultation and Coordination

Many Federally Recognized Tribes have interests that could be affected by this rulemaking. Our regional Tribal liaisons sent notifications to all Federally Recognized Tribes in their regions in September 2021 informing them of the Advance Notice of Proposed Rulemaking (ANPR) for this rulemaking, offering government-to-government consultation if requested, and encouraging Tribes to review and comment on our proposal.

On October 14 and 21, 2021, the Service held webinars that were restricted in attendance to only Federally Recognized Tribal members, with the purpose of informing Tribes of the proposed action and soliciting input and feedback. Tribal representatives were invited to ask questions and seek clarifications on our proposal. In addition, we sent letters through our regional offices inviting Tribes to engage in this proposed action via the government-to-government consultation process. During the comment period on the ANPR, we received comments from seven Tribes or Tribal groups. These letters were reviewed, and comments incorporated into the proposed rule and this EA as appropriate.

On October 19, 2022, and November 2, 2022, the Service offered webinars to Federally Recognized Tribes to present information and respond to questions on the proposed rule and draft EA. During the public comment period, Tribes submitted 11 letters containing 141 unique comments. Tribal comments were considered and incorporated into the final rule and this EA as appropriate. Public comments are available at http://www.regulations.gov under Docket No. FWS-HQ-MB-2020-0023.

On December 12, 2023, the Service held a webinar that was restricted in attendance only to member of federally recognized Tribes to inform Tribes of our impending final action and to solicit last minute input and feedback. We invited Tribal representatives to ask questions and seek clarifications on our proposal.

2.6 Public Participation

On September 14, 2021, the Service published an ANPR to inform the public of changes the Service is considering for expediting and simplifying the permit process authorizing incidental take of eagles. This ANPR also served as the Notice of Intent (NOI) for the Service to prepare a draft environmental review document pursuant to NEPA. The Service used this NOI to notify federal and State agencies, Tribes, and the public of our intentions to evaluate the potential environmental impacts of the proposed action.

In the ANPR/NOI, we invited input from other federal agencies, Tribes, State agencies, and nongovernmental organizations for any pertinent issues we should address, including alternatives to our proposed approach for authorizing eagle incidental take. The public comment period for both documents was open until October 29, 2021.

During the public comment period, we received 1,899 distinct comments on the ANPR and NOI. Many comments included additional attachments (e.g., scanned letters and supporting

documents). These comments represented the views of multiple Federal and State agencies, private industries, non-governmental organizations (NGOs), and private citizens. In addition to the individual comments received, multiple organizations submitted attachments representing individuals' comments, form letters, and signatories to petition-like letters representing almost 1,804 signers.

The proposed rule and associated draft EA (DEA) were published in the Federal Register on September 30, 2022, opening a 60-day public comment period until November 29, 2022. This public comment period was later extended to December 29, 2022, at the request of commenters. During the public comment period, we received 1,649 distinct comments from a diverse group of entities and individuals. We received 751 comments from industry groups, 141 comments from Tribes, 84 comments from state governments, and 673 comments from other entities, including NGOs and individuals. We considered these comments and incorporated them into the final rule and this EA as appropriate. Public comments on both the rulemaking and this EA, and our responses, are available at http://www.regulations.gov under Docket No. FWS-HQ-MB-2020-0023.

3.0 Alternatives

3.1 Introduction

This chapter describes alternatives to our proposed action and alternatives that were considered but eliminated from detailed analysis. We evaluated each alternative to determine whether it meets our eagle preservation standard and to analyze the impacts to the human environment, including eagles, socioeconomics, and other relevant impacts.

3.2 Key Elements of Alternatives

We analyze three Action Alternatives in this EA. The primary elements of each alternative are: (a) eligibility for general permits; (b) eligibility for specific permits; (c) required pre-application monitoring; (d) avoidance and minimization; (e) compensatory mitigation; (f) adaptive management; (g) fatality monitoring; (h) reporting; and (i) permit tenure. A summary of these elements for each alternative is provided in Table 3-1. Detailed descriptions of the alternatives are provided in Section 3.4.

Table 3-1. Summary of the key elements of the Alternatives

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
General Permit Eligibility	N/A	<u>For wind only:</u> Projects where all existing or proposed turbines are or will be located > 1 mile from bald eagle nests and > 2 miles from golden eagle nests. <u>For all others:</u> No general permit available.	<u>For wind only:</u> For a project's first general permit only, projects in areas characterized by eagle relative abundance values less than the values in Table 3-2 AND where all existing or proposed turbines are or will be located > 660 feet and > 2 miles from a known bald eagle and golden eagle nest, respectively. OR For existing projects only, if you have applied for a specific permit and have received a letter of authorization from the Service notifying you that your project is eligible for a general permit. OR Projects that have previously held a general permit for the same applicant and the same project, provided there is no lapse in general permit coverage and the adaptive management threshold of four discovered eagle fatalities of a single species has not been reached during any general permit term. <u>For all others:</u> No general permit available.	<u>For wind only:</u> General permit eligibility for wind energy facilities same as Alt 3. <u>For all others:</u> Eligibility will be activity specific. See Section 3.4.5.

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
Specific Permit Eligibility	All permits issued will be specific permits.	For wind only: Available to anyone who does not wish to receive a general permit and will be the only option for: a) anyone who does not meet general permit eligibility requirements, or b) existing wind energy facilities that find the remains of ≥4 individual bald eagles or ≥4 individual golden eagles during any 5-year permit term. Different tiers of specific permit application review have been created with different fee structures, depending on time and resources the Service is likely to expend processing specific permits for wind. See Section 3.4.2.2. For all others: No general permit available. All other applicants are eligible for a specific permit.	Same as Alternative 2	For wind only: Same as Alternative 2. For all others: Available to anyone who does not wish to receive a general permit and will be the only option for anyone who does not meet general permit eligibility requirements.

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
Pre-Application Information Collection	Eagle-use monitoring required for wind (if not waived by the Service). May be required based on application-specific guidance for other types of activities.	General permits: Eagle-use monitoring not required for projects that meet general permit issuance criteria. Existing projects that do not meet general permit issuance criteria but wish to submit a request to the Service for general permit approval will need to submit, with a specific permit application, all project-specific eagle-use and fatality monitoring data previously collected. Specific permits: For Tier 1, project-specific eagle-use and fatality-monitoring data that meets the Service's standards or willingness to accept compensatory mitigation rates for the first 5-years that are based on the Service's collision risk model run with priors only. See Section 3.4.2.2. For Tier 2 and Tier 2 with reimbursable agreement, eagle-use monitoring data not required, but helpful in assessing impacts.	Same as Alternative 2	Same as Alternative 2.
Avoidance and Minimization Measures	Project-specific Avoidance and Minimization measures, negotiated for each permit application	General permits: Standardized Avoidance and Minimization measures for wind energy facilities. Specific permits: Standardized Avoidance and Minimization measures for wind energy facilities. If applicant cannot or will not agree to implement these measures, then same as Alternative 1.	Same as Alternative 2	General permits: Standardized Avoidance and Minimization measures for wind energy facilities and separate standardized measures for other types of activities. Specific permits: Same as Alternative 2.

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
Compensatory Mitigation	As needed to ensure consistency with eagle preservation standard; mitigation at a 1:1 ratio for bald eagles, mitigation at a 1.2:1 ratio for golden eagles. Under long-term permits, mitigation rates would be adjusted, if warranted, at required administrative check-ins, to happen at least every 5 years.	General permits: Each permittee would be required to provide compensatory mitigation to offset the take of 2 golden eagles over a 5-year permit term. Additionally, they would be required to provide LAP mitigation of 0.2 eagles over a 5-year permit term regardless of operation date. Specific permits: Same as Alternative 1, except there will be no requirement for administrative check-ins.	General permits: Each permittee would be required to provide compensatory mitigation to offset the take of golden eagles per unit volume (cubic kilometer [km^3]) of hazardous area. Mitigation rates vary by EMU and are listed in Table 3-3. Additionally, they would be required to provide LAP mitigation at a rate 1.40 eagles per unit volume (km^3) of hazardous area regardless of operation date. These requirements would repeat with every new registration. Specific permits: Same as Alternative 2.	General permits: Same as Alternative 3 for wind. For other activities, activity-specific requirements will be in place. Specific permits: Same as Alternative 2.
Project-level Adaptive Management	Required for all permits for wind. Conditions geared towards ensuring that authorized take is not exceeded. Adaptive Management not typically required for other activities but will be considered on a permit-by-permit basis.	General permits: None required, except if 3 eagles of a single species are found during a 5-year permit term, then the applicant will be required to implement an adaptive management plan of their own design. If 4 eagles of a single species are found during a 5-year permit term, then that permitted project will no longer be eligible for a general permit upon future applications/registrations. Specific permits: Same as Alternative 1.	General permits: same as Alternative 2. Specific permits: Same as Alternative 1.	General permits: Same as Alternative 2 for wind. For other activities, no adaptive management will typically be required. Specific permits: Same as Alternative 1 for wind. For other activities, no adaptive management will typically be required, but may be on a permit-by-permit basis.

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
Fatality Monitoring	Project-specific monitoring of eagle fatalities is required of all permits issued for wind and evaluated project-by-project. Generally, the Service prescribes such monitoring with a goal of achieving a site-wide probability of detecting eagle remains (if take has occurred) of 35% (i.e., a probability of detection of 0.35) averaged over each 5-year period of the permit tenure. For nest disturbance and nest take permits, monitoring nest sites to determine occupancy or success is typically required.	General permits: Project staff will be required to look for eagle remains as a part of day-to-day activities during turbine visits and following a standardized protocol. No other formal project-level fatality monitoring would be required. An administration fee would be charged to each permittee. This fee would cover Service costs necessary to support implementation of the general permit framework and ensure consistency with the Service's preservation standard. Specific permits: Same as Alternative 1.	General permits: Same as Alternative 2 Specific permits: Same as Alternative 1.	General permits: Monitoring would be the same as Alternative 2 for wind. For power line entities, comparable training and utilization of project staff to document eagle remains will be required. Powe line entities would also be charged an administration fee to cover Service costs necessary to support implementation of the general permit framework and ensure consistency with the Service's preservation standard. For activities likely to cause nest disturbance, fatality monitoring will not be required; however, we may require nest monitoring for occupancy, success, and productivity. For nest take, fatality monitoring will not be required; however, we may require monitoring to determine if nests are rebuilt. Specific permits: Same as Alternative 1
Reporting	Required for all permits. Permittee must report evidence of incidental take to the Service and submit an annual report for each year their permit is valid.	General permits: Permittee must report eagle remains found within two weeks of the date of discovery. Annual reports will be required as in Alternative 1. Specific permits: Same as Alternative 1.	Same as Alternative 2	Same as Alternative 2, although general permits for some activity types (such as nest removal activities) may not require annual reporting.

	Alternative 1 – No Action	**Alternative 2** – General Permit for Wind; Eligibility Based on Distance from Nests; Flat Fee for Mitigation	**Alternative 3** – General Permit for Wind; Eligibility Based on Eagle Relative Abundance and Distance from Nests; Mitigation Based on Hazardous Area	**Alternative 4** – Implement Alternative 3 for Wind; Create General Permits for Power Line Entities, Activities That May Disturb Eagles, and Nest Removal Activities
Permit Tenure	For long-term permits, applicant can choose a permit tenure between 5 years and 30 years. For short-term permits, applicants can choose a permit tenure of any duration less than 5 years.	General permits: Permit tenure of 5 years. For coverage beyond 5 years, permittees will need to re-register every 5 years. Specific permits: Same as Alternative 1	Same as Alternative 2	General permits: Same as Alternative 2, although general permits for nest take and incidental disturbance will be limited to one year. Specific permits: Same as Alternative 1, although specific permits for incidental disturbance and nest take will be limited to 5 years.

3.3 Alternatives Analyzed in Detail in this EA

3.3.1 Alternative 1: No Rulemaking to Amend Eagle Regulations (No Action)

3.3.1.1 Eligibility for General Permits

Under Alternative 1, the Service would not develop a general permit framework.

3.3.1.2 Pre-Application Information Collection

Under Alternative 1, the Service would continue current practices of pre-application information collection. For nest disturbance and nest take permits, pre-application information would remain relatively minimal. The major components would include a description of the activity with details on timing and intensity, the location of the nest and other nearby locations (if known), and the status of the nest.

For long-term permits for land-based wind energy facilities, the applicant would be required by regulation to collect at least two years of pre-construction, eagle-use monitoring data with the following additional requirements:

- Surveys must be point-based recordings of bald and golden eagle flight activity (minutes of flight) within a 3-dimensional cylindrical plot (the sample plot). The radius of the sample plot must be 2,625 feet (800 meters) and the height above ground level must be either 656 feet (200 meters) or 82 feet (25 meters) above the maximum blade reach, whichever is greater.
- The duration of the surveys for each visit to each sample plot must be at least one hour.
- Sampling must include at least 12 hours per sample plot per year for two or more years. Each sample plot must be sampled at least once per month, and the survey start time for the sampling period must be selected randomly from daylight hours.
- Sampling design must be spatially representative of the project footprint, and spatial coverage of sample plots must include at least 30 percent of the project footprint. Sample plot locations must be determined randomly.
- The permit application package must contain the following:
    - Coordinates of each sample point in decimal degrees.
    - The radius and height of each sample plot.
    - The proportion of each three-dimensional sample plot that was observable from the sample point for each survey.
    - Dates, times, and weather conditions for each survey, to include the time surveys at each sample point began and ended.
    - Information for each survey on the number of eagles by species observed (both in flight and perched), and the amount of flight time (minutes) that each was in the sample plot area.

- The number of proposed turbines and their specifications, including brand or model, rotor diameter, hub height, and maximum blade reach (height), or the range of possible options.
- Coordinates of the proposed turbine locations in decimal degrees (specify projection/datum), including any alternate turbine sites.

These specific requirements for pre-application monitoring can be waived if the Service determines it has data of sufficient quality to estimate the likely risk to eagles, that expediting the permit process will benefit eagles, or that the risk to eagles from the activity is low enough relative to the status of the eagle population.

3.3.1.3 Avoidance and Minimization Measures

Under Alternative 1, A&M measures would continue to be required for every incidental take permit issued. Applicants must agree to avoid and minimize their eagle impacts to the extent practicable. Additionally, nest removal can only be authorized if there is no practical alternative to the removal. Presently, the Service does not have standard A&M measures for permit types, and A&M conditions are negotiated on a permit-specific basis. However, after over a decade of negotiating with applicants during permit review and issuing permits, some conditions are relatively standardized, as they appear on many if not all permits for certain types of activities.

3.3.1.4 Compensatory Mitigation

Under Alternative 1, the Service must require compensatory mitigation as a condition of issuing eagle take permits if cumulative authorized take exceeds the applicable EMU take limit, or if the issuance of the permit in question will cause cumulative authorized take to exceed the applicable EMU take limit. Because the Service is concerned that any increase in anthropogenic take of golden eagles will cause population declines that are not consistent with stable or increasing breeding populations of golden eagles, authorized take of golden eagles will always come with a requirement to provide compensatory mitigation at a ratio of 1.2:1. The Service will also require compensatory mitigation if any authorization of bald eagle take exceeds EMU take limits or if mitigation is required for the authorization of nest removal under a nest removal permit. In the case of mitigation for nest removal, compensatory mitigation must provide a net benefit to eagles (i.e., more than offset the estimated loss).

For long-term eagle take permits, any compensatory mitigation is required for the first five years of the permit tenure, although an applicant could elect to immediately offset all authorized take for the entire permit tenure. Long-term permits require an administrative check-in at least every five years. At or around the time of these administrative check-ins, the Service reviews fatality-monitoring data (and other data if applicable) collected at the project-site since permit issuance. We use this data to update the fatality estimate at a permitted project and, if warranted, to update the take authorization and mitigation requirements associated with the permit.

3.3.1.5 Adaptive Management

Under Alternative 1, permit-specific adaptive management is required under all long-term eagle take permits. The goal of this adaptive management is to set thresholds (often referred to as ‘triggers’) that the Service has pre-identified as indicating that take rates are greater than

authorized. Take rates that are higher than authorized are a concern for the Service because it would mean that, at the permit scale, authorized take is not being properly offset with compensatory mitigation. Adaptive management conditions are not typically required for short-term or nest removal permits; although the Service could elect to require them if the situation warrants.

3.3.1.6 Fatality Monitoring

Under Alternative 1, all long-term permits issued come with project-specific fatality monitoring requirements that must be conducted by third parties. The objectives of this fatality monitoring are to:

- Verify that the Service is not authorizing take at rates that exceeds our established management objectives for both eagle species.
- Determine if evidence exists to support that take at an individual project exceeds the amount of take authorized.
- Produce fatality estimates for individual projects that will serve, if needed, to:
    - Determine if a project has over- or under-mitigated for take and adjust compensatory mitigation requirements as requested by the permittee, or as deemed necessary by the Service.
    - Increase certainty if deriving future project-specific fatality estimates for a future permit amendment or new application.
    - Understand the effectiveness of any project modifications implemented (either voluntarily or as required through adaptive management) to reduce fatality rates.
    - Improve fatality estimates at other proposed or existing wind energy facilities by improving our understanding of exposure and collision in relation to factors across sites.

To meet these objectives, the Service requires project-specific eagle fatality monitoring methods for each permit. Since there are many site-specific variables that have a strong influence on the effectiveness of fatality monitoring, specific methods are different for each long-term permit issued by the Service. The Service generally requires, when practical for the permittee, fatality monitoring methods that achieve a site-wide probability of detection of 35% (i.e., a probability of a monitoring method detecting eagle remains, if one has been killed, of 0.35, averaged over 5 years). We are currently working on fatality monitoring standards for wind facilities that would outline requirements and best management practices to achieve the monitoring objectives listed above. The goal of these standards is to assist long-term applicants and permittees in fatality monitoring design and to more consistently apply project-specific fatality monitoring requirements under eagle take permits.

Permits issued to activities not likely to result in the injury or death of eagles (e.g., activities that may cause nest disturbance or nest removal activities) will not require fatality monitoring. Such permits typically require other types of monitoring for a short time after completion of the permitted activity, including monitoring for eagle nest occupancy, eagle behavior, or eagle nest success.

3.3.1.7 Reporting

Under Alternative 1, permittees conducting fatality monitoring are typically required to report documented eagle fatalities to the Service within 48 hours of discovery. Information submitted with this report includes date discovered, location (GPS coordinate), the suspected cause of death, and the unique tracking number assigned to the eagle. Within 7 days of discovery, the permittee must submit a full record of the observation in the Service's Injury and Mortality Reporting (IMR) system. Finally, an annual report must be submitted to the Service for each year that the permit is valid. Reports must include all fatality monitoring methods used, data from each survey, and observation of eagle remains. Data must be submitted using the Service's data-reporting template. Data in this template great simplify updating fatality estimates at a permitted wind project.

Reporting is also required for short-term eagle take permits; however, these reports are typically due annually. These reports must include information on nest occupancy, success, and productivity either observed incidentally or while monitoring.

3.3.2 Permitting Framework Details Common to All Action Alternatives

This section describes a new permitting framework proposed under this rulemaking that will be consistent across all three Action Alternatives. Alternatives to this proposed new framework were considered, but subsequently eliminated from consideration. These are discussed in more detail in Section 3.4.6 of this EA. This section also describes proposed changes to several aspects of the existing regulation and several procedural changes that will be implemented across all three Action Alternatives.

3.3.2.1 General Permits

All Action Alternatives, below, incorporate general permits. General permits, in the context of eagle take permits, are automated permits that the Service will process and issue electronically with no site- or project-specific review. These permits will only be available when we determine that site- or project-specific analysis is not necessary in order to comply with the Eagle Act's preservation standard. General Permit Programs (GPPs), under which general-permit eligibility will be defined and under which general permits can be issued, may be developed for different activity types. While we will issue general permits to individual organizations or persons, each general permit authorized will provide standard authorizations and requirements for each permittee under the applicable GPP.

The Service's purpose for introducing a permitting framework that includes general permits is three-fold:

- To streamline permit issuance for projects that the Service can pre-determine are unlikely to have relatively high or uncertain impacts on eagles. This will allow the Service to focus limited staff and resources on activities or projects that may have high or uncertain risks to eagles. The goal being to increase the number of projects on the landscape that operate under permits.
- To provide applicants and the Service with predictability, certainty, and increased efficiency in the application process and implementation of permits to applicants.

- To foster consistency in eagle-take permitting across Service regions and offices, and between individual permits.

Because general permits do not require site- or project-specific review, application-review times for projects or activities that qualify for a general permit will be eliminated. Additionally, issuing general permits for a subset of situations is expected to free up time and resources for Service staff to work on relatively fewer specific permits, which is likely to result in much faster application review times for specific-permit applications. We anticipate both of these general-permit benefits will increase the number of applications we receive and the number of permits we issue and, thus, the amount of conservation (through implementation of A&M measures and mitigation) we achieve for eagles.

The lack of site- or project-specific review for general permits also means that the Service will not be able to estimate the specific impacts of any one activity authorized under a general permit on the applicable EMU and LAP prior to permit issuance. Because we will no longer have this information prior to permit issuance, we will build into general-permit conditions measures designed to ensure each GPP can be implemented consistent with our preservation standard and eagle-population-management objectives set forth in the PEIS. These measures are described below and, in most cases (when referenced), are based on analysis described in Appendix A. Additionally, we will require each general permittee for wind energy facilities to pay an administration fee to fund the Service's costs associated with the administration of GPPs for wind energy projects. If analysis of monitoring data suggests a GPP is authorizing take inconsistently with our preservation standard, we will suspend the GPP temporarily or indefinitely. This suspension may apply over all or part of the program area. Such a suspension could also occur if the Service finds that bald- or golden-eagle populations are trending in a direction that would cause concern for meeting our preservation standard. Should the Service take such action, permits issued under the GPP would remain valid until their expiration; however, no new permits could be issued under the GPP in the geographic area where suspended.

Because site- or project-specific review of general permit requests will not occur, all general permits will come with a standard condition that implementation of permit conditions will not violate State, Tribal, or Federal laws, including the Endangered Species Act.

3.3.2.2 Specific Permits

All Action Alternatives also include specific permit authorizations. Specific permits are permits issued to projects that do not qualify for a general permit (or do not wish to receive a general permit) and require a site- or project-specific analysis. To date, all eagle-take permit applications submitted to the Service have been reviewed (and any permits subsequently issued) with a site- or project-specific analysis. "Specific permits" is a new name used to differentiate this type of permit from "general permits" and represents the existing system the Service uses to review and issue eagle take permits since promulgation of the incidental take permit regulations in 2009. Under the permitting framework proposed here, however, we only expect to issue specific permits to projects that do not qualify for, or do not wish to accept the conditions of, general permits.

For projects that do not qualify for, or do not wish to accept conditions of, a general permit, we are proposing changes to improve program efficiency under specific permits and to encourage participation.

First, under all Action Alternatives, we propose to remove third-party monitoring requirements, which are currently required for issuance of long-term permits. We included this third-party monitoring requirement in the 2016 Eagle Rule because of concerns from the public that dishonest reporting could occur. For example, a company may underreport the number of eagle fatalities at a permitted project. However, over the last several years (and in comments submitted for the ANPR) wind companies, utility companies, and defense sectors have each communicated to the Service that the third-party monitoring requirement in the existing regulation has discouraged participation in the permitting process or influenced the permit tenure requested by applicants. These companies have indicated that cost, safety, or legal restrictions on property access can all contribute to making third-party monitoring difficult or impossible to implement. Moreover, we expect that the criminal penalties at 18 U.S.C. 1001 for making false statements when interacting with the federal government to receive a benefit or legal authorization to conduct an activity will serve as an adequate deterrent for dishonest reporting by permittees. Thus, we have decided that the benefits of greater participation in eagle take permitting outweigh any potential risk and cost of dishonest reporting and that existing criminal penalties for making false statements also reduce any need to require third-party monitoring.

Second, under all Action Alternatives, we propose to eliminate administrative check-in requirements that are currently required under long-term permits. When the Service increased the maximum permit tenure to 30 years in the 2016 Eagle Rule, we introduced administrative check-ins between the Service and the permittee at a frequency not to exceed five years. The purpose of these check-ins was for the Service to review all existing data related to a permitted project and re-calculate fatality estimates, authorization levels, and mitigation requirements, as well as require new permit conditions if deemed necessary and if practicable for and agreed to by the permittee. Over the last several years, the Service has heard complaints from some wind companies that these administrative reviews introduced uncertainty into the permitting process. Long-term applicants and permittees have complained that, under the current permit regulation, they don't know what their permit is going to look like after five years or how much additional cost they may incur if their permit conditions change. According to these complaints, this requirement has discouraged participation in the permitting process or influenced the permit tenure requested by applicants (i.e., applicants simply request 5-year permits for long-term projects instead of more appropriate 30-year permits with 5-year check-ins). These complaints were reiterated in comments submitted for the ANPR. In the interest of improving certainty for applicants and permittees, the Service proposes to remove the requirement for administrative check-ins under specific permits. We instead propose to hold permit terms constant unless the permittee requests an amendment, or unless the Service determines that an amendment is necessary and required under 50 CFR 22.200(e). Such a change would replace scheduled check-ins and amendment of permit conditions, with unscheduled check-ins and amendments that the applicant or the Service could initiate at any time when situations arise that warrant one.

We propose to retain the requirement for permit-specific adaptive management plans for certain long-term specific permit types. The Service and permittee will use these adaptive management plans, when required, to account for unforeseen or unlikely circumstances, such as a new nest in the vicinity of a permitted activity or when take levels are greater than predicted. The measures

in these plans will become permit conditions and will offer permittees certainty for the duration of their permit. If the Service estimates that authorized take has been exceeded at any time during the permit tenure, the permittee will need to amend their permit to account for higher-than-expected take rates. Such amendments, if necessary, would include additional compensatory mitigation to offset higher-than-expected amounts of take.

Finally, under all Action Alternatives, we propose to construct a three-tier, specific permit application structure for wind energy projects, with each tier characterized by different application fees and processing times commensurate with the Service resources needed to process the application. These tiers are designed to encourage applicants to make decisions that reduce the need for lengthy analysis and negotiation during application review. Lengthy analysis and negotiation slow down permit issuance and are typically caused by the submission of data or methods that do not meet the Service's standards, or applicants not agreeing to the Service's analysis or permit terms during application review. To combat inefficiency and work towards the goal of a more efficient specific permit review process, the Service proposes to create standardized specific permit conditions that will make the specific permit issuance process more transparent to the applicant and, if these conditions are agreeable to the applicant, streamline permit application review and processing for wind energy development. Applicants are eligible for a streamlined specific permit application review if (1) they have eagle-use or fatality monitoring data for the project in question that meets the Service's standards (see section 3.4.1.2) or they are willing to accept compensatory mitigation rates for the first 5-years that are based on the Service's CRM run with priors only, (2) they are willing to accept and implement the Service's standardized specific permit conditions without negotiation and use a previously approved in-lieu fee (ILF) program for any required compensatory mitigation, and (3) their application review does not require a tiered EA or EIS. This streamlined tier is referred to as Tier 1 hereafter and in the regulation.

If an applicant does not have eagle-use or fatality monitoring data collected according to Service standards and does not wish to accept mitigation rates based on priors-only CRM, or if the Service needs to adapt permit conditions to applicant needs or review and approve individual compensatory mitigation plans, such projects will have a higher application fee and longer processing times. This tier is referred to hereafter and in the regulation as Tier 2. Tier 2 projects must not require a tiered EA or EIS. Finally, if an applicant is applying for a project that requires a tiered EA or EIS, the Tier 2 application fee will apply, processing times will again increase, and a reimbursable agreement will be necessary to offset Service costs in developing the additional NEPA review. This final tier is referred to hereafter and in the regulation as Tier 2 with reimbursable agreement.

The application fee under Tier 1 is $18,000. Combined with a $10,000 administration fee, these permits will cost an applicant $28,000. The application fee under Tier 2 is $26,000. Combined with an $10,000 administration fee, these permits will cost an applicant $36,000. The application fee under Tier 2 with reimbursable agreement is the same as for Tier 2, except that the applicant will also be required to enter into a reimbursable agreement with the Service to reimburse Service costs of any additional analysis associated with permit application review, such as a tiered EA or EIS. Section 13.11 contains fee details for each of the specific permit tiers described above. To ensure these tiers are achieving our goal of more efficient specific permit processing, the Service's policy will be to move projects in any tier that do not diligently pursue their permit (evidenced through timely responses to the Service and good-faith negotiations) to either the

bottom of the Service's application processing queue or to a higher tier, if deemed appropriate by the Service.

As with general permits, the Service would have the right to temporarily or indefinitely suspend incidental take permitting across all or parts of the country if we have reason to believe that continuing to permit eagle take would not be consistent with the preservation standard.

3.3.2.3 Definition Changes

Proposed alongside all Action Alternatives below are updates to definitions at 50 CFR 10.12, 22.12, and 22.6:

- For clarity, we propose adding a definition of "general permit" to 50 CFR 22.6 to distinguish general permits from the current definition of permit in 50 CFR 10.12.
- For clarity, we added a definition of "incidental take," as this term is used throughout our regulations but not currently defined in relation to eagle take. Incidental take means direct and foreseeable take that results from, but is not the purpose of, an activity. This simply clarifies that take of eagles that is associated with, but not the purpose of, an activity (how this type of take is currently described in 50 CFR 22.80) equates to this commonly understood phrase. It does not change the scope or effect of any permit regulations that will apply this definition.
- We updated the definition of "eagle management unit" to include the current boundaries for those units to improve transparency to the public and general permit applicants.
- We propose amending Illegal Activities (50 CFR 22.12) to clarify that application for a permit does not release you from liability for any take that occurs prior to issuance of, or outside the terms of, a permit. This provision is currently in section 22.80(e)(8) but applies to all of Part 22 so is better located in section 22.12.
- The current definition of "eagle nest" includes assemblages of materials built, maintained, or used by bald eagles or golden eagles for the purpose of reproduction, regardless of current situation and availability for future use by eagles. Under all Action Alternatives, we amend this definition to clarify that materials with no conceivable future use to breeding eagles do not qualify as eagle nests. This amendment avoids unnecessary protection of former nest structures when they are no longer of biological value to eagles. For example, a bald eagle nest in a tree that fell into a parking lot and needed to be removed would no longer retain the regulatory designation of an eagle nest and could be destroyed without a permit. We expect this change will result in minimal, low-intensity effects at most.
- The current definition of an "in-use eagle nest" includes a nest characterized by the presence of one or more eggs, dependent young, or adult eagles on the nest in the past 10 days during the breeding season. This definition does not acknowledge the common reality that nonviable eggs with no value to bald eagle reproduction may be present in nests and even incorporated into nest structures. Under all Action Alternatives, we have updated the definition of in-use nest to specify that eggs must be viable for a nest to be considered in-use. This updated definition better matches our original regulatory intent of

protecting nests containing live eggs or chicks from removal in all circumstances except emergencies.

These changes are primarily ministerial in nature and introduce, clarify, or better explain regulatory terms. Therefore, we anticipate these changes will have no or minimal, insignificant effects on the environment.

3.3.2.4 Prioritization Order

Several public commenters pointed out that our proposed regulation had omitted any statement of how the Service will consider cultural significance of eagle populations and prioritize Tribal requests for eagle take related to all other requests. We added this language back into the final regulation. Among the issuance criteria for specific permits, we will consider the cultural significance of a local eagle population and whether the issuance of an eagle take permit would preclude the Service from authorizing take that is necessary to protect an interest of higher priority according to the following prioritization order: (1) safety emergencies, (2) increased need for traditionally practiced Tribal religious use that requires taking eagles from the wild, or (3) non-emergency activities necessary to ensure public health and safety.

The prioritization order would not apply to general permits because of their automated nature.

3.3.2.5 Analysis of Unpermitted Take

We propose to remove the 10% unauthorized-mortality LAP threshold that we introduced with the 2016 Eagle Rule. We established this threshold to further assure the sustainability of authorized take by factoring in the cumulative impacts of unauthorized take within the LAP. However, since promulgation of the 2016 Eagle Rule, we have noted that georeferenced data on unauthorized eagle mortality are sparse and heavily biased towards sources of mortality that commonly occur in areas where humans are present (e.g., roadsides, under power lines). Thus, we cannot meaningfully assess unauthorized take as a percent of LAPs based on available information. However, to mitigate any potential impact of this change, we will continue to monitor the health of LAPs and the impacts of unauthorized take on eagles through review of data from Tribal, state, NGO, law enforcement, pathology findings, and wildlife-rehabilitation-community sources. Further, we will continue eagle population monitoring efforts through aerial surveys, Global Positioning System (GPS) telemetry monitoring, and leveraging of community science.

3.3.2.6 Baseline Take of Golden Eagle East of the 100th Meridian

The Service would clarify that baseline take applies to golden eagle take that was occurring East of the 100th Meridian prior to September 11, 2009 (i.e., finalization of the Service's 2009 Eagle Rule). In other words, take authorized in the Eastern golden eagle EMU that is (or would be) considered part of baseline (see Section 1.4) will not be deducted from EMU take limits and, thus, will not be subject to an offsetting mitigation requirement as long as take authorizations within the LAP are consistent with our preservation standard.

In the 2016 PEIS, the Service assumed that baseline take would not apply to this population. This position represented a cautious approach to expanding the availability of golden eagle take authorization in the eastern EMU. In the intervening years, the Service has not issued any permits for incidental take of golden eagles in this management unit. Biological evidence also indicates that the eastern golden eagle population has remained relatively stable through recent decades (Farmer et al. 2008, Dennhardt et al. 2015). The Service currently applies a baseline standard to pre-September 11, 2009, golden eagle take in the western U.S., as well as bald eagle take anywhere in the U.S. that was occurring prior to this date. By broadening the baseline standard to apply to eastern golden eagles, we intend to establish a nationally consistent policy based squarely in biology. Because no nest or incidental take permits have been issued to date for golden eagles in the eastern EMU, we do not expect that this clarification will have any environmental impacts compared to the No Action Alternative other than to encourage compliance from existing and future projects that may have otherwise been dissuaded from applying for a permit by our previous approach.

3.3.2.7 Take Rates Debited from EMU Take Limits and LAP Thresholds

Although not a change to the regulation, the Service would change the number of eagles debited from EMU limits and LAP thresholds for bald eagle nest disturbance permits, based on updated best available information. Presently, the Service conservatively predicts that bald-eagle-nest disturbance authorized under permits results in an annual loss of breeding productivity equivalent to 1.33 bald eagles (estimated annual productivity at the 80th quantile) per territory in all the lower 48 United States, except the southwest. In the southwest, we assume a value of 0.95 bald eagles (estimated annual productivity at the 80th quantile). However, a recent Service analysis of annual reports submitted under past nest disturbance permits indicates that disturbance, as defined in the regulations, does not ultimately occur at a relatively high percentage of authorized nests. Specifically, of all used nests where disturbance was authorized (via a nest disturbance permit), the Service conservatively estimates (at the 80th quantile) that 19.5% of them were unproductive (see Appendix A, Attachment 3). This analysis offers valuable insight into the actual loss to bald eagle populations associated with nest disturbance permits. Thus, this information can be used to update the observed, nationwide, bald eagle take rate under nest disturbance permits from an assumed 1.33 bald eagles per year, to 0.26 (1.33 * 0.195) bald eagles per year. Using this observed rate of take, we can more accurately account for the impacts of our bald eagle nest disturbance permits (general or specific) on the respective EMU limits and LAP thresholds for bald eagles. Note that this change excludes permits issued in the southwest EMU, where we did not have large enough sample sizes for this analysis and thus will conservatively keep the take debit there at 0.95 bald eagles per year. The Service does not have sufficient information to assess the observed rate of take for golden eagle nest disturbance permits or nest removal permits for either species.

3.3.2.8 Nest Take Amendments

We propose to amend the existing Nest Take permitting regulations under all Action Alternatives. The purposes of these proposed changes are as follows:

- Clarify that temporary or permanent obstruction of a nest, causing temporary or permanent nest abandonment, constitutes nest take and requires a nest take permit.

- Add an additional justification authorizing the take of eagle nests to protect species protected under the ESA (see List of Threatened and Endangered Species (50 CFR 17.11)).
- Extend the ability of the Service to authorize nest take for an in-use nest prior to egg laying, including situations where safety of humans or listed species is at risk.

Under all Action Alternatives, the 5 situations under which the Service can authorize nest removal would now be (including the four 4 existing situations):

> **1. (Currently in Regulation)** For an Emergency: When an in-use or alternate eagle nest must be taken to alleviate an existing safety emergency, or to prevent a rapidly developing safety emergency that is otherwise likely to result in a safety emergency to humans or eagles while the nest is still in use by eagles for breeding purposes.
>
> **2. (Currently in Regulation)** For Health and Safety: When an in-use eagle nest prior to egg-laying or an alternate eagle nest must be taken to ensure public health and safety.
>
> **3. (Currently in Regulation)** For Regaining Use of a Human-Engineered Structure: When an in-use eagle nest prior to egg-laying or an alternate eagle nest, that is built on a human-engineered structure, must be removed in order to eliminate a functional hazard, or the development of a functional hazard, that renders or would render the human-engineered structure inoperable for its intended use.
>
> **4. (NEW)** For Endangered or Threatened Species Protection: When an in-use eagle nest prior to egg-laying or an alternate eagle nest must be removed to protect species on the List of Endangered and Threatened Wildlife (50 CFR 17.11).
>
> **5. (Currently in Regulation)** For a Net Benefit to Eagles (other purposes): When the activity necessitating the removal of an alternate nest, or the mitigation for that nest removal, will provide, with reasonable certainty, a net benefit to eagles.

3.3.3 Alternative 2: General Permits Available for Wind Energy Facilities; Eligibility Based on Distance from Nests; Flat Fee for Mitigation

If we select Alternative 2, the Service will create a GPP for land-based wind energy facilities only. Only a subset of wind energy facilities would qualify for these general permits. Specific permits would be available to projects that do not qualify for general permits, or that do not wish to accept the conditions necessary to receive a general permit. This GPP would specify that every general permittee would pay a flat compensatory mitigation fee and an administration fee based on project ownership for each general permit issued, regardless of project size or risk to eagles.

We include this alternative in our analysis because it represents a detailed alternative that was presented during the public comment period for the ANPR and represents a potentially viable concept and thus a reasonable alternative. However, we note (as described in more detail below) that it is difficult to analyze this Alternative's consistency with the Eagle Act's preservation standard without assessing additional criteria and conditions that would more clearly ensure consistency with that standard.

3.3.3.1 Eligibility for General Permits

Under Alternative 2, wind energy facilities would qualify for a general permit if every project turbine that exists or is proposed is not within one mile of a known bald eagle nest, or within two miles of a known golden eagle nest. No other activity types would qualify for a general permit.

All potential applicants who are not eligible for or not seeking a general permit to incidentally take eagles during operation of a wind energy facility would need to apply for a specific permit. Also, any wind energy facilities that do not qualify for a general permit, or that qualify but do not wish to accept conditions necessary to receive a general permit or do not otherwise want to pursue one, would need to apply for a specific permit.

3.3.3.2 Pre-Application Information Collection

To determine if a project is eligible for a general permit, applicants would need to certify that they have searched all possible nest substrate within two miles of all turbine locations (existing or potential) for eagle nests belonging to both eagle species. For projects east of the 100th meridian, a one-mile search radius would be appropriate because golden eagles are not known to nest there. Applicants must also certify that they have searched all known databases and otherwise attempted to obtain any known records of existing and historical eagle nest locations within two miles of all existing or potential turbine locations. No pre-construction eagle-use surveys will be required for issuance of a general permit for a wind energy facility.

Applicants seeking specific permits will be subject to the information collection requirements for specific permits described in Section 3.4.2.2. Regulations will stipulate that the Service's pre-construction monitoring standards must be followed to the maximum extent practicable. The Service will decide if submitted information is appropriate for use in our fatality estimation process for the associated permit application and will use the best available information when making such estimates.

This Alternative would retain, under all specific permits for wind energy facilities, the criteria in the current regulation for waiving pre-construction monitoring requirements for wind projects. This language states that the above data standards may not be needed if:

- The Service has data of sufficient quality to estimate the likely risk to eagles.
- Expediting the permit process will benefit eagles, or
- The Service determines the risk to eagles from the activity is low enough relative to the status of the eagle population based on:
    - Physiographic and biological factors of the project site, or
    - The project design (i.e., use of proved technology, micrositing, etc.)

We would strongly recommend nest surveys be conducted, but they would not be a requirement of specific permit issuance. Applicants seeking specific permits for activities such as those that are likely to disturb or remove an eagle nest would have limited pre-application information collection requirements outside of the basic information necessary for application processing, such as nest location and status.

3.3.3.3 Avoidance and Minimization Measures

Under Alternative 2, the Service would develop standard A&M measures under the wind-energy GPP that all general permit applicants would have to accept to receive a general permit. These measures would become conditions of any general permit. To the extent practicable, we will structure A&M requirements to encourage the use and evaluation of experimental technologies to avoid and minimize take. These standard measures are likely to change over time as new information and technology becomes available. Examples of such measures are listed below. This list is not intended to be a complete list, and measures may be added or removed over time at the Service's discretion. When the Service changes these approved measures, all new general permit applicants will be held to those updated measures. If measures are updated by the Service, existing general permittees will not be required to immediately adopt any new A&M measures. However, if existing general permittees elect to re-register for another 5-year general permit upon expiration of their existing permit, such new measures would apply. Applicants who do not wish to or cannot agree to the new standard A&M measures would have the option to apply for a specific permit.

Examples of A&M measures that may be standard under the GPP for wind energy.

- Project personnel are required to drive 25 mph or less on non-public project roads, be alert for wildlife, and use additional caution in low-visibility conditions when driving any vehicle.
- Any garbage or waste observed will be collected and disposed of in an appropriate trash receptacle securely protected from wildlife.
- Any new transmission infrastructure associated with the wind energy project will be constructed and maintained to meet the most recent APLIC suggested practices (currently 2006) for reducing electrocution risk to birds.
- If applicable, permit holders will install underground collection lines when practicable to minimize eagle collision and electrocution risk associated with aboveground lines. Any aboveground lines will be constructed in compliance with APLIC (2006) standards.

To obtain a permit, all applicants for specific permits will be required to either a) implement the Service's standard specific permit conditions (if they wish to be eligible for Tier 1), or b) implement a customized set of project-specific A&M measures. Customized sets of conditions must include any practicable A&M measure. Measures will be negotiated at the project level and may vary from permit to permit.

3.3.3.4 Compensatory Mitigation

Under Alternative 2, each general permittee would be required to provide compensatory mitigation adequate to offset two golden eagles, at a ratio of 1.2:1, for every five-year permit term. Considering this ratio, compensatory mitigation for golden eagles under this Alternative will need to save or provide at least 2.4 golden eagles every 5 years. Compensatory mitigation for bald eagles is not typically needed to ensure authorized take is consistent with our preservation standard because most bald-eagle EMU take limits are relatively high commensurate with that species' increasing population. However, the Service does expect that

general permits will occasionally be issued in areas in which compensatory mitigation for bald eagles could be necessary to meet our preservation standard. The risk of general permit issuance for bald eagles being inconsistent with our preservation standard is highest in the southwestern U.S., an area characterized by relatively low bald eagle EMU take limits and relatively small bald eagle LAPs. To reduce the risk of general permit issuance being inconsistent with bald eagle management objectives, the Service will require a small compensatory mitigation requirement for bald eagles under each general permit we issue. Under this Alternative, each general permittee would provide compensatory mitigation to offset 0.2 bald eagles at a ratio of 1:1 for every five-year permit term. The mitigation credits purchased with this requirement (hereafter general-permit LAP mitigation requirement) could be used to offset bald or golden eagle take should the Service determine that authorized bald or golden eagle take in a locality is inconsistent with our preservation standard.

Under a general permit, compensatory mitigation would only be implemented by using a Service-approved ILF program. Agreements with ILF programs would require the ILF program to track mitigation funds received from eagle take permittees and EMUs within which those funds must be spent. All mitigation credits purchased by permittees must be directed to the species-specific EMU where the take is authorized. Agreements with ILF programs will also require annual meetings with the Service. In the months between these annual meetings, the Service will track the locations and estimated amounts of authorized take for each species under the GPP, noting areas with relatively high densities of general permits or high amounts of authorized take in each EMU. At each annual meeting, the Service will instruct the ILF programs where to direct mitigation efforts. Typically, the Service will direct ILF programs to implement compensatory mitigation in areas in each EMU where cumulative authorized take seems to be the highest, and most likely to be exceeding the LAP threshold; however, the Service may direct the funds based on other factors if deemed necessary for meeting our preservation standard.

All applicants for specific permits would offset any take that exceeds established EMU take limits. For golden eagles, EMU take limits are set at zero throughout the United States; thus, compensatory mitigation would be provided for all authorized take of golden eagles that is not considered to be a part of baseline. Golden eagle take that is not a part of baseline would be offset at a ratio of 1.2:1. For bald eagles, compensatory mitigation will not typically be required unless we estimate that issuance of a specific permit will exceed EMU take limits. Bald eagle take that is not considered part of baseline would be offset at a ratio of 1:1. All compensatory mitigation requirements must be applied in the EMU where the authorized take above the EMU take limit occurs. If the Service estimates that authorized take under a specific permit is inconsistent with our preservation standard at the LAP scale, the Service may elect to require compensatory mitigation within the project-specific LAP. To be eligible to apply for a specific permit under Tier 1, applicants must agree to use a Service-approved ILF program or conservation bank to satisfy compensatory mitigation requirements. Applicants that do not wish to utilize a Service-approved ILF program must apply for a specific permit under Tier 2 (or Tier 2 with reimbursable agreement if a tiered EA or EIS is required). Such applicants could submit their own compensatory mitigation plan for Service approval.

3.3.3.5 Adaptive Management

General permits under Alternative 2 would require that any wind energy facility covered by a general permit that finds three bald eagles or three golden eagles over the five-year permit tenure design and implement measures to reduce eagle take. Permittees must provide the Service with their adaptive management plan and a description and justification of which adaptive management approaches will be implemented. Such measures need not be approved by the Service. However, it will be in the best interest of the general permittee to implement measures likely to reduce take at the project because if four bald eagles or four golden eagles are found over the five-year general permit tenure, the covered facility would be ineligible to receive another general permit upon expiration of their current permit. If an injury or mortality of a fourth eagle of that species is not found before the 5-year permit tenure is up, the permittee remains eligible for another general permit. Continuing any adaptive-management measures into the next permit term would be optional. By requiring this adaptive management measure, the Service expects to minimize the number of wind energy facilities authorized under general permits that have unexpectedly high impacts on eagles. This will reduce the risk that the GPP is authorizing take that is inconsistent with our preservation standard. Projects that exhibit relatively high and unexpected impacts to eagles are more appropriately permitted under specific permits.

Specific permits issued to wind energy facilities will require project-specific adaptive management measures that reduce the risk that actual eagle take at a project exceeds the amount authorized on the specific permit. These adaptive management conditions will typically involve a "trigger" (*e.g.*, 9 eagles found in the first 5 years of the permit tenure, or the presence of a new nest within 1 mile of a project turbine) and an associated measure that is geared towards either better understanding the eagle risk at the facility or reducing take rates. Typically, required measures would increase in intensity as concern for exceeding authorized take grows.

With the Service's proposal to remove the requirement for administrative check-ins, conditional periodic re-assessment of impacts and potential amendment of permit terms (e.g., take authorization levels, compensatory mitigation, etc.) will no longer be scheduled. However, the permittee can request, or the Service can require an amendment to permit conditions at any time as outlined in 50 CFR 13.23. Should the permittee wish to amend permit conditions (e.g., mitigation requirements), the permittee can request a permit amendment by submitting a full written justification and supporting information. Conversely, the Service can determine that an amendment is necessary and require such an amendment under 50 CFR 22.200(e). The Service could require amendments to permits under this authority if information suggests we have overestimated eagle take rates at the permitted project and that over-authorization is hindering our ability to issue other permits within an EMU or LAP (amendments could also occur if we underestimate eagle-take rates). Because of the conservative nature of estimating take rates, we would expect to overestimate predicted take rates much more frequently than we underestimate them.

Shorter-term specific permits for other activities, like activities that may cause nest disturbance or nest removal, would not typically include adaptive management conditions. However, specific permits for some longer-term activities, especially where the Service has a high level of uncertainty surrounding the amount of authorized take, may include project-specific adaptive management requirements. Adaptive management conditions would typically have the same goal

as those under specific permits for wind energy development – to reduce the risk of exceeding authorized take.

3.3.3.6 Fatality Monitoring

Under Alternative 2, general permit holders would train relevant employees to look for, recognize, and report eagle take concurrent with their regular duties in the vicinity of project infrastructure. We describe this monitoring as "concurrent monitoring." Concurrent monitoring would include visually scanning for injured eagles and eagle remains during inspections, maintenance, repair, and vegetation management at and around project turbines. Concurrent monitoring scans would occur a minimum of once every three months corresponding to the highest eagle-use, seasonal periods to the maximum extent practicable. Additionally, utility-scale general permittees would pay an administration fee of $12,000 per permit and distributed and community-scale wind projects would pay an administration fee of $3,000 per permit to fund Service costs to administer the GPP and ensure consistency with our preservation standard. These fees are slightly higher than under Alternatives 3 and 4, due to the costs of administering the GPP being spread across fewer expected permits (see Section 5.4.5.1). The Service will use those fees to acquire information that will help verify that the GPP is compatible with the preservation of eagles and to better understand program impacts. Service-led information collection will be done with the following primary and secondary objectives:

> Primary Objective: To provide information that will assist the Service in estimating authorized eagle take (of both species) under the GPP and to ensure that eagle take under the GPP, along with other authorized take from specific permits, is consistent with our preservation standard. To determine this, all authorized take should be within EMU take limits and should not significantly exceed the LAP take threshold in any LAP (additional analysis and/or compensatory mitigation might be required if it does).
>
> Secondary Objective: Inform other relevant aspects of the administration of the program, such as an understanding of changes in the sources of golden eagle mortality and effectiveness of the permitting program in achieving eagle conservation.

The Service does not intend to conduct surveys for eagle remains at generally permitted projects. Rather, Service-led monitoring may include, but is not limited to, telemetry projects studying eagle movements, behavior, and survival, and bias trials to estimate the searcher efficiency (and possibly carcass persistence) of eagle remains during concurrent monitoring at wind facilities.

Specific permits issued to wind energy facilities will require that the permittees be directly responsible for required project-specific fatality monitoring at their permitted infrastructure. The Service expects higher and more uncertain fatality rates associated with specific permits given they will generally be issued for projects in higher-risk areas, so fatality monitoring under specific permits will have the same objectives as under Alternative 1. We would publish specific permit standard conditions, including minimum standards for fatality monitoring. We will also post a technical resource that describes best practices for achieving the Service's fatality monitoring standards for specific permits. As we learn more about fatality monitoring techniques and technologies, the Service will update these standards.

3.3.3.7 Reporting

Under Alternative 2, permittees would submit reports of documented eagle fatalities to the Service within 2 weeks of discovery. Like under Alternative 1, general permittees under Alternative 2 would submit annual reports that summarize eagle fatality findings for the previous year.

Reporting for all specific permits under Alternative 2 is the same as under Alternative 1.

3.3.4 Alternative 3: General Permit Available for Wind Energy Facilities; Eligibility Based on Relative Abundance and Distance from Nests; Mitigation Fee Based on Hazardous Area

Under Alternative 3, the Service would create a GPP for land-based wind energy facilities only, just as we proposed under Alternative 2. However, eligibility for new general permits would be based on the relative abundance of eagles where turbines exist or are proposed. To account for different status and trajectory between the two eagle species, we would reduce the minimum distance eligibility requirement for bald eagle nests to 660 feet. All wind projects that qualify for and receive a general permit will retain their eligibility for general permits regardless of future changes in relative abundance thresholds and nest locations. Specific permits would still be available to projects that do not qualify for general permits, or that do not wish to accept the conditions necessary to receive a general permit.

Alternative 3 further deviates from Alternative 2 in how the Service would determine compensatory mitigation requirements. Under Alternative 3, the GPP would specify that every general permittee would be required to pay a compensatory mitigation fee that would be based on the project's existing or proposed hazardous area (*i.e.*, rotor-swept area). This is different from Alternative 2, where mitigation fees are the same for all general permits. The Service calculated compensatory mitigation amounts that are specific to general permits for wind-energy projects under this Alternative. This was accomplished utilizing data from pre-construction eagle-use surveys and post-construction fatality monitoring required of existing projects permitted under the current regulations that would be eligible for general permits under this Alternative. We based the compensatory mitigation values described in this Alternative on our fatality predictions across all general permits (see Appendix A).

Fatality monitoring under Alternative 3 would be the same as required under Alternative 2, however administration fees would be slightly lower, accounting for the higher participation rates expected under Alternative 3 (see Section 5.5.5.1). If participation in general permits remains low, the Service would likely have to increase the fees associated with general permits or suspend the general permit program in part or in whole and convert existing general permits to specific permits. Conversely, the more permittees that are eligible for and receive general permits, the lower the required monitoring costs may be in the future.

3.3.4.1 Eligibility for General Permits

Under Alternative 3, the Service proposes to use eagle abundance to determine general permit eligibility for new permits. Using eagle abundance, based on specific thresholds, allows the Service and the regulated community to identify localities where eagle use is low enough that we are confident (without site-specific survey data) that cumulative eagle fatalities at wind energy

facilities will remain within EMU take limits or can be sufficiently offset with standardized contributions to implement compensatory mitigation. A detailed discussion on the benefits of utilizing eagle relative abundance to set general permit issuance criteria is included in Appendix A.

In order to use eagle abundance as eligibility criteria, the Service requires standardized information on the relative abundance of each eagle species at a fine scale in each season throughout the coterminous U.S. We evaluated the utility of the following sources of available information: North American Breeding Bird Surveys, Christmas Bird Counts, the Midwinter Bald Eagle Survey, the bald eagle communal roost database, various eagle telemetry datasets, databases of nest locations, and eBird Status and Trends relative abundance products. The only one of these datasets that meets our requirement of providing annually comprehensive spatial and temporal relative abundance estimates throughout the coterminous U.S. for either eagle species is the eBird Status and Trends relative abundance products. We have previously evaluated the ability of the eBird Status and Trends relative abundance products to identify high eagle use areas delineated in the other data sets and determined that eBird successfully identified > 90% of such areas (Ruiz-Gutierrez et al. 2021). Given this, and accounting for the comprehensive spatio-temporal coverage of eBird, its availability to the public from the Cornell Lab of Ornithology, which receives federal and nonfederal support, and the fact that eBird products are regularly updated, the Service determined that eBird Status and Trends relative abundance estimates for eagles represents the best available information for our purposes here. eBird relative abundance values represent the average number of eagles of each species expected to be seen by an expert eBirder who observes for 1 hour at the optimal time of day for detecting the species, and who travels no more than 1 kilometer during the observation session (see eBird FAQs at https://ebird.org/spain/science/status-and-trends/faq#mean-relative-abundance). eBird relative abundance estimates for eagles are hereafter referred to as "ERA".

We used processed eBird relative abundance data from 2020 provided by the Cornell University Lab of Ornithology to develop maps of ERA for each eagle species across the coterminous U.S. Before receipt of data by the Service, the hundreds of millions of bird observations reported by eBird observers are passed through a series of validation filters to ensure only accurate observations are considered. The filtered data are then combined and passed through analytical models that account for variation in detection and effort, and which incorporate environmental information, to estimate species relative abundance seasonally at the scale of 3 km^2 (Sullivan et al. 2009, Kelling et al. 2015).

Based on our analysis of these eBird ERA maps, outlined in Appendix A, we have determined that wind energy facilities in the coterminous U.S. could qualify for a new general permit if every turbine that exists or is proposed will be located in an area characterized by expected seasonal ERA values for bald and golden eagles that are less than the values in Table 3-2 for each species in each season. This requirement does not apply to subsequent general permits for the same applicant and the same project, provided there is no lapse in general permit coverage and the permittee is compliant with conditions of their existing permit. No ERA values are available in areas where offshore wind would be constructed. Offshore wind projects would not currently be eligible for general permits and would have to apply for a specific permit.

ERA products from eBird are available at https://ebird.org/science/status-and-trends/data-access. As a convenience to the regulated community, a map of areas in the coterminous U.S. that have been pre-determined to meet these criteria is shown in Figure 3-1 and will be available in higher

resolution on the Service's website (https://www.fws.gov/node/4519786). The Service intends to update the ERA thresholds in Table 3-2 and our map periodically as updated eBird Status and Trends relative abundance products become available. At present, we plan to issue these updates approximately every five years, depending on need and program demand. For example, changes in population related to external factors such as anthropogenic mortality could alter update frequency.

Table 3-2. Seasonal ERA values for each eagle species and season. To qualify for general permits for wind energy development, each turbine must be located in an area characterized by ERA values less than these values for each species and season. For bald eagles, the seasons are defined as: Period 1 = February 15 – May 23, Period 2 = May 24 – July 19, Period 3 = July 20 – December 20, and Period 4 = December 21 – February 14. For golden eagles, the seasons are defined as: Period 1 = February 8 – June 6, Period 2 = June 7 – August 30, Period 3 = August 31 – December 6, and Period 4 = December 7 – February 7.

Period	Date Range	Bald Eagle Abundance
1.	February 15 – May 23	0.821
2.	May 24 – July 19	0.686
3.	July 20 – December 20	0.705
4.	December 21 – February 14	1.357
Period	**Date Range**	**Golden Eagle Abundance**
1.	February 08 – June 06	0.081
2.	June 07 – August 30	0.065
3.	August 31 – December 06	0.091
4.	December 07 – February 07	0.091

In addition to eligibility based on ERA, wind energy facilities would only be eligible for a new general permit if no existing or proposed turbines are or will be located within 660 feet of a known bald eagle nest, or within two miles of a known golden eagle nest. This requirement does not apply to subsequent general permits for the same applicant and the same project, provided there is no lapse in general permit coverage and the permittee is compliant with conditions in their existing permit. The minimum distance for bald eagles is reduced from what would be required under Alternative 2 because the Service does not believe specific permits are necessary for that species at that distance, given recent bald eagle population trends and our EMU take limits for the species. We anticipate that the highest density bald eagle nesting areas will be captured by our selected ERA threshold and that the environments with the lower ERA for bald eagles can sustain occasional take from general permits based on the overall trajectory of bald eagle populations and the increasing number of floaters (adult eagles that have not settled on a breeding territory) ready to adopt vacant territories.

The Service intends this distance (660 feet) to reduce the risk of nest disturbance. We recognize that it may not substantially reduce fatality rates of bald eagles at wind facilities when an in-use nest is nearby. However, authorizing general permits for wind energy facilities with turbines

sited so close to bald eagle nests that they may cause nest disturbance would be ignoring another form of eagle take. Such take would require an additional and separate eagle take permit (for nest disturbance), which would defeat the purpose of offering a general permit option, which is to reduce and streamline permitting requirements for the applicant and reduce Service workload when appropriate to do so.

With the increase in bald eagle populations and because eagles of both species commonly build new nests and establish new territories, a new eagle nest could be built near a project with a general permit, through no fault of the project proponent. To alleviate this risk to general permittees and, thus, encourage participation, the Service has elected to allow all wind projects that qualify for and receive a general permit to retain their eligibility for general permits regardless of future changes in ERA thresholds and nest locations. This may result in some wind energy projects with general permits that have turbines within 660 feet of a bald eagle nest or 2 miles of a golden eagle nest. Such permits may authorize more take of eagles than intended under general permits; however, general permit holders will become ineligible for future general permits if four eagle remains are discovered as described in detail in Section 3.4.3.5.

Existing wind energy facilities that do not meet the general-permit eligibility criteria defined above may still become eligible for general permits. The facility operator would have to initially apply for a specific permit but could demonstrate during the application process that annual eagle fatality estimates at the project in question are comparable to those estimated at wind energy facilities that meet ERA eligibility requirements, as determined by the Service's review of project-specific monitoring data. In aid of this review, the applicant should submit to the Service any pre-construction eagle use data that applies to the facility, any post-construction eagle fatality monitoring information (including any survey methods and bias trial data) from project turbines, and any records of eagle fatalities at the facility. In general, the Service will grant eligibility for a general permit if project-specific information indicates that take rates at an existing project are likely to be consistent with or lower than eagle take rates expected at similarly sized wind facilities that qualify for general permits. If the Service determines that a general permit is appropriate when reviewing the specific permit application, the applicant will receive a letter of authorization from the Service notifying them that they are eligible for a general permit.

All potential applicants that are not eligible for a general permit would have to apply for a specific permit. Additionally, any wind energy projects that qualify for, but do not wish to accept, conditions necessary to receive a general permit may apply for a specific permit.

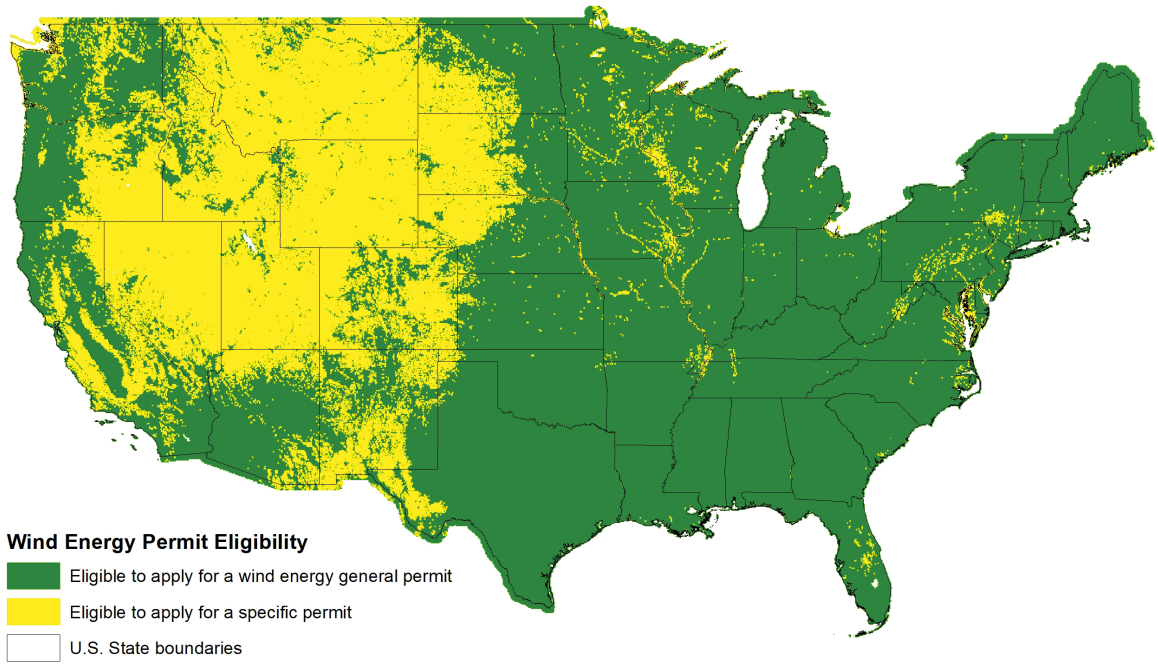

Figure 3-1. Map of the coterminous U.S. showing current localities that meet the ERA criteria in Table 3-2. Green color depicts localities where ERA values are less than the criteria and, thus, wind energy facilities are eligible to apply for a new general permit, provided that minimum nest distances of 660 feet (for bald eagles) and 2 miles (for golden eagles) are also met. Yellow depicts localities where ERA values are greater than or equal to the criteria and facilities are eligible to apply only for specific permits.

Since general permits will be issued automatically, with limited or no review by the Service at the application stage, we realize that applicants will have an opportunity to falsely certify that they meet eligibility criteria. The Service recognizes this risk and may revoke general permits if it is found that applicants have falsely certified they met eligibility criteria when applying for a general permit. Also, falsifying documents provided to or required by the federal government is a crime under 18 U.S.C. 1001. As added protection against false certifications, the Service intends to randomly audit self-certifications periodically to ensure that applicants are appropriately certifying during application. The Service expects to randomly audit a small percentage of general permits on an annual basis to ensure compliance with conditions of the general permit. Audits could consist of both desktop exercises (i.e., document, report review) or in-field audits. The audit program will be established through fees collected as part of the application fee for each permit.

3.3.4.2 Pre-Application Information Collection

Requirements for pre-application information collection under general permits will be the same as under Alternative 2, with one exception. Applicants for general permits under Alternative 3 will need to assess ERA at their project turbines and be prepared to certify that they meet general

permit eligibility standards related to ERA. To make eligibility criteria clear, and to make the certification easy for applicants, we have produced and will keep up to date a map of areas of the coterminous U.S. that meet current ERA criteria. The current map is shown in Figure 3-1 and will be available online.

3.3.4.3 Avoidance and Minimization Measures

Requirements for A&M measures under general and specific permits will be the same as under Alternative 2, with one exception. Applicants for general permits under Alternative 3 will be required to site project turbines, if not already operational, at least 660 feet from any known bald eagle nest. If an applicant cannot site turbines at least 660 feet from known bald eagle nests (or if they cannot site turbines at least 2 miles from a golden eagle nest), the applicant may apply for a specific permit.

3.3.4.4 Compensatory Mitigation

Under Alternative 3, each general permittee must provide compensatory mitigation for golden eagles at a rate commensurate with the hazardous volume (HV) at each permitted project. For the purposes of calculating this requirement, hazardous volume for a group of turbines is defined as:

$$HV = n \cdot h \cdot \pi \cdot (d \div 2)^2$$

where n = the number of turbines in the project of a given rotor diameter, h = 0.200 km, and d = the rotor diameter of a single turbine in kilometers. If a project contains turbines of varying rotor diameters, the hazardous volume for the project is the sum of the hazardous volume calculated for each turbine size. This definition of hazardous volume is consistent with the equation used to estimate fatalities in Appendix A, thus, it must also be used to calculate project-specific hazardous volume. If calculating hazardous volume at a wind energy project that has modified or added turbines after September 11, 2009, the hazardous volume requiring compensatory mitigation ($HV_{mitigation}$) can be calculated as the total hazardous volume of the current or of the future wind project (HV_{after}), minus the hazardous volume that went operational before September 11, 2009 (HV_{before}).

$$HV_{mitigation} = HV_{after} - HV_{before}$$

The Service will require general permittees to provide offsetting compensatory mitigation for golden eagles based on an EMU-specific rate of eagles-per-kilometer cubed (km^3) of hazardous volume. The rates for each EMU are listed in Table 3-3 and represent the number of fatalities we estimate will occur in each EMU per hazardous volume (km^3). Details on how these values were calculated are included in Appendix A.

Under Alternative 3, the Service would continue to require mitigation at a 1.2:1 ratio for golden eagles, consistent with our 2016 Eagle Rule and as analyzed in the PEIS. Similar to Alternative 2, a small amount of compensatory mitigation (general-permit LAP mitigation requirement) will be required in order to ensure authorized take in LAPs remains consistent with our preservation standard. Unlike under Alternative 2, this amount will be based on a rate of eagles-per-hazardous area (kilometer cubed (km^3)) that exists or is proposed at a wind energy facility regardless of whether it is part of baseline or not. To keep these mitigation calculations simple and straightforward, we will require bald eagle mitigation based on the estimated nationwide take

rate for bald eagles. The general permit LAP mitigation requirement was calculated at 10% of the nationwide rate per unit hazardous area volume for bald eagles and is listed in Table 3-3. Details on how take estimates were calculated are included in Appendix A. The mitigation credits purchased with this requirement could be used to offset bald or golden eagle take should the Service determine that authorized bald or golden eagle take in a locality is in danger of being inconsistent with our preservation standard.

Table 3-3. Five-year compensatory mitigation rates under Alternative 3, by EMU. Compensatory mitigation must be provided to ILF programs that will offset the number of golden eagles (GOEA Mitigation Rate) and apply LAP mitigation credits (LAP Mitigation Rate) as directed by the Service.

EMU	Annual GOEA Fatality Rate (# of golden eagles per km^3)	Annual BAEA Fatality Rate (# of bald eagles per km^3)	Five-Year GOEA Mitigation Rate[1] (# of golden eagles per km^3)	Five-Year LAP Mitigation Rate[2] (# of bald eagles per km^3)	Total Five-year Mitigation Rate[3] (# of eagles per km^3)
Atlantic/ Mississippi	0.77	2.80	4.62	1.40	6.02
Central	1.01	2.80	6.06	1.40	7.46
Pacific	1.62	2.80	9.72	1.40	11.12

[1] Calculated by multiplying the EMU specific Annual GOEA Fatality Rate by 1.2 (to account for the required 1.2:1 ratio), and then by five (to account for a 5-year permit term)

[2] Can be used for either eagle species as determined by the Service. Calculated as a percentage (10%) of the nationwide Annual BAEA Fatality Rate, multiplied by five (to account for a 5-year permit term).

[3] The Total Mitigation Rate is the sum of the Five-Year GOEA Mitigation Rate, and the Five-Year LAP Mitigation Rate.

Using the values in Table 3-3, a large wind project in the Pacific EMU containing 200 turbines, each with a 95.7 meter rotor diameter (average diameter of existing turbines in the U.S. Geological Survey (USGS) U.S. Wind Turbine Database (Hoen et al. 2018)) will need to provide compensatory mitigation for 2.80 golden eagles to offset take at the EMU scale, and 0.40 bald eagles to offset take at the LAP scale for every five-year general permit received. The total mitigation requirement is calculated by the sum of the two mitigation rates; thus, the example project described would need to provide mitigation for 3.20 eagles for each 5-year general permit received. Conversely, a smaller wind project in the Atlantic/Mississippi EMU containing 36 turbines of the same size (95.7m diameter) will need to provide compensatory mitigation for only 0.24 golden eagles to offset take at the EMU scale, and 0.07 bald eagles to offset take at the LAP scale for every five-year general permit received. This project would need to provide mitigation for only 0.31 eagles for each 5-year general permit received.

As under Alternative 2, a general permit under Alternative 3 would require permittees to implement compensatory mitigation using a Service-approved ILF program, as described in Section 3.4.3.4.

Requirements for compensatory mitigation for specific permits under Alternative 3 would be the same as under Alternative 2.

3.3.4.5 Adaptive Management

Requirements for adaptive management under general and specific permits would be the same as under Alternative 2.

3.3.4.6 Fatality Monitoring

Under Alternative 3, wind projects under general permits will be required to conduct concurrent monitoring and projects under specific permits will be required to conduct project-specific monitoring as described under Alternative 2 (Section 3.4.3.6). Each general permittee will also be required to pay an administration fee of $10,000 or $2,500 for utility-scale or distributed and community-scale wind projects, respectively. These administration fees are slightly lower than under Alternative 2, accounting for the higher permit participation rates expected under Alternative 3 (see Section 5.5.5.1). This money would be collected directly by the Service and is separate from any compensatory mitigation required. As under Alternative 2, the Service will use that fee to acquire information that will help verify that the GPP is compatible with the preservation of eagles and to better understand program impacts. Monitoring objectives discussed under Alternative 2 would remain the same. We note that it is difficult to predict how many applications we will receive for general permits from wind energy facilities, given that this would be a new permit program. We have predicted participation to the best of our ability based on current information. However, if participation in general permits is lower than predicted, the Service could have to temporarily subsidize information-collection efforts from our general funds. If the Service collects insufficient administration fees and does not have the ability to subsidize from general funds, the Service would likely have to either increase the fees associated with general permits or suspend the GPP in part or in whole and convert existing general permits to specific permits.

Fatality monitoring for all specific permits under Alternative 3 would be the same as under Alternative 2.

3.3.4.7 Reporting

Reporting for all general and specific permits under Alternative 3 would be the same as under Alternative 2.

3.3.5 Alternative 4: Implement Alternative 3 for Wind Energy Facilities; Create Additional General Permits for Power Line Entities, Activities Likely to Cause Nest Disturbance, and Nest Removal Activities

Under Alternative 4, the Service would implement all provisions under Alternative 3 and establish additional GPPs for the following:

Power Line Entities

Activities Likely to Cause Nest Disturbance

Nest Take and Nest Removal

3.3.5.1 Eligibility for General Permits

Wind Energy Facilities

Under Alternative 4, the GPP for land-based wind energy facilities would have the same eligibility requirements as described under Alternative 3.

Power Line Entities

Under Alternative 4, all power line entities would be eligible for a general permit, provided they are willing to accept and implement the conditions and certifications required by the Service (as described in the following sections).

The electric-utility industry has worked for decades alongside partners, including the Service, to find solutions that minimize raptor electrocutions and collisions occurring at some electric-utility infrastructure. This extensive work has resulted in the creation of Suggested Practice documents (APLIC 2006, 2012) that describe effective methods to reduce electrocutions and collisions at infrastructure that is hazardous to raptors and eagles. The implementation of these Suggested Practice documents has reduced avian electrocutions and collisions on power line infrastructure (APLIC 2006, 2012). These proven standards for reducing avian take provide the basis for the different eligibility criteria and different GPP framework for power line entities when compared to the framework proposed for wind energy facilities.

Activities Likely to Cause Nest Disturbance

Under this GPP, the Service would make general permits available to all activity types listed below that are likely to disturb a bald eagle nest, provided that applicants are willing to accept and implement the activity-specific conditions and certifications required by the Service.

- Building construction and maintenance within 660 feet of a bald eagle nest;
- Linear infrastructure construction and maintenance (*e.g.*, roads, rails, trails, power lines, and other utilities) within 660 feet of a bald eagle nest;
- Alteration of shorelines and water bodies (*e.g.*, shorelines, wetlands, docks, moorings, marinas, and water impoundments) within 660 feet of a bald eagle nest;
- Alteration of vegetation (*e.g.*, mowing, timber operations, and forestry practices) within 660 feet of a bald eagle nest;
- Motorized recreation (*e.g.*, snowmobiles, motorized watercraft, etc.) within 330 feet of an in-use, bald eagle nest;
- Non-motorized recreation (*e.g.*, hiking, camping, fishing, hunting, canoeing, etc.) within 330 feet of an in-use, bald eagle nest;
- Aircraft operation (*e.g.*, helicopters, fixed-wing aircraft) within 1,000 feet of an in-use, bald eagle nest;

- Prescribed burn operations within 660 feet of a bald eagle nest; or
- Loud, intermittent noises (*e.g.*, blasting) within one-half mile of an in-use, bald eagle nest.

Activities occurring farther than the distances specified do not require a permit because they are unlikely to cause disturbance. Regularly occurring activities that pre-date the eagles' selection of a given nest site are evidently tolerated by the eagles and unlikely to cause disturbance unless the activity was not occurring when the eagles selected their nest site. Activities conducted adjacent to a communal roost or foraging area and use of non-lethal methods to disperse eagles away from a site (known as hazing) do not constitute eagle disturbance and do not require a permit. A general permit for disturbance does not authorize take of nests or loss of a territory. Removal of a foraging area may cause disturbance, particularly if the activity will remove all or a large portion of foraging opportunities within an eagle's home range. All applicants conducting activities that are likely to fully prevent use of a foraging area will need to apply for a specific permit. All applicants conducting activities that are likely to disturb a golden eagle nest will need to apply for a specific permit. Further, any applicant likely to take a bald eagle nest that does not fall into the above categories or that cannot, or does not wish to, implement the general permit conditions under this GPP would have to apply for a specific permit. General permits are not available for nest disturbance for nest structures located in Indian country, as defined in 18 U.S.C. 1151. The Service considers the case-by-case review of specific permits appropriate for nests located in Indian country. This restriction does not apply when the Tribal government is the applicant for the permit on their own land.

Nest Take Activities

As listed in Section 3.4.2.4, this action proposes five situations under which the Service can authorize nest take when there is no practicable alternative to nest take that would protect the interest to be served. Under this GPP, the Service would make general permits available to applicants nationwide that wish to remove bald eagle nests under situations 1 through 3 only (nest take for emergency, nest take for health and safety, and nest take on human-engineered structures; see Section 3.4.2.4 for further explanation, including situations 4 and 5). The Service has amassed substantial experience issuing permits in these situations and is comfortable automating review and issuance of these permits under a GPP. The Service would make general permits available to applicants in Alaska only for removal of bald eagle nests under situation 5 (other purposes). In Alaska, the Service has developed and implemented standard conditions to meet these requirements consistent with the robust Alaska bald eagle population.

General permits would authorize removal of a bald eagle nest and any subsequent nesting attempts on the same nesting substrate and within one-half-mile of that location for the duration of the permit if the subsequent nests recreate the emergency, safety, or functional hazard that the permittee certified applied to the original nest.

All applicants wishing to remove a golden eagle nest, a bald eagle nest that may result in complete loss of territory, a bald eagle nest under situation 4, or a bald eagle nest under situation 5 outside of Alaska, will need to apply for a specific permit. These situations either result in impacts that the Service needs to analyze individually or require more in-depth analysis than would occur through issuance of a general permit. All potential applicants that cannot or do not wish to implement the general permit conditions under this GPP must apply for a specific permit. General permits are not available for take of nest structures located in Indian country, as defined

in 18 U.S.C. 1151. The Service considers the case-by-case review of specific permits appropriate for nests located in Indian country. This restriction does not apply when the Tribal government is the applicant for the permit on their own land.

3.3.5.2 Pre-Application Information Collection

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same pre-application information collection requirements as described under Alternative 3.

All Other Activities

Under Alternative 4, we will require that all power line entities, individuals conducting activities likely to disturb eagles, and individuals wishing to take eagle nests provide basic pre-application information as part of their application, regardless of whether they are applying for a general or specific permit. Such information requirements are outlined in 22.200(c) and 22.210(c). No eagle-specific pre-application monitoring will typically be required.

3.3.5.3 Avoidance and Minimization Measures

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same A&M requirements as described under Alternative 3.

Power Line Entities

Under Alternative 4, all power line entities applying for a general permit would need to certify that they have complied with or will comply with the standard conditions. We will design these conditions to ensure that any risk of eagle take from new infrastructure will be limited, and any risk of eagle take at existing infrastructure is reduced over time. At a minimum, standard conditions will include the following:

- Develop and implement a reactive retrofit strategy following all discovered electrocutions of eagles. Complete the investigation, documentation, and design selection within 90 days of the incident. Implement a response within 1 year. Retrofits must remain effective for 30 years.
- Implement a proactive retrofit strategy to convert all baseline poles to avian-safe. Retrofits must remain effective for 30 years.
    - For investor-owned utilities, complete proactive baseline retrofits within 50 years. Convert ten percent of baseline poles to avian-safe during each permit tenure.
    - For non-investor-owned utilities, complete proactive baseline retrofits within 75 years. Convert seven percent of baseline poles to avian-safe during each permit tenure.
    - Permittees without a proactive retrofit strategy may delay implementation until a strategy is developed, not to exceed April 12, 2027.
- Implement an eagle collision response strategy. For the span where the collision occurred, complete the investigation, documentation, and design selection within 90 days of the incident. Implement a response within 1 year of the incident.

- Implement an eagle-shooting response strategy. Contact the applicable Office of Law Enforcement immediately within 72 hours of discovering the eagle.
- If extenuating circumstances occur in implementing the elements above within the specified timelines, the permittee must document in permit records the circumstance, why it is extenuating, and the plan to remedy the deficit. The permittee must also notify the Service about extenuating circumstances at least 180-days prior to permit expiration and remedy any deficit within 5 years to remain eligible for future general permits.
- Train personnel to scan for eagle remains when onsite and implement internal reporting and recordkeeping procedures for discovered eagles.
- All new construction and reconstruction of poles in areas of high-risk for eagles must be avian-safe, as limited by existing rights-of-way constraints and the need to ensure human health and safety.
- New construction and reconstruction must incorporate information on eagles into siting and design considerations. Minimize eagle risk by siting away from eagle use areas, such as nests and winter roosts. This requirement is as practicable, subject to existing rights-of-way, human health and safety, and significant adverse effects to biological, cultural, or historic resources.
- Comply with all Migratory Bird Treaty Act (MBTA) Part 21 regulations and permit conditions, including any provisions specific to authorizing incidental take of migratory birds.
- Submit required reports to the Service, and
- Pay the required application and administration fee (50 CFR 13.11(d)(4)).

We will require all applicants for specific permits to implement any practicable A&M measures. The Service and the applicant will negotiate measures at the project-level. These measures may vary between specific permits.

Activities Likely to Cause Nest Disturbance

Under Alternative 4, applicants for general permits must meet or implement standard conditions for their activity type. These measures would become conditions of any general permit. The Service will continue to develop new measures and update these standard conditions in the future as new information becomes available. Examples of such measures are listed below. This list is not intended to be a complete list, and measures may be added or removed over time at the Service's discretion. When the Service changes these measures, all new general permit applicants will be held to those updated measures. If measures are updated by the Service, existing general permittees will not be required to adopt any new measures. Applicants who do not wish to or cannot agree to the standard measures have the option to apply for a specific permit.

Standard measures under an activity-specific nest disturbance general permit may include the following:

- To the maximum degree practicable, implement measures to avoid and minimize nest disturbance, including disturbance due to noise from human activities, visibility of human activities, proximity to nest, habitat alteration, and indirect stressors.

- Avoid activities that may negatively affect the nesting substrate, such as the survivability of the nest tree.
- Monitor in-use nests to determine when nestlings fledge from the nest and submit this information on your annual report.

All applicants for specific permits will be required to implement any practicable A&M measures. Measures will be negotiated at the project level and may vary between specific permits.

Nest Take Activities

Under Alternative 4, we would require applicants for general permits to agree to standard conditions specific to the reason for nest removal and status of the eagle nest to be removed. These measures would become conditions of any general permit. The Service will continue to develop new measures and update these standards conditions in the future as new information becomes available. Current conditions are listed below. This list is not intended to be a complete list, and measures may be added or removed over time at the Service's discretion. When the Service changes these measures, all new general permit applicants will be held to those updated measures. If measures are updated by the Service, existing general permittees will not be required to adopt any new measures. Applicants who do not wish to or cannot agree to the standard measures have the option to apply for a specific permit.

Standard measures under nest take general permits may include the following:

- Adjust the timing of your activity to minimize the effects of nest take.
- Obstruct nests or nest substrate.
- Minimize renesting that would cause the same emergency, safety, or functional hazard.
- Relocate the nest or provide suitable nesting substrate within the same territory.
- Remove chicks or eggs from an in-use nest for immediate transport to a foster nest, rehabilitation facility, or as otherwise directed by the Service.
- Monitor in-use nests that are relocated with nestlings or eggs present, or foster nests, to ensure adults are tending to nestlings or eggs.
- Monitor the area near the nest removal for one or more seasons to determine the effect on eagles.

We would require all applicants for specific permits to implement any practicable A&M measures. Measures will be negotiated at the project level and may vary between specific permits.

3.3.5.4 Compensatory Mitigation

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same compensatory mitigation requirements as described under Alternative 3.

Power Line Entities

Under Alternative 4, we would not require power line entities to provide compensatory mitigation for permitted eagle take under general permits. Considering the standard A&M measures that will be required with every general permit, which include requirements to retrofit existing infrastructure and ensure new infrastructure is avian-safe, we anticipate participation in this general permit will effectively reduce the annual rate of electrocutions and collisions for both eagle species over time. Considering further that we expect the majority of eagle take under these general permits to be on infrastructure that is a part of the environmental baseline for permits set when we established the incidental-take permit framework in 2009, we anticipate that any general permit issued will be compatible with eagle preservation in the long-term, without compensatory mitigation. Furthermore, we expect that utilities' assistance in reducing illegal shooting of golden eagles, which kills an estimated 670 golden eagles per year (see Table 2 of Appendix A), will also advance eagle conservation, though we cannot quantify the exact benefit at this time.

Because we would negotiate A&M measures for all specific permits at the project level and on a case-by-case basis, compensatory mitigation requirements for specific permits must be negotiated in a similar manner. We would typically not require compensatory mitigation if the project-specific A&M measures are determined by the Service to meet or exceed the goals or projected outcomes of the standard conditions for general permits.

Activities Likely to Cause Nest Disturbance

Since general permits under this GPP will only be available for bald eagles, no compensatory mitigation will be required under nest disturbance general permits so long as authorized take remains below EMU thresholds.

All applicants for specific permits will be required to offset any take that the Service estimates would exceed established EMU take limits. For golden eagles, EMU take limits are set at zero throughout the United States; thus, compensatory mitigation would be required for all authorized take of golden eagles. Golden eagle take must be offset at a ratio of 1.2:1. For bald eagles, compensatory mitigation will not typically be required unless we estimate EMU take limits will be exceeded. Bald eagle take would be offset at a ratio of 1:1. All compensatory mitigation requirements must be applied in the EMU where the authorized take is occurring. If the Service estimates that authorized take under a specific permit may be inconsistent with our preservation standard at the LAP scale, the Service may elect to require compensatory mitigation within the project-specific LAP. Under specific permits, permittees would be encouraged to use Service-approved ILF programs; however, the use of such programs is not required. Applicants for specific permits could submit their own mitigation plan for Service approval.

Nest Take Activities

Since general permits under this GPP are only available for bald eagles, no compensatory mitigation will be required under nest take general permits. The situations under which these permits are issued are typically hazardous to eagles, meaning that eagles usually also benefit from resolving the situation.

All applicants for specific permits will be required to offset any take that the Service estimates would exceed established EMU take limits. Requirements are identical to those described above for Activities Likely to Cause Nest Disturbance, except that if compensatory mitigation is

required under a nest take permit to provide a net benefit to eagles, mitigation amounts must more than offset the estimated loss to the eagle population.

3.3.5.5 Adaptive Management

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same adaptive management requirements as described under Alternative 3.

Power Line Entities

Under Alternative 4, there will typically be no adaptive management requirements for power line entities under general or specific permits.

Activities Likely to Cause Nest Disturbance

Under Alternative 4, when issuing general permits for nest disturbance, there will be no adaptive management requirements.

When issuing specific permits for nest disturbance, adaptive management would not typically be included as a permit condition. However, specific permits for some longer-term activities may come with project-specific adaptive management requirements (especially where the Service has a high level of uncertainty surrounding the amount of authorized take). Such adaptive management conditions would typically have the same goal as specific permits for wind energy development – to reduce the risk of exceeding authorized take.

Nest Take Activities

Under Alternative 4, when issuing general permits for nest take, there will be no adaptive management requirements. General permits would provide some flexibility in that they would authorize continual removal of eagle nests on the same substate in the same year if eagles renest in the same place, or continual removal of eagle nests on other substrate within one-half mile of the original nest for the duration of the permit.

When issuing specific permits for nest take, the Service would generally not require adaptive management as described above for general permits; however, we would retain the ability to require project-specific adaptive management plans, when appropriate.

3.3.5.6 Fatality Monitoring

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same fatality-monitoring requirements as described under Alternative 3.

Power Line Entities

Under Alternative 4, we would require that all power line entities receiving general permits train relevant employees to recognize and report eagle take. These employees would visually scan for injured eagles and eagle remains during inspections, maintenance, repair, and vegetation management on and around power poles, substations, or other project infrastructure. Additionally, similar to the requirement for wind energy projects, each non-investor-owned power line entity receiving a general permit would pay an administration fee of $2,500 and each

investor-owned power line entity receiving a general permit would pay an administration fee of $10,000. This administration fee will be combined with fees provided under general permits for wind energy facilities to monitor whether GPPs for wind energy facilities and power line entities adequately reduce golden eagle mortality across the landscape, including mortality rates from other sources.

We note that it is difficult to predict how many general-permit applications we will receive from power line entities, given that this would be a new permit program. Our predictions for the number of general-permit applications we will receive from wind energy facilities are similarly limited. We have predicted participation to the best of our ability based on current information. However, if participation in the two GPPs is lower than predicted, the Service may have insufficient funds to gather intended information and could have to temporarily subsidize eagle monitoring efforts from our general funds. If the Service is short on administration fees and does not have the ability to subsidize from general funds, the Service would likely have to either increase the fees associated with general permits or suspend the GPP in part or in whole and convert existing general permits to specific permits.

Specific permits issued to power line entities would require eagle fatality monitoring at least at the level required under general permits. Depending on the situation, the Service could require additional fatality monitoring. Monitoring requirements are likely to vary depending on concerns or questions the Service might have, along with the level of fatality monitoring already implemented by the applicant on and around project infrastructure.

Activities Likely to Cause Nest Disturbance

Because nest disturbance permits are not likely to result in death or injury of eagles, we would require no fatality monitoring for general or specific permits for nest disturbance. However, under both general and specific permits, we would typically require monitoring for nest occupancy, success, and productivity. Monitoring requirements under general permits would be standardized and designed not to be overly burdensome to any applicant. Under specific permits, we would determine monitoring requirements on a permit-by-permit basis and may include additional measures unique to permit-specific questions or concerns.

Nest Take Activities

Similar to nest disturbance permits, nest take permits are not likely to result in death or injury of eagles, thus we would require no fatality monitoring under general or specific permits. Monitoring requirements for nest take should instead determine if nests are rebuilt at the location of the nest take or in the vicinity. Such monitoring may be required as appropriate under specific permits. For both general and specific nest take permits where the nest substrate is removed, monitoring will not typically be required.

3.3.5.7 Reporting

Wind Energy Facilities

Under Alternative 4, the GPP for wind projects would have the same reporting requirements as described under Alternative 2.

Power Line Entities

Under Alternative 4, we would require all power line entities to report all eagles discovered injured or dead on or near utility infrastructure, regardless of suspected cause. The utility will also be required to report, at minimum, the location, date of discovery, distance to the nearest infrastructure, and design and retrofit status of adjacent infrastructure.

Activities Likely to Cause Nest Disturbance

General and specific nest disturbance permits may require annual reporting of nest occupancy, success, and productivity monitoring results.

Nest Take Activities

General and specific nest take permits may require annual reporting of nest site monitoring results.

3.4 Alternatives Considered but Eliminated

The following Alternatives were considered but eliminated from detailed analysis in this EA.

3.4.1 Amend Existing Regulations (50 CFR 22.80 and 22.85) to Encourage Increased Participation and Increased Permitting Efficiency

Under this Alternative, the Service would not change the permitting framework by adding general permits. Instead, we would propose amendments to existing regulations that would make eagle take permitting more efficient to encourage increased participation. We eliminated this alternative from consideration because it still would have required project-specific analysis for all eagle-take permits. Our strong preference is to focus our limited time and resources on eagle take permits that are likely to have the highest risk to eagles or the highest uncertainty surrounding that risk. In addition, the 2016 rulemaking effort was designed to achieve the same goal with limited success. Thus, any Alternative that simply amends the current permitting framework would likely not meet the purpose and need for this action.

3.4.2 Different Relative Abundance Eligibility Criteria for General permits for Wind Energy Facilities

Under this Alternative, the Service would alter the eagle permitting framework to include general permits, as proposed under Action Alternatives 2, 3, and 4. However, we would select different ERA thresholds than described in Alternatives 3 and 4, which placed 95% and 50% of the overall bald and golden eagle abundance distributions, respectively, in the general permit zone for new permits (provided all existing or proposed turbines in a project are beyond 660 feet and two miles from bald and golden eagle nests, respectively). Alternatives considered included scenarios with 92.5% and 97.5% of the overall bald eagle abundance distribution included in the general permit zone, and 30% and 70% of the overall golden eagle abundance distribution included in the general permit zone (Appendix A). The lower-percentage scenarios for bald and golden eagles were slightly more protective of eagles because they decreased general permit eligibility. The higher-percentage scenarios for bald and golden eagles were slightly less protective of eagles because they increased general permit eligibility. After consideration of these alternate scenarios, the higher-percentage scenarios were eliminated because they contained projects with too broad a range of risk for the Service to conclude that authorizing all

eligible projects under general permits would be consistent with the preservation standard. The lower percentage scenarios were more protective of eagles but were eliminated to ensure that a higher percentage of wind projects would be eligible for general permits and thus apply A&M measures and mitigation to reduce impacts to eagles. In effect, setting lower thresholds and reducing the area where projects are eligible to apply for new general permits is a tradeoff between potentially increasing the overall risk to eagles from the GPP while also increasing the number of projects that apply for an eagle permit and thereby implement measures designed to protect eagles that may not be implemented otherwise. To further ensure that the selected moderate percentages in Alternatives 3 and 4 were sufficiently protective of eagles, ERA thresholds were paired with minimum distances from nest locations when setting eligibility criteria for new general permits. Thus, even projects that are eligible for general permits based on ERA may still need to obtain a specific permit based on the additional risk that comes with proximity to a nest location.

3.4.3 New Regulations Promulgating General Permits for All Activities Likely to Take Eagles, No Specific Permits

Under this Alternative, the Service would have retained very little of the current eagle take permitting framework, eliminating specific permits in lieu of general permits for all applications. Although this Alternative may make the permit process more efficient and increase participation, the Service could not conclude that the permit program would be consistent with the preservation standard. This Alternative would also eliminate a large amount of Service oversight on our eagle take permitting program and would not be sufficiently protective of eagles, thus we eliminated it from further review.

3.4.4 Alternative 2 plus additional general permit types as described in Alternative 4 (hybrid between Alternatives 2 and 4)

Under this Alternative, the Service would adopt a GPP for wind energy as described under Alternative 2 but would also include the three additional GPPs as described in Alternative 4 – one for power lines, one for nest disturbance, and one for nest take. Several public commenters requested the Service consider this Alternative. The Service did consider this Alternative, however, did not add it to the list of formal Alternatives because the Service will have the flexibility to select aspects of more than one of the analyzed Alternatives in a Finding of No Significant Impact or EIS/ROD should the Service ultimately find that an EIS is necessary.

3.4.5 Specific Permits for Incidental Disturbance with Differing Permit Tenure

Under this Alternative, we would establish a maximum permit tenure of 30 years for specific permits for incidental disturbance, which have rarely been issued. We considered whether a longer permit term could reduce workload for Service staff and increase certainty for permitted projects. Although this Alternative could be implemented consistent with our eagle preservation standard, we concluded that the 5-year maximum tenure under Alternative 4 would not significantly create added workload for Service staff or reduce certainty for permitted projects. Further, in the rare circumstance when activities threaten to cause incidental disturbance to eagle nests over long periods of time, or eagle territory loss, there are options that would allow for adequate management of eagles in the vicinity of any project. For example, permit renewals

under a NEPA analysis that analyzes impacts over a longer-term than 5 years (if supplementary NEPA is necessary).

4.0 Affected Environment

4.1 Introduction

This chapter describes the affected environment associated with the current status quo, as described in the No Action Alternative, and acts as a baseline for considering the environmental impacts of adopting the actions considered as part of the three Action Alternatives as compared to continuing implementation of the current regulations under the No Action Alternative. The proposed action will affect relatively few specific resources aside from both eagle species and other wildlife species that might also incidentally benefit from, or be otherwise affected by, any permit conditions or compensatory mitigation, particularly other raptor species. This chapter therefore is limited to a description of the general populations and status of bald and golden eagles, and other wildlife that may be impacted by this rulemaking. This section also describes tribal interests and cultural resource considerations where relevant.

This EA tiers to the 2016 PEIS (USFWS 2016a), which, along with an accompanying status report (USFWS 2016d), provides population size estimates, allowable take rates, and allowable take limits for bald and golden eagles. The PEIS also established that the Service uses the 20th quantile of the probability distribution for population size as the basis for setting the take limits. In other words, the PEIS set up the sideboards within which the Service's eagle incidental take permit program could operate and be compatible with the preservation of both eagle species as required by the Eagle Act. We do not expect any of the Action Alternatives to affect or alter the eagle-management framework described in the PEIS in any way that could result in significant environmental impacts. The PEIS also committed the Service to conducting population and other monitoring necessary to update the population size estimates and demographic information used to set the take limits. The PEIS required that the population size estimates be reassessed at least once every six years. We anticipated in the PEIS that these updates would not require additional NEPA analysis, including supplementation, but that we would notify the public of any updated information and any adjustments to the allowable take limits.

For bald and golden eagles, we incorporate the Affected Environment sections from the PEIS by reference here (Sections 3.2.1 for bald eagles, and 3.3.1 for golden eagles). However, new research and information related to eagle populations is available, including recent updates to the population estimate and take limits for bald eagles. This new information and any updated EMU take limits for bald eagles are described below.

4.2 Bald Eagles

4.2.1 Population Size and Take Limits

The Service has implemented monitoring programs that provide data suitable for updating population size and allowable-take estimates for each eagle species' range in the United States. Based on that monitoring, the Service has formally updated population size and allowable take rates and take limits for bald eagles in four of six bald eagle EMUs (USFWS 2022) since publication of the 2016 PEIS. The methods used and approach for these updates are presented in USFWS 2021a and Zimmerman et al. (2022).

The updated population estimate covers four EMUs (Atlantic, Mississippi, Central, and northern Pacific) excluding the Pacific Flyway South and Alaska EMUs (USFWS 2021a). The Service estimated 316,708 bald eagles were present in the four EMUs in the 2019 breeding season, 4.4 times more bald eagles than in 2009. The Service uses the 20th quantile of the probability distribution for the population estimate as the relevant value for management purposes, which is 273,327 bald eagles. The new population estimate was obtained via three main methods:

- Aerial surveys in 2018 and 2019 of 364 plots (100 square kilometers [km^2]) to estimate the number of occupied bald eagle nesting territories in 16 high-density breeding survey strata (USFWS 2021a);
- A model relating eBird bald eagle relative-abundance estimates to the survey-based, occupied-nesting-territory estimates at the plot level, and then using the eBird model and eBird data to estimate the number of occupied, bald eagle, nesting territories for four of the six EMUs; and
- An integrated population model (IPM) to obtain updated estimates of bald eagle vital rates. These estimates were used to extrapolate the estimated number of occupied bald eagle nesting territories to determine total population size. Using the IPM allowed better incorporation of floaters, juveniles, and subadults into estimates of overall population size. These age groups, particularly adult floaters, could not be included effectively with the previous population estimation efforts. This contributed to the increased population estimate but most of the increase is likely due to population growth, estimated to be around 10-percent per year.

The Service did not implement surveys in Alaska due to limited financial and logistical resources. In the Pacific Flyway South EMU, bald eagles are relatively scarce and patchily distributed, making aerial surveys impractical. Take limits for these two EMUs will remain as reported in the 2016 PEIS until the Service is able to acquire and conduct separate analyses of new information from these populations.

As part of the Service's bald eagle population update (USFWS 2021a), we used a prescribed take level model, with input from the IPM, to update the bald eagle allowable-take rate (Zimmerman et al. 2022) consistent with our goal of maintaining stable bald eagle numbers measured against the baseline of population size in 2009 (see Section 1.4). The updated allowable-take-rate distribution multiplied by the updated population size estimate distribution produces the updated bald eagle EMU take limits; the Service uses the 20th quantile of that joint distribution as the take limit.

Under the 2016 Eagle Rule, the Service set take limits (for take that is not required to be offset) at 6% of populations for bald eagles in most EMUs, including the Alaska portion of the Pacific Flyway, with a lower rate (3.8%) in the Pacific Flyway South EMU. After updating the bald eagle population estimate and allowable take rate (USFWS 2021a), the Service updated the EMU take limits for bald eagles (Table 4-1; USFWS 2022). Take limits for the Pacific Flyway South and Alaska Flyway EMUs were not changed because the Service's population estimate for those EMUs has not been updated.

Table 4-1. Current bald eagle EMU-specific population size and take limits. Population size for management purposes, reported here, is the 20th quantile of the probability distribution for the total population size (USFWS 2016a). Estimates for the Pacific Flyway South and Alaska are described in the PEIS (USFWS 2016a); estimates for all other flyways are described in USFWS (2021a), Zimmerman et al. (2022), and Appendix A. This table updates information in Table 3 in USFWS (2016d) and Table 3-2 in the PEIS (USFWS 2016a).

Eagle Management Unit	Year Updated	Current Allowable Take Rate	Current Population Size Estimate (20th Quantile)	Current Take Limit (20th Quantile)
Atlantic Flyway	2021/2022	0.090	72,990	4,223
Mississippi Flyway	2021/2022	0.090	137,917	7,986
Central Flyway	2021/2022	0.090	26,253	1,521
Pacific Flyway North	2021/2022	0.090	36,302	2,102
Pacific Flyway South	2016	0.038	391	15
Alaska	2016	0.060	62,935	3,776

4.2.2 Causes of Mortality

Causes of bald eagle mortality are reviewed in Section 3.2.1.2 of the PEIS (USFWS 2016a). Since we issued that document, additional information has been published relevant to bald eagle populations and management. Two recent studies in particular have highlighted the negative effect of lead contamination on bald eagle population growth.

Hanley et al. (2022) used a population matrix model to compare bald eagle population dynamics under current conditions to hypothetical reduced-lead and lead-free scenarios. They used annual counts, banding records, and necropsy records gathered between 1990 and 2018 in seven northeastern U.S. states to inform their model. They determined that mortality events of wild eagles that arose from the ingestion of lead affected population dynamics and depressed the long-term growth rate of the population by 4.2% in female eagles and 6.3% in male eagles. They concluded that, although current lead contamination levels have not caused a region-wide decline of eagles, these conditions have stressed the resilience of the population.

Slabe et al. (2022) quantified the lead exposure of 1,210 North American bald and golden eagles across the annual cycle from 2010-2018. Study findings for golden eagles are summarized in Section 4.3. They used the blood of live bald eagles (n = 237) and bone, liver, and feathers of dead bald eagles (n = 343) to test hypotheses about (i) the spatial, temporal, and demographic extent of lead exposure across the continent, and (ii) the degree to which lead exposure influences the trajectory of populations of these two species in North America. They found 47% of bald eagles had bone-lead concentrations above thresholds for chronic poisoning. Frequency of chronic poisoning was greater in adults than subadults and greater for bald eagles in the Central Flyway than in the Atlantic and Pacific Flyways. Using matrix population models and assuming that severe clinical poisoning always results in death, they estimated that lead

poisoning suppresses the bald eagle population growth rate by 3.8% (95% confidence interval: 2.5% – 5.4%).

In 2022, an emerging strain of highly pathogenic avian influenza (HPAI) was documented in the U.S., with reports showing bald eagles have suffered mortality and nest failure due to HPAI (Nemeth et al. 2023). HPAI viruses can severely affect human, domestic animal, and wildlife health (USFWS n.d.). The Service will continue to monitor HPAI along with partner government agencies including the National Wildlife Health Center (U.S. Geological Survey; National Wildlife Health Center 2022) and the Animal and Plant Health Inspection Service (U.S. Department of Agriculture; APHIS 2022).

4.3 Golden Eagles

4.3.1 Population Size and Take Limits

The Service has collected and analyzed updated demographic and population monitoring information for golden eagles in one and parts of a second golden eagle EMU, which collectively cover about 85% of the species U.S. population. The results of those analyses have recently been peer-reviewed and published (Millsap et al. 2022).

The golden eagle population size update (Table 4-2; USFWS 2022a) used the Service's golden eagle west-wide survey data through 2016 along with Breeding Bird Survey data from 1997 – 2016 from the coterminous U.S. portions of the Central and Pacific flyways. These count data were combined with demographic data from 1997 – 2016 in an IPM, and the vital-rate estimates from that model were used to update our estimate of the allowable take rate for these parts of the two golden eagle EMUs. For golden eagles, much of the survival information in the IPM came from 512 individuals tagged with GSM-GPS transmitters (see Section 4.3.2). Within the golden eagle IPM, we implemented a cause-of-death model to estimate the frequency of each primary cause of mortality. As with bald eagles, golden eagle population size and allowable take rates in the EMUs where updates have not occurred remain as in 2016. Golden eagle populations in the western U.S. appeared stable through 2016, but there is increasingly strong evidence that anthropogenic mortality exceeds the allowable take rate (Millsap et al. 2022), which may lead to future population declines.

Table 4-2. Current golden eagle EMU-specific population size and take limits. Population size for management purposes, reported here, is the 20th quantile of the probability distribution for the total population size (USFWS 2016a). Estimates for the Central and Pacific Flyways are described in Millsap et al. (2022) and are combined because we did not estimate population size separately for each EMU. Estimates for the Atlantic-Mississippi Flyways and Alaska are from USFWS (2016a). This table updates information in Table 10 in USFWS (2016d) and Table 3-7 in the PEIS (USFWS 2016a). See also Appendix A.

Eagle Management Unit	Year Updated	Current Allowable Take Rate	Current Population Size Estimate (20^{th} Quantile)	Current Take Limit (20^{th} Quantile)
Atlantic-Mississippi Flyways	2016	0.050	3,180	0

Central & Pacific Flyways	2022	0.070	30,958	0
Alaska	2016	0.050	4,002	0

4.3.2 Causes of Mortality

Section 3.3.1.2 of the PEIS (USFWS 2016a) describes known causes of mortality for golden eagles. We update that information here with more recent studies. Millsap et al. (2022) investigated causes of mortality for transmittered golden eagles (n = 512) with broad coverage of the western United States. Transmittered birds provide less-biased information on causes of mortality compared to band recoveries and incidental finds of dead individuals because both of the latter are dominated by birds that die in places where they are more likely to be discovered (Schaub and Pradel 2004). Millsap et al. (2022) determined cause-of-death for 126 transmittered golden eagles for which the cause of death could be confidently determined (Table 4-3). Based on the proportions of known cause of death and population estimates for the species, Millsap et al. (2022) estimated that anthropogenic factors (collision, electrocution, shooting, poisoning, and trapping) accounted for nearly 60% of all golden eagle mortality in the coterminous western United States (Table 4-3).

Table 4-3. Estimated number of golden eagles that die annually from nine major causes of death in the interior western coterminous U.S., 1997 – 2016, reprinted from Table 2 in Millsap et al. (2022). This updates Table 8 in USFWS (2016d).

Eagle Age and Cause of Mortality	**Median**	**Lower 95% credible interval**	**Upper 95% credible interval**
First Year			
Collision	51	11	143
Electrocution	69	20	174
Shot	69	20	174
Poisoned	32	4	109
Caught in trap	88	30	203
Fight	32	4	109
Disease	88	30	204
Accident	182	86	346
Starvation	656	416	1,001
After First Year			
Collision	560	322	877
Electrocution	437	231	731
Shot	601	354	926

Poisoned	395	201	675
Caught in trap	191	67	409
Fight	191	68	408
Disease	150	45	351
Accident	274	118	523
Starvation	150	45	348

Slabe et al. (2022) quantified the lead exposure of 1,210 North American bald and golden eagles across the annual cycle from 2010–2018. They used the blood of live golden eagles (n = 383) and bone, liver, and feathers of dead eagles (n = 270) to test hypotheses about (i) the spatial, temporal, and demographic extent of lead exposure across the continent, and (ii) the degree to which lead exposure influences the trajectory of populations of these two species in North America. They found that 46% of golden eagles had bone lead concentrations above thresholds for chronic poisoning. Using matrix population models and assuming that severe clinical poisoning always results in death, they estimated that lead poisoning suppresses the golden eagle population growth rate by 0.8% (95% confidence interval: 0.7% – 0.9%).

Mojica et al. (2018) reviewed known scientific literature on golden eagle electrocutions from 1940–2016. They concluded that golden eagle electrocution on power poles is a global conservation problem and a leading anthropogenic cause of death for golden eagles, with an estimated 504 golden eagles (95% credible interval: 124–1,494) electrocuted annually in North America (USFWS 2016d). They identified eight electrocution risk factors: pole design, eagle age, morphology, land cover and topography, prey availability, season, weather, and behavior. Pole configuration was the most frequently identified electrocution risk factor and electrocution incidents were most often associated with distribution level (<69 kilovolts) equipment poles. Age was the second-most-frequently identified risk factor, with juvenile eagles electrocuted at approximately twice the rate of subadults or adults. Risk was also associated with large body size, high-quality habitat, high prey density, winter dispersal, inclement weather, and intraspecific interactions. To reduce electrocutions and mortalities, Mojica et al. (2018) recommend updating utility construction standards to require avian-friendly construction for new facilities in eagle habitat, reactive retrofitting programs for utilities where utility staff are trained to recognize and report electrocution events and immediately retrofit the pole and nearby high-risk poles to prevent repeat events, and risk assessments for utilities to proactively target areas with high-risk poles in eagle habitat and schedule annual retrofitting activities to systematically fix poles on their system. They also recommend that compensatory mitigation should incorporate risk assessments at the regional scale to efficiently target the highest risk poles first for a greater reduction of electrocution risk at the EMU scale.

Two recent studies have also examined how mortalities may affect population dynamics for golden eagles across the continent. Katzner et al. (2016) performed a suite of genetic and stable isotope analyses on samples from 67 golden eagles killed at the Altamont Pass Wind Resource Area in California from 2012 to 2014. They determined that 26% (17 of 66) of the golden eagles killed at the study site immigrated to the area within about 12 months and concluded that the apparent stability of the local golden eagle population was maintained by continental-scale

immigration. Due to the interconnectedness of the golden eagle population, Katzner et al. (2016) concluded that mitigation of turbine-associated mortality occurring in other parts of the western United States could have local benefits, which is consistent with the Service's strategy to use compensatory mitigation to offset eagle mortalities at specific permitted projects.

Tack et al. (2017) used life-stage-simulation analysis to identify golden eagle life-history characteristics that most affect population growth and are amenable to management actions. They found that breeding adult survival had the greatest relative effect on population growth, although productivity explained the most variation in growth, and found that even minor reductions in breeding adult survival (<4.5%) caused otherwise stable populations to decline. Tack et al. (2017) determined that their results supported the Service's compensatory mitigation strategy for permitting at wind energy facilities under the 2009 Eagle Rule, suggested that reducing anthropogenic sources of mortality should be a top management objective, and recommended reducing golden eagle mortalities due to electrocutions and lead poisoning as two practicable mitigation targets.

In 2022, an emerging strain of HPAI was documented in the U.S., with reports showing bald eagles have suffered mortality and nest failure due to HPAI (Nemeth et al. 2023). A relatively small number of golden eagle mortalities from HPAI have been reported to date. HPAI viruses can severely affect human, domestic animal, and wildlife health (USFWS 2022d). It is unclear how vulnerable golden eagles are to HPAI or if HPAI could have population level impacts. The Service will continue to monitor HPAI along with partner government agencies including the National Wildlife Health Center (U.S. Geological Survey; National Wildlife Health Center 2022) and the Animal and Plant Health Inspection Service (U.S. Department of Agriculture; APHIS 2022).

4.4 Migratory Birds

The PEIS (USFWS 2016a) described the affected environment for migratory birds in Section 3.5.1. We incorporate that information by reference here and update it with new information.

On January 7, 2021, the Service published a final rule defining the scope of the Migratory Bird Treaty Act (MBTA), as amended (16 U.S.C. 703–712) as it applies to conduct resulting in the injury or death of migratory birds protected by MBTA (86 FR 1134). The Service determined that the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same, applied only to actions directed at migratory birds, their nests, or their eggs.

On October 4, 2021, the Service published a final rule revoking the January 7, 2021, regulation that limited the scope of the MBTA (86 FR 54642), effective December 3, 2021. The Service did not propose replacement language, instead simply removing the previous language. A Director's Order clarifying the Service's current enforcement position that the MBTA prohibits incidental take was issued at the time of this final rule's publication, coming into effect on the effective date of the final rule (USFWS 2021b).

In addition, the Service simultaneously published an ANPR announcing our intent to solicit public comments and information as we consider developing proposed regulations to authorize the incidental take of migratory birds (86 FR 54667, October 4, 2021). The ANPR describes the Service's proposal to address human-caused migratory bird mortality by codifying the interpretation that the MBTA prohibits incidental take of migratory birds and developing

regulations that authorize incidental take under prescribed conditions. This proposal furthers the Service's objectives of better protecting migratory bird populations and providing more certainty for the regulated public. The Service gathered information necessary to develop a proposed rule to authorize the incidental taking or killing of migratory birds, including determining when, to what extent, and by what means authorizing incidental take is consistent with the MBTA and compatible with the terms of the four migratory bird conventions. This information was used to develop proposed regulations to authorize the incidental take of migratory birds under prescribed conditions and prepare a draft environmental review pursuant to NEPA. Comments on the ANPR were accepted from the public until December 3, 2021. New proposed regulations resulting from the ANPR have not yet been published.

The Service announced revisions to the list of migratory birds protected by the MBTA by both adding and removing species, effective May 18, 2020 (85 FR 21282, April 20, 2020). Reasons for the changes to the list include adding species based on new taxonomy and new evidence of natural occurrence in the United States or U.S. territories, removing species no longer known to occur within the United States or U.S. territories, and changing names to conform to accepted use. The net increase of 67 species (75 added and 8 removed) brought the total number of species protected by the MBTA to 1,093.

On June 16, 2021, the Service announced the availability of Birds of Conservation Concern (BCC) 2021 (86 FR 32056, USFWS 2021c). This publication identifies species, subspecies, and populations of migratory birds in need of additional conservation actions and updates the previous list from 2008. The purpose and goal of this publication is to stimulate and guide coordinated, collaborative, and proactive conservation actions for these taxa among Federal, Tribal, State, and private partners. The 2021 BCC list does not include bald eagles or golden eagles. Bald eagles were previously listed as a BCC because of their recent Endangered-Species-Act-delisted status (USFWS 2008).

With ranges spanning the North American continent and beyond, migratory birds are bound to occur in the vicinity of permitted projects or future permitted projects. In that context, migratory birds may be affected by a project's implementation of eagle-permit conditions. Under current regulations, the Service considers impacts to migratory birds on a permit-by-permit basis prior to issuance.

4.5 Federally Threatened and Endangered Species

Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531–43), requires Federal agencies to "ensure that any action authorized, funded, or carried out . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat" (16 U.S.C. 1536(a)(2)). Intra-Service consultations and conferences consider the effects of the Service's actions on listed species and critical habitat.

With ranges spanning the North American continent, bald and golden eagles often occur near listed species and potentially in or near designated critical habitat. Although the regulations we propose will not apply to any listed species or proposed or designated critical habitats, those species or critical habitats could be present at projects applying for eagle incidental take permits or in areas where compensatory mitigation is being implemented. Since the proposed regulations will apply nationwide and we expect permits to be issued in all parts of the country, listed

species and critical habitats could be present where eagle permits are issued. Information about listed species and designated critical habitat in a given location can be obtained from the Service's Information for Planning and Consultation (IPaC) tool at https://ipac.ecosphere.fws.gov. Under current regulations, the Service considers impacts to listed species and critical habitats on a permit-by-permit basis prior to issuance.

4.6 Tribal Traditional Uses, Religious Concerns, and Cultural Resources

In Section 3.7.1 of the PEIS (USFWS 2016a), the Service describes Tribal cultural and religious issues related to the 2016 Eagle Rule, including the affected environment, the spiritual significance and use of eagles and eagle parts by federally recognized Tribes, the symbolism of eagles in U.S. history, and relevant federal and Tribal statutes. We incorporate that information here by reference. The federal government has a unique responsibility and obligation to consider and consult with federally recognized Tribes on potential effects to resources that may have religious and cultural importance to Tribes. Eagles, eagle feathers, and eagle nests in particular may all be of interest and importance to area Tribes; and eagles and their feathers are considered sacred in many Native American traditions. Under the Eagle Act and our implementing regulations, we may issue permits authorizing the taking, possession, and transportation of eagles, eagle parts, or eagle nests for Indian religious use, see 50 CFR Parts 21 and 22.

Dead eagles found during monitoring are sent to the Service's National Eagle Repository (NER). If in good condition, the remains are distributed to permitted members of federally recognized Tribes. See also the discussion of this topic in the PEIS (Section 3.7.1.4, USFWS 2016a).

In addition, issuance of an eagle take permit is an undertaking under the National Historic Preservation Act (NHPA), which may require consideration of the effects of the permit issuance on historic and cultural resources as those are defined under the NHPA and implementing regulations at 36 CFR Part 800.

4.7 Socioeconomics

The analysis of socioeconomic resources identifies those aspects of the social and economic environment that may be affected by the proposed revisions to the 2016 Eagle Rule (USFWS 2016b). The industries most likely to be directly affected include long-term infrastructure and public service projects, such as real estate development and transportation, and public utility, resource development, and energy projects. Economic considerations for developers include project finance, contracts or agreements, and weighing the cost of obtaining and complying with conditions of an eagle incidental take permit against the risks, financial and nonfinancial, of operating without one. The societal impacts analysis focuses on how recreational opportunities, aesthetic, and other societal values might be affected by the proposed revisions.

4.7.1 Financial Impacts

4.7.1.1 Permitting and Mitigation Costs

Costs to an applicant associated with eagle incidental take permits include the permit application fee associated with the permit itself. Current fees depend on the type of permit issued, and whether the permit is a general or specific permit, specific to an industry, or associated with nest

disturbance or nest take. The Service uses the fee to account for the time and resources needed to issue the permits.

For certain permits, such as those issued for wind energy projects, compensatory mitigation may be required. Compensatory mitigation requirements are based on the expected amount of eagle take from the project. The cost to purchase an "eagle credit" of compensatory mitigation is based on market transactions conducted with the entity that will be conducting the restoration or enhancement. The Service has approved and will continue to assess and approve ILF programs or conservation banks under which the permittee negotiates a price with the ILF-program sponsor or conservation bank provider, which then uses the funds to conduct an activity that reduces ongoing take of eagles. At present, the only mitigation activity approved under ILF programs is retrofitting of utility poles. The costs of compensatory mitigation can be substantially greater than the permit application fee. Although the cost of an eagle credit can vary, a credit can cost around $120,000 in the marketplace. This calculation is based on the retrofit cost of a power pole. The Service's 2013 Eagle Conservation Plan Guidance document assumes that $7,500 represents a reasonable estimate, at market price, for the current average cost to retrofit a power pole in the United States (USFWS 2013). We are carrying this value forward in our analysis here without increasing it to account for inflation because we do not expect the per-pole cost to have permanently increased. Instead, the price may fluctuate both higher and lower than $7,500 because it is based on the programmatic market rate, which may fluctuate higher or lower based on market demand. The Service is not aware of supply chain status or labor availability to meet any increased demand for retrofitting; however, we assume that any additional need for materials and labor will be built into mitigation costs charged by mitigation providers. The Service estimates that retrofitting 16 power poles is required to offset one golden eagle at a ratio of 1.2:1. Thus, we use this $120,000 value (16 poles at $7,500 apiece) when discussing compensatory mitigation in this analysis.

Other permitting costs include the costs incurred by the applicant to implement the permit conditions, which may include pre-construction monitoring, compiling project-specific background data, and fatality monitoring and reporting. These costs are detailed in Section 5.2.5.1.

4.7.1.2 Project Financing Costs

Companies often finance projects from outside the parent company when infrastructure investment needs long-term financing. Project financing uses cash flow generated by the project to repay investors with the project's assets and rights as collateral. This type of financing is typically used by real-estate development, transportation, public utility, dam, and renewable-energy projects. In general, investors base their investment decision on the projected profits and associated risks of the potential project. Typical risks associated with project financing include construction, operational, supply, offtake, repayment, political, and currency (Fletcher and Pendleton 2014). As noted by Comer (1996), "because many risks are present in such transactions, often the crucial element required to make the project go forward is the proper allocation of risk." Operational risk may be impacted if the project's location coincides with bald or golden eagle habitat, which could potentially lead to eagle take without prior authorization. If so, the project may not generate the forecasted revenue to repay investors. One approach to

reduce operational risk would be to obtain an eagle incidental take permit, as a type of insurance, that may increase the cost of the project but would also reduce the potential risk of consequences from eagle take.

4.7.1.3 Enforcement Costs

The Service primarily uses enforcement as a last resort, preferring to first work collaboratively with companies to minimize risk to eagles and ensure the long-term health of eagle populations through the issuance of take permits. However, the Service may undertake enforcement actions against companies that fail to minimize risk, fail to obtain an incidental take permit, or violate the conditions of an incidental-take permit. Entities operating without an eagle take permit risk federal penalties, including criminal prosecution, under both the MBTA and the Eagle Act for any unauthorized take of eagles. The Eagle Act prohibits anyone from, amongst other things, taking an eagle or eagle nest without prior authorization. This includes in-use and alternate nests. The Eagle Act contains criminal and civil penalty provisions—a criminal violation requires the mental state of "knowingly or with wanton disregard for the consequences" of an action. The first criminal offense is a misdemeanor with a maximum penalty of one year in prison and a $100,000 fine for an individual ($200,000 for an "organization" such as a business). The second offense becomes a felony with a maximum penalty of two years in prison and a $250,000 fine for the offending individual ($500,000 for an organization). Civil penalties do not require the Service to demonstrate any mental state on the part of the actor (i.e., strict liability) and Service regulations currently provide for maximum civil penalties of $15,662 for each civil violation of the Eagle Act (see 50 CFR 11.33). Under the MBTA, which prohibits take of listed birds including eagles, all penalties are criminal provisions. Any non-commercial violation is a strict-liability misdemeanor with a maximum penalty of six months in prison and a $15,000 fine (16 U.S.C. 707), and commercialization (sale of live or dead eagles or parts of eagles) is a felony violation with a maximum penalty of two years imprisonment and a $250,000 fine ($500,000 for an organization) (18 U.S.C. 3571).

4.7.2 Societal Impacts

Eagles provide recreational opportunities such as birding and aesthetics. According to the 2016 National Survey of Fishing, Hunting and Wildlife-Associated Recreation published by the Service, about 45 million Americans over the age of 16 observed birds (USFWS and U.S. Department of Commerce, U.S. Census Bureau, 2016). In 2017, the 53.6 million visits to National Wildlife Refuges primarily for non-consumptive activities, including birding, generated over $3.2 billion in economic activity, $1.1 billion in job income, and over 41,000 jobs (Caudill and Carver 2019). It is not possible to attribute an exact share of this effect to eagles. Eagles have educational value in part due to the public attention that bald and golden eagles attract. Birdwatching can be used to foster ecotourism as a source of income. Many nature centers and nonprofit environmental organizations create revenue through birdwatching tours. These kinds of activities can also be used to introduce students and children to the outdoors to foster an appreciation for nature.

Eagles can provide spiritual enrichment and an appreciation of nature; sighting a bald or golden eagle can fulfill an aesthetic value. Resource values such as clean air and water quality, scenery and natural landscape, open space, and the number of recreation opportunities (including wildlife watching and birding) can be economic assets for local economies (Boley and Green 2016).

The recreational value of natural resources can attract new residents to an area or retain existing residents. Proximity to nature, in particular to public lands, can influence where people choose to live and how much they are willing to pay for housing (i.e., property values). Homes with proximity and access to public lands receive a price premium. Research by Ham et al. (2012; 2014) and Mueller et al. (2022) indicate that people make regional housing and labor-market decisions based in part on the availability of and proximity to public lands, such as forests, lakes, mountains, etc. Living proximate to public lands provides amenities such as convenient access to recreation and wildlife viewing, and sometimes disamenities such as crowds, litter, and noise. That is, population movement and migration into environmentally desirable areas can be explained by the presence of and density of natural resources and associated environmental amenities.

The value held by natural resources for purposes other than direct use is called "non-use value" or "existence value" and has been well documented in the literature (Brookshire et al. 1983; Stevens et al. 1991; Freeman et al. 2014; Phaneuf and Requate 2017). Individuals may receive value from the survival of eagles even if they do not expect to see one. The existence value of an eagle reflects this benefit. Eagles have served as powerful symbols in numerous cultures throughout history. In the U.S., Congress chose the bald eagle to be depicted on the official seal. In its capacity as the nation's symbol, the bald eagle generally represents Americans' sense of autonomy, courage, and power. Today, bald eagle imagery is ubiquitous in American culture, attesting to the widespread symbolic importance of bald eagles in U.S. society (USFWS 2007). As the nation's symbol, the bald eagle has a high existence value compared to other species (Ninan 2009). The bald eagle is also widely portrayed as a symbol of environmental progress, concern, or general awareness. The remarkable decline and recovery of bald eagles coincides with the emergence of the ecological movement in the U.S. in the late 1960s. Bald eagles nearly became extinct due to expansive use of chemical pesticides during the booming post-World War II years, but then recovered dramatically when growing ecological awareness led to increased regulation of pesticides and the passage of numerous laws protecting wildlife and the environment. To many Americans, the bald eagle has come to exemplify ecological consciousness and the health of the environment (USFWS 2007).

The concept of valuing species such as bald or golden eagles is controversial, as many oppose the notion of assigning dollar values to nature. However, disasters such as the Exxon Valdez and BP oil spills have created the need and opportunity to estimate non-use values of species and environmental resources. In general, it is not possible to use market prices or other revealed-preference methods that use consumer behavior to estimate the existence value of the bald or golden eagle. "Stated preference" survey methods such as the contingent-valuation method involve directly asking people, based on a specific hypothetical scenario and description of the environmental good or service, how much they would be willing to pay for a change in that environmental good or service. Three example studies in the U.S. valuing bald eagle conservation from the 1980s and 1990s were found through a literature search (Boyle and Bishop 1987, Stevens et al. 1991, Swanson 1993). These studies report annual willing-to-pay values of $30-64 per household per year in 2020 dollars. These values provide quantitative examples of willing-to-pay values; however, they are not applied in the rest of the report as these studies were conducted when bald eagles were still classified as "endangered" and may not represent current values.

5.0 Environmental Consequences

5.1 Introduction

This chapter describes the potential environmental effects associated with the No Action Alternative and the Action Alternatives. We present the Service's analysis of the direct and indirect effects on the environment that may occur as a result of implementing the alternatives.

The Council on Environmental Quality recently modified the uniform federal regulations implementing NEPA (85 FR 43304, July 16, 2020), including modifications to the definition of "effects" to be considiuered and the express repeal of the definition of "cumulative" impacts, see 40 CFR 1508.1(g)(3). Nonetheless, to determine our action's consistency with the Eagle Act's preservation standard, which is described in detail in the PEIS (USFWS 2016a), we must determine whether the direct and indirect effects of the take and required mitigation, together with the cumulative effects of other permitted take and additional factors, affected the eagle populations within the EMU and the LAP and if they are compatible with the preservation of bald and golden eagles. Additionally, the Council on Environmental Quality has proposed to modify certain aspects of its regulations for implementing the procedural provisions of NEPA, including restoring some regulatory provisions modified in 2020 (86 FR 55757, October 10, 2021). Thus, we analyze and discuss cumulative effects under each Alternative below where they are relevant and pursuant to our obligations under the preservation standard of the Eagle Act.

5.2 Alternative 1 – No Action

5.2.1 Bald and Golden Eagles

Under the No Action Alternative, the current environmental impacts on bald and golden eagles described for the PEIS's Alternative 5 (Sections 3.2.2.7 and 3.3.2.7, USFWS 2016a) will continue.

The PEIS determined that impacts of its Alternative 5 (and therefore, the impacts of the current regulations and the No Action Alternative of this EA) for eagle incidental take permits are likely to be moderately beneficial to bald eagles and minorly to moderately beneficial to golden eagles. Bald eagle populations in all of the EMUs and the nation as a whole are expected to continue increasing toward their theoretical carrying capacity, though once stabilized, would likely fall short of the levels that would be attained in the absence of human-caused impacts. For golden eagles, compensatory mitigation not only offsets authorized take but, because it is required at a ratio ≥1.2:1, it also further reduces the impact of other factors that are currently limiting golden eagle population size. Thus, under the No Action Alternative, golden eagle populations may stabilize or increase in contrast to the stable or declining population projection anticipated prior to the 2016 Eagle Rule (see Figure 3-14, USFWS 2016a).

Increases in golden eagle populations as a result of mitigation are proportional to the amount of mitigation and therefore the number of permits issued and the amount of permitted take. Because the number of permits issued under the No Action Alternative is anticipated to be less than if one of the Action Alternatives is selected, mitigation and any resultant population increase under the No Action Alternative will be less than if an Action Alternative is selected. Although individual companies will ultimately determine project and turbine siting, we anticipate that the Action

Alternatives below will encourage siting of future wind energy infrastructure in areas where overall impacts to eagles will be lower than under the No Action Alternative.

5.2.2 Migratory Birds

Under the No Action Alternative, the environmental consequences for migratory birds described for the PEIS's Alternative 5 (Sections 3.5.2.6, USFWS 2016a) will continue. As described in Section 5.3.1, the Service expects that the No Action Alternative will result in fewer permit applications and permits issued compared to the Action Alternatives due to the lack of a GPP. Thus, the Service expects less compensatory mitigation for eagle take at wind energy facilities under the No Action Alternative compared to the Action Alternatives.

Under the No Action Alternative, the Service would develop A&M measures on a project-specific basis. There is a range of possible A&M measures, and their effect on migratory birds could be beneficial (e.g., removing carcasses from a wind farm could reduce corvid mortalities from turbine collisions), neutral (e.g., retrofitting power poles would have no effect on birds too small to be at risk of electrocution) or detrimental (e.g., removing vegetation to discourage bird activity near a hazard would reduce overall habitat available for some species). Because the Service will select A&M measures with the goal of minimizing detrimental effects, we expect that A&M measures for GPs will have a neutral or slightly positive impact overall on migratory birds. Because we expect the No Action Alternative would result in the least implementation of A&M measures compared to the Action Alternatives due to the lack of GPs, we also expect that the positive impact on migratory birds would be less under the No Action Alternative compared to the Action Alternatives.

Compensatory mitigation for eagle incidental take permits under the 2016 Eagle Rule is likely to provide additional benefits to migratory birds. Compensatory mitigation in the form of power pole retrofits could benefit certain migratory-bird species by preventing electrocution mortalities of large-bodied birds that use power poles as nesting sites, roosts, or perches (likely raptors, vultures, and corvids). Compensatory mitigation that replaces lead ammunition with non-lead ammunition could prevent lead poisoning mortalities of birds that consume gut piles of harvested game (likely raptors, vultures, and corvids). The positive benefits to migratory birds will be proportional to the amount of mitigation and the number of permits issued. The number of permits issued under the No Action Alternative is anticipated to be less than if one of the Action Alternatives is selected, so mitigation and positive benefits to migratory birds will be less than if an Action Alternative is selected. Some potential forms of mitigation focused on eagles (such as habitat modification) could have adverse impacts to some migratory birds and migratory bird habitats, but the effects are more likely to be moderately beneficial overall. We therefore expect that compensatory mitigation for eagle take would result in a moderate reduction of migratory bird take. Because we expect the No Action Alternative would result in the least amount of compensatory mitigation, it would also have the smallest reduction of migratory bird take compared to all other Alternatives.

5.2.3 Federally Endangered and Threatened Species

Under the No Action Alternative, the eagle incidental take permitting program will continue as described in the PEIS (USFWS 2016a; Section 2.7). Any consequences to listed species and critical habitat would be the result of implementing A&M measures, compensatory mitigation, or

required monitoring at projects permitted under the 2016 Eagle Rule. Project-specific impacts to listed species or critical habitat under those permits are analyzed on a case-by-case basis for each project applicant.

Fatality monitoring at permitted projects (including but not limited to wind energy facilities) could potentially detect carcasses of listed species, but such detections are unlikely to provide more than incidental information about mortality of those species. Monitoring at these facilities will be focused on detecting eagles, which are large-bodied and easier to detect than bats, songbirds, shorebirds, etc. While fatalities of listed species may occasionally be detected and recorded, it is unlikely that the Service will obtain enough information to scientifically assess risk to these species or meaningfully add to our understanding of their population status. Permittees are required to report to the Service any injuries or mortalities of listed species discovered at permitted projects. Such findings may result in an application for a Section 10 permit under the ESA, which would likely result in positive impacts to affected species caused by implementation of Section 10 permit conditions, including potential mitigation of impacts.

5.2.4 Tribal Traditional Uses, Religious Concerns, and Cultural Resources

Under the No Action Alternative, the consequences for cultural and religious resources and effects to Native American Tribes or individuals described for the PEIS's Alternative 5 (Sections 3.7.2.2 and 3.7.2.6, USFWS 2016a) will continue. This alternative is not expected to substantially interfere with cultural practices and ceremonies related to eagles, or to substantially affect the ability of tribes to use eagle feathers or parts consistent with Federal law. Because eagle remains that are found at permitted activities and projects must be sent to the Service's NER and, if in good condition, distributed to permitted members of federally recognized tribes, eagle remains will be made available for cultural practices and ceremonies under the No Action Alternative.

For reasons described in Section 5.3.1, the Service anticipates that the No Action Alternative will result in fewer permit applications and issued permits compared to the Action Alternatives. Because each permit issued under a GPP will include A&M measures that would not have been required outside of the permit process, the Service expects that a lower number of permits issued under the No Action Alternative will result in a higher amount of eagle take at wind energy facilities compared to the Action Alternatives. The Service also anticipates that, due to the overall lower number of permit applications expected for the No Action Alternative, the amount of compensatory mitigation for eagle take will be lower and therefore eagle take will be higher compared to the Action Alternatives. We therefore expect overall eagle take to be higher under the No Action Alternative than under the Action Alternatives due to increased take at wind facilities and an increase in take rates from other sources, due to less required compensatory mitigation.

As a result of increased eagle take, under the No Action Alternative, the Service anticipates a greater magnitude of detrimental impacts on Native American tribes or individuals for whom eagles are central to cultural or spiritual values compared to the Action Alternatives. Similarly, increased eagle take under the No Action Alternative will increase the adverse effects on those who perceive the concept of authorizing eagle take as offensive and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation compared to the Action Alternatives.

The No Action Alternative does not include a GPP covering wind energy facilities, but all long-term permits issued for eagle take at wind energy facilities require project-specific eagle fatality monitoring. The Service anticipates that, due to the overall lower number of permit applications and issued permits expected, eagle fatality monitoring at wind energy facilities will be substantially less under the No Action Alternative when compared to the Action Alternatives. Eagle remains found at monitored facilities must be sent to the Service's NER and, if in good condition, distributed to permitted members of federally recognized tribes and made available for cultural practices and ceremonies. Under the No Action Alternative, the Service expects that fewer eagle remains will be found during monitoring and sent to the NER as compared to the Action Alternatives, potentially resulting in longer wait times (compared to the Action Alternatives) for Tribal members to receive eagle parts and feathers for religious and cultural use.

Under the No Action Alternative, the Service does not anticipate any change in how current permits affect historic properties, as defined under NHPA. In general, permitted actions under the No Action Alternative are unlikely to affect historic properties because eagle permits authorize eagle take, not ground-disturbing activities that are likely to have impacts on historic properties, such as the construction of a project. An eagle permit is not a prerequisite for the construction of a project, rather it provides legal coverage for the take of eagles for project activities likely to result in injury or mortality. Additionally, in the case of wind turbines, eagle take generally occurs above ground, away from potential historic properties.

Currently, compensatory mitigation requirements requiring power-pole retrofits are the only permit conditions with potential to impact historic properties if chosen as the method to compensate for eagle take. While most retrofits occur above ground where they would not affect historic properties, occasionally individual power-pole retrofits require replacement or relocation of the pole itself, where ground disturbance could potentially affect historic properties. To safeguard against this infrequent potential impact under the No Action Alternative or any of the Action Alternatives, the Service will build language into agreements with in-lieu fee programs that prevent or mitigate impacts to historic properties.

Under the No Action Alternative, we would continue to analyze any individual permit conditions that could potentially affect historic properties on a site-specific basis. If the Service has previously concluded that permit conditions do not negatively impact historic properties, or that safeguards are in place to prevent such impacts, individual-permit analysis of NHPA-related impacts will either be unnecessary or greatly simplified.

5.2.5 Socioeconomics

Under the 2016 Eagle Rule, specific eagle permits are the current approach to permitting eagle take. Since the issuance of the 2016 Eagle Rule, approximately 707 permits have been issued under the current permitting framework. Of those permits, 29 were permits authorizing incidental take of eagles at wind energy projects (26), solar projects (1), mines (1), and military installations (1). The remaining 677 permits that have been issued since the 2016 Eagle Rule were short-term permits granted to businesses, government agencies, and individuals for nest disturbance (479 permits) and nest take (198 permits). For the purposes of socioeconomic analysis in this EA, we assume the Service will continue to issue approximately 30 long-term permits every 5 years. Currently, the Service estimates that there are 1,970 wind generation

facilities either operating or under construction (USDOE 2021). USGS data shows a total of 70,808 turbines in the same general area as those facilities (Hoen et al. 2018). Therefore, for purposes of this analysis, we assume that the average wind project contains 36 turbines (70,808 turbines / 1,970 projects = 35.9 turbines per project). The approximately 30 issued wind energy programmatic permits represent approximately 1.5% of the total number of generation facilities.

5.2.5.1 Financial Impacts to Permittees – Applicant Permitting and Mitigation Costs

Under the current permit structure, the standardized incidental take permit fee for a wind energy project is $36,000 for the initial application submittal, with an additional $8,000 administration fee every five years for permit review. In addition to this fee, wind energy permit applicants must compensate for the anticipated take of golden eagles and bald eagles when EMU take limits will be exceeded. Since EMU take limits for bald eagles are relatively high across the board, permits authorizing take of bald eagles rarely require compensatory mitigation. However, since golden eagle take limits are set at zero across the country, all permits authorizing take of golden eagles require compensatory mitigation. We estimate (by running the CRM with nationwide priors only for a wind energy facility in the center of the U.S.) that an average (36 turbine) project receiving a specific permit will take and need to mitigate for 1.6 golden eagles annually or 8 golden eagles over five years. At a rate of $120,000 per eagle (accounting for the required 1.2:1 ratio for golden eagles), the cost to mitigate for 8 golden eagles for a five-year permit term is estimated to be $960,000 per project. Compensatory mitigation for bald eagles will not typically be required. Wind energy applicants must also provide pre-construction survey data, detailed location and operational data on the project, adaptive management proposals, and any other requested information, as required by 50 CFR 22.80. The cost data for these efforts are captured in the monitoring costs in the table below. The dollar values are based on estimates provided by American Clean Power (ACP) and the Energy and Wildlife Action Coalition (EWAC) as part of the scoping public comment period for this rulemaking.

ACP provided cost estimates for various components of fatality monitoring. They estimate that the cost of third-party fatality monitoring, including the costs of maintaining survey plots in densely vegetated areas and compensating farmers for crops, is approximately $376,000 annually or $1,880,000 every 5 years. This estimate is likely an over-estimate since (a) most permits will not require third-party monitoring in all years, (b) this estimate is for projects in densely vegetated areas, which likely does not represent an "average" project that has applied, or will apply, for an eagle take permit, and (c) this estimate is based on a 100-turbine facility, which is larger than the average 36-turbine project size calculated above. Considering these three factors, we have scaled (linearly) this estimate down to what we estimate it costs to conduct fatality monitoring at an average wind facility. We estimate that this fatality monitoring cost will be $135,360 annually or $676,800 every 5 years. ACP further estimates that pre-construction eagle-use surveys for 2 years would cost approximately $300,000. Pre-construction eagle-use and post-construction fatality monitoring together then would cost approximately $195,360 annually or $976,800 – paid before and during the first 5 years of a permit. For every 5-year permit period thereafter, there would be no eagle-use monitoring requirement and the total monitoring costs would be approximately $135,360 annually or $676,800 every 5 years. EWAC also provided estimates for various components of fatality monitoring. They estimate that the cost of third-party fatality monitoring, including the costs of compensating farmers for lost crops, averages

approximately $1,427,000 every five years. This is likely an over-estimate for reasons (a) and (b) listed above. It is also a probable overestimate because it based on an approximately 150MW wind project. According to the USGS, in 2020 the average wind turbine was 2.75MW; thus, these EWAC estimates apply to a wind project that is approximately 55 turbines in size. Considering this, we have scaled this fatality monitoring estimate to be applicable to an average wind facility. In doing this, we estimate that the fatality monitoring total will be $186,808 annually or $934,036 every 5 years. EWAC also estimates that pre-construction eagle-use surveys for 2 years would cost $300,000. Thus, EWAC's estimated total monitoring cost is approximately $246,808 annually or $1,234,036 – paid before and during the first 5 years of a permit. For every 5-year permit period thereafter, there would be no eagle-use monitoring requirement and the total monitoring costs would be approximately $186,808 annually or $934,036 every 5 years. The Service averaged the estimates from these two commenters to estimate the total monitoring costs for eagle take permits. The average cost estimate for the first five years of a permit (including eagle-use monitoring) is approximately $1.1 million. The average cost estimate for every 5-year period thereafter is approximately $805,000. These costs are estimates and actual costs can range widely depending on the project. The Service thinks these estimates likely over-estimate average 5-year monitoring costs at an average wind facility because of the reasons mentioned above.

Nest disturbance and nest take permits have a smaller fee than programmatic wind energy permits, and do not typically have associated mitigation requirements. The lower value in the range of values outlined in the table below represents the non-commercial cost while the higher value represents the commercial cost for a permit.

Under the current framework, permits are not issued to power line entities, thus, there is no administration fee, nor a mitigation requirement listed. However, many power line entities mitigate for eagle impacts voluntarily.

The estimated cost range for these additional costs to permittees is outlined in Table 5-1.

Table 5-1. No Action Alternative – Current Fees and Costs for Eagle Incidental Take Permits

Type of Permit	Type of Fee/Cost	Requirements	Permittee Cost (over 5 years)
Wind Energy Project	Permit Application Fee	Fee required for application for a permit	$36,000
	Administration Fee	Fee associated with the Service's administration of the permit	$8,000
	Average Compensatory Mitigation Costs	Mitigation required as needed to ensure consistency with preservation standard; 1.2:1 ratio for golden eagles	$960,000
	Average Monitoring Costs	Project-level monitoring is required of all permittees.	$1,100,000
	Total Cost Over 5 Years		**$2,104,000**

Nest Disturbance	Permit Application Fee	Cost to apply for a permit	$500 (noncommercial) $2,500 (commercial)
	Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - $2,500**
Nest Take	Permit Application Fee	Cost to apply for a permit	$500 (noncommercial) $2,500 (commercial)
	Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - 2,500**

The estimated costs of permitting, assuming that permit application counts are similar to those issued since the 2016 Eagle Rule was implemented, are outlined in Table 5-2.

Table 5-2. No Action Alternative – Estimated Permit Fee and Mitigation Costs to Permittees Over a Five-Year Permit Period

Type of Permit	Permit Count	Permit Application Fee	Administration Fee	Average Compensatory Mitigation Cost	Average Monitoring Cost	Total Cost of Permits (range)
Wind Energy Project	30	$36,000	$8,000	$960,000	$1,100,000	$63,120,000
Nest Disturbance	479	$2,500	$0	$0	$0	$1,197,500
Nest Take	198	$2,500	$0	$0	$0	$495,000
Total[1]	**707**	**N/A**	**N/A**	**N/A**	**N/A**	**$64,812,500**

[1] We assume the highest cost for the existing cost of permits whenever there is a range of costs in question.

5.2.5.2 Financial Impacts to Permittees – Project Financing Costs

In addition to the direct costs associated with the permit fee and mitigation, the current eagle incidental take application review process can be long and the costs (particularly after the first 5 years of the permit tenure) can be uncertain. Projects that are not able to adequately predict and account for their expected mitigation costs may face some financial challenges managing the costs and risks associated with operations over the project life cycle.

5.2.5.3 Financial Impacts to Permittees – Enforcement Costs

The facilities that have not received a permit are potentially operating under increased operational risk due to the unmitigated risk of incidental take occurring. As described in Section 2.4.2, we believe it is likely that many facilities at risk of incidental take would continue to operate without a permit under the No Action Alternative. As such, the number of permits issued is likely to be significantly lower than the number of facilities eligible for such a permit – leaving

many projects without permits and at risk for enforcement actions if take occurs. Enforcement costs are described in detail in Section 4.7.1.3.

5.2.5.4 Financial Impacts to the Service

We developed the $36,000 eagle incidental take, standardized permitting fee to reflect the Service's estimate of the administrative costs of processing a long-term permit application. However, since the Service implemented the 2016 Eagle Rule, the eagle incidental take permit processing time and burden has routinely exceeded this estimate for long-term permits. Thus, the resources required to process permits have created an administrative burden of time and costs on the Service. However, time and costs associated with long-term permit issuance has come down in recent months as the regulated community has become more familiar with the application process and as the Service has standardized its application processing methods.

The Service also provides technical assistance and consultation services as part of the eagle incidental take permit program. This technical assistance helps potential applicants weigh their risk to eagles, determine for themselves whether a permit is necessary, and, if so, what potential fees may be required. The Service intended that the funding for this technical assistance would come from excess funds associated with the administration of permits; however, because the Service has not issued as many permits as expected and because the administration costs associated with the permits have been higher than the Service expected, the funding for technical assistance has been less than originally anticipated.

Under the current regulation, the Service's costs associated with administering specific permits exceeded the revenue associated with the permit fees. Thus, the Service is likely to continue to subsidize the permit review process using general funds under the No Action Alternative.

5.2.5.5 Societal Impacts

As described in previous sections, the benefits of permit issuance from permit conditions that require A&M, compensatory mitigation, and fatality monitoring would be less than under the Action Alternatives. Thus, benefits to eagle populations under the No Action Alternative would be limited by comparison. Correspondingly, the societal benefits of eagles described in Section 4.7.2 would be reduced compared to the Action Alternatives. Specifically, the No Action Alternative would result in slightly reduced recreational opportunities and a reduced aesthetic and cultural benefit from viewing fewer eagles when compared to the Action Alternatives.

5.3 Permitting Framework Common to All Action Alternatives

5.3.1 Bald and Golden Eagles

All Action Alternatives include general permits for incidental take of eagles. The GPP(s) described under the Action Alternatives authorize take of eagles in a mostly automated way, in contrast to specific permits, and include standard provisions requiring conservation measures for eagles, including offsetting compensatory mitigation when necessary to remain consistent with the eagle preservation standard.

General permits are structured to require less administrative work and Service staff review. They are expected to have lower mitigation and monitoring fees than specific permits, resulting in

reduced costs and much faster processing than current specific permits (see *Monitoring Considerations*, Appendix A). For these reasons, the Service anticipates that creating GPPs will result in an increase in projects that obtain permits to authorize incidental take of eagles as compared to the No Action Alternative, potentially a significant increase. Because each permit issued under a GPP will include A&M measures and compensatory mitigation (when necessary for maintaining the preservation standard) for eagles that would not have been required outside of the permit process, the Service concludes that the expected increase in permit applications will reduce eagle take at many more wind energy facilities than currently occurs, and also reduce take from other sources. We expect this positive impact on eagles from reduced incidental take to outweigh any negative impact from potentially reducing mitigation requirements for projects operating under general permits instead of specific permits. Within the Action Alternatives, differing eligibility standards for general permits, monitoring and mitigation fee structure, and the number of activities covered under GPPs all influence the type and extent of predicted effects, as described below in subsequent sections.

While all Action Alternatives include a GPP for wind energy facilities, only Alternative 4 includes GPPs for other activities – analyzed in Section 5.6. The general permit framework would increase efficiency in permitting and should significantly increase the proportion of wind energy projects that are permitted, but we do not expect it to affect the number of new wind energy facilities built on the landscape. The Service does not have regulatory authority over the siting or construction of wind energy facilities. Instead, eagle permits authorize eagle take that may occur at facilities, which is primarily caused by operation of the facility once constructed, but disturbance could also potentially occur during construction. See also Section 2.4.2. Applying for an eagle incidental take permit is not a prerequisite to site and construct a project, but an eagle permit is required to operate a project legally if eagle take occurs. However, many wind energy facilities currently operate without an eagle incidental take permit and the Service anticipates some will continue to do so even if general permits are available. The purpose of developing a general permit framework is to substantially reduce the number of projects at risk of taking eagles that operate without a permit.

For GPPs covering wind energy facilities, all projects will be required to conduct concurrent monitoring (Section 3.4.3.6). The Service anticipates that, due to the overall expected increase in permit applications, eagle fatality monitoring at wind energy facilities may increase substantially overall under all Action Alternatives. Under specific permits, projects must conduct project-specific monitoring (Section 3.4.3.6). Due to the standardization of data collection and the ability to institute a systematic survey design across both permit types, the Service expects that current uncertainty about eagle mortalities at wind energy facilities will decrease over time, leading to improved accuracy of predicted take assessments and consequently management of the species in general.

Compensatory mitigation for eagle take would be required for GPPs covering wind energy facilities. Because of the expected overall increase in permit applications, compensatory mitigation for eagle take at wind energy facilities would likely increase substantially compared to the No Action Alternative. Take that is currently unpermitted and unmitigated would be converted to permitted and mitigated take, and actual take would likely decrease due to the implementation of additional A&M measures for eagles at permitted facilities. Service-approved ILF programs would administer mitigation funds. Although we cannot anticipate all possible ILF programs, two currently available ILF programs mitigate eagle take through retrofitting power

poles to prevent electrocutions. Increasing the overall mitigation required at projects across the landscape through permit authorizations that likely would not occur under the No Action Alternative will result in more power poles being retrofitted and a reduction in eagle mortality. We also anticipate that one or more future ILFs could mitigate eagle take through programs to reduce lead ammunition used for hunting. Poisoning due to ingesting lead from spent ammunition in gut piles is a leading source of illness and mortality in eagles nationwide (Millsap et al. 2022, Slabe et al. 2022). Creating one or more ILFs to reduce lead in gut piles would result in a reduction of mortalities for eagles. We also expect to develop other mitigation measures suitable for Service approval in the future.

All Action Alternatives include restrictions on general permit eligibility for wind projects to ensure that higher-risk projects will be ineligible for general permits. Ineligible facilities would have to apply for a specific permit that requires a project-specific risk analysis along with additional requirements that are similar to those required under the current permit scheme represented by the No Action Alternative. However, under all Action Alternatives, the Service proposes several minor changes that are intended to increase interest and participation in specific permits compared to the status quo under the current regulations (see Section 3.4.2.2). Specifically, we are proposing to remove the existing requirement that permittees hire an independent third-party to conduct fatality monitoring and remove the requirement for a mandatory, administrative check-in every five years (see Section 3.4.2.2). We are also proposing a new three-tiered fee structure under specific permits intended to reduce lengthy negotiations over estimated project impacts, compensatory mitigation methods, and potential permit conditions. These negotiations currently contribute to longer-than-expected permit application reviews and permit issuance times (see Section 3.4.2.2). The new, three-tiered structure includes a requirement for a reimbursable agreement between the Service and the applicant if a tiered EA or EIS is necessary to reach a permit decision. The Service anticipates that these changes will increase application and permit issuance rates for specific permits and will provide the Service with sufficient funds to conduct, in a timely manner, any project-specific analysis that may be required during application review. Any increase in the number of specific permit applications received and speed of specific permits issued will result in implementation of more conservation measures for eagles and will further convert unpermitted and unmitigated take to permitted and mitigated take, which will benefit eagles.

The Action Alternatives include different eligibility restrictions (Table 3-1) for GPPs, which we analyze for each Alternative. Overall, introducing general permits may increase the difficulty in estimating and understanding project-specific impacts to eagles compared to the No Action Alternative because general permits will not require pre-construction, eagle-use data collection or any project-specific analysis. Although general permittees will be required to conduct concurrent fatality monitoring (Section 3.4.3.6), many injuries or mortalities will likely be missed because the effective search effort and search area will generally be relatively low compared to that required under specific permits. However, any increased difficulty in assessing project-specific impacts under a GPP assumes all or most eligible projects under the No Action Alternative would apply for a permit to authorize take of eagles, which has not been the case under the current permit framework.

Under the wind-energy GPPs proposed in the Action Alternatives, projects will be required to conduct concurrent monitoring (Section 3.4.3.6). Under specific permits, projects will be required to conduct project-specific monitoring (Section 3.4.3.6). The Service will use data from

concurrent monitoring, project-specific monitoring, and Service-led monitoring to estimate take within the EMUs and ensure that estimated take is below take limits, consistent with the preservation standard. Tables 4-1 and 4-2 provide updated bald and golden eagle take limits for each EMU. The Service's recent increase in take limits for bald eagles (USFWS 2022) is related to strong population growth in 4 of the 6 bald eagle EMUs.

The general-permit, LAP-mitigation requirement, collected as a small fee for general permits for wind facilities under all Action Alternatives, would be used to offset bald or golden eagle take should the Service determine that authorized bald or golden eagle take in a locality is inconsistent with our preservation standard (see Sections 3.4.3.4 and 3.4.4.4). To accomplish this, the Service would direct ILFs to implement compensatory mitigation in areas in each EMU where cumulative authorized take is relatively high compared to estimated eagle densities and thus most likely to impact the LAP threshold. However, the Service may direct the funds based on other factors if necessary to meet our preservation standard. This mitigation would offset the LAP take, providing a check on the impacts of authorized take and ensuring that the preservation standard is upheld. We note that estimated take in the Pacific - South EMU is closest to the take threshold for bald eagles (Table 5-7). The Service will monitor this threshold closely and apply general-permit, LAP-mitigation funds in that EMU if there is any concern that implementation of the GPP is approaching EMU limits or LAP thresholds. Under specific permits, the Service can analyze take at the EMU and LAP scale and make decisions before permit issuance that are consistent with our preservation standard. The Action Alternatives include different mitigation requirements (Table 3-1) and the overall amount and distribution of mitigation may differ among Alternatives. We analyze the specific impacts of mitigation for each Alternative.

The Service acknowledges that, in rare instances, relatively high levels of take may occur at projects that qualify for general permits under all Action Alternatives. Two measures limit general permit availability to unexpectedly high-risk wind energy facilities: facilities covered by general permits must design and implement measures to reduce eagle take if they find three dead or injured bald eagles or three dead or injured golden eagles at permitted infrastructure, and facilities that find four dead or injured bald eagles or four dead or injured golden eagles are ineligible to receive another general permit upon expiration of their current permit. Such facilities would have to apply for a specific permit, requiring a project-specific risk analysis. These requirements would reduce the number of wind energy facilities with unexpectedly high impacts on eagles that can remain under a general permit, thereby reducing the risk that the GPP authorizes take that is inconsistent with our preservation standard.

Under all Action Alternatives, we will remove the Service's standard practice (established in 2016) of applying a 10% LAP threshold for unpermitted take to determine consistency with our preservation standard. The Service has not been able to accurately quantify unpermitted take rates in LAPs with the data at our disposal, making this standard practice uninformative, impossible to apply, and ultimately unnecessary. Thus, the removal of this threshold will have no measurable impact on bald or golden eagles compared to the No Action Alternative.

Under all Action Alternatives, we will clarify that the concept of baseline take applies to golden eagles east of the 100th Meridian. By making this clarification we are broadening the baseline standard to apply to eastern golden eagles. Because no incidental take permits have been issued to date for golden eagles in the eastern EMU, we do not expect that this clarification will have any environmental impacts compared to the No Action Alternative other than to encourage

compliance from existing and future projects that may have otherwise been dissuaded from applying for a permit by our previous approach.

Under all Action Alternatives, we would establish a new take rate using updated information of 0.26 bald eagles per year for bald eagle nest disturbance permits in the coterminous U.S., which would be debited from EMU take limits and LAP thresholds. This new take rate would not be applied in the southwest bald eagle EMU, where the take rate would remain at 0.95 bald eagles per year. Using this new observed take rate, we can more accurately account for the impacts of our bald eagle nest disturbance permits (general or specific) on the respective EMU take limits and LAP thresholds. Although the establishment of this new rate would theoretically allow the Service to issue a greater number of nest disturbance permits regardless of the Alternative selected, we do not anticipate that this change will result in a greater number of such permits issued because EMU take limits and LAP thresholds are rarely if ever reached using the existing rate. Thus, this change will not result in any meaningful increase in nest disturbances compared to the No Action Alternative. If a greater number of nest disturbance permits were issued as a result of this change, that would not result in any significant impact on bald eagles because bald-eagle populations could sustain such increases within current EMU take limits and LAP thresholds.

Finally, under all Action Alternatives, we would amend nest take permits to (1) clarify that a nest take permit is required to authorize temporary or permanent obstruction of a nest that causes nest abandonment, (2) add the ability for the Service to authorize nest take for an in-use nest prior to egg laying in situations where the safety of either humans or listed species is at risk, and (3) add an additional justification authorizing the take of eagle nests when necessary to protect listed species and there is no practicable alternative to nest take. The minor clarification in (1) and the addition of flexibility for the Service to authorize nest take prior to egg laying in (2) may increase the frequency at which nest take permits are issued and cause take of eagles; however, if the Service properly debits and tracks EMU take limits and LAP thresholds, this change should not have any effect on eagles. Additionally, the Service expects issuance of nest-take permits to protect listed species in (3) to be rare and that the introduction of these permits will not have significant impacts on eagles.

5.3.2 Migratory Birds

As described in Section 5.3.1, the Service expects that the Action Alternatives will result in an overall increase in permit applications and permits issued that provide conservation benefits to eagles as compared to the No Action Alternative. Each general permit requires implementation of standardized A&M measures for eagles. The Service anticipates, due to the expected overall increase in permit applications, that A&M measures provided for eagles will be greater (perhaps significantly greater) for the Action Alternatives compared to the No Action Alternative. Effects of these requirements on migratory birds could be beneficial (e.g., removing carcasses from a wind farm could reduce crow mortalities from turbine collisions), neutral (e.g., retrofitting power poles would have no effect on birds too small to risk electrocution) or detrimental (e.g., removing vegetation to discourage bird activity near a hazard would reduce overall habitat available). Because the Service will select A&M measures that minimize detrimental effects on eagles, we expect that A&M measures for GPPs will have a neutral or slightly positive impact on migratory birds overall. This is because the positive impacts of these measures on migratory birds will likely outweigh any potential negative impacts, particularly for raptors with similar

biological characteristics to eagles. Because we expect all Action Alternatives would result in the implementation of A&M measures for more activities than the No Action Alternative, the positive impact on migratory birds will likely be greater under the Action Alternatives compared to the No Action Alternative. We discuss the relative benefits among Action Alternatives under the specific Alternatives below.

For GPPs covering wind energy facilities, compensatory mitigation for eagle take is required. The Service anticipates that permit applications will increase, perhaps significantly, under a GPP, which will result in a substantial increase in applied compensatory mitigation for eagle take at wind energy facilities. Mitigation funds would be administered by Service-approved ILFs. Although we cannot anticipate how many ILF programs will ultimately be developed, two currently available ILFs mitigate eagle take through retrofitting power poles to prevent electrocutions. Increasing the number of permitted projects will increase the mitigation funds available to these ILFs, which will result in more power poles being retrofitted and a reduction of mortalities of eagles and other large-bodied birds that use power poles as nesting sites, roosts, or perches (likely raptors, vultures, and corvids). We also anticipate that one or more future ILFs may mitigate eagle take through programs to reduce lead ammunition left on the landscape. Creating one or more ILFs to reduce lead that is available for uptake into food chains would result in a reduction of mortalities to other animals that scavenge gut piles (likely vultures, raptors, corvids, and mammals including rodents and canids). Some potential forms of mitigation focused on eagles (such as habitat modification) could have adverse impacts to some migratory birds and migratory bird habitats, but the effects are more likely to be moderately beneficial overall. We therefore expect that compensatory mitigation for eagle take under the Action Alternatives would result in a moderate reduction of migratory bird take and potentially a larger reduction for some species, such as raptors, vultures, and corvids. Relative benefits among Action Alternatives are discussed under the specific Alternatives below.

5.3.3 Federally Endangered and Threatened Species

An eagle incidental take permit would authorize only the incidental take of eagles, not the underlying activity. Therefore, effects to listed species or designated critical habitat resulting from the underlying activity are not "effects of the action" of issuing an eagle incidental take permit (although any take of listed species resulting from the underlying activity would still be subject to ESA's section 9 prohibitions against take).

Issuance of general permits would not result in impacts to listed species or designated or proposed critical habitat. General permits would have standardized permit conditions for A&M measures, monitoring, and compensatory mitigation (if required). General permits may not be used to authorize incidental take of eagles by an activity if implementing the conditions required by the general permit may affect a listed species or designated or proposed critical habitat. In those cases, the applicant must apply for a specific permit. The specific permit issuance process would include analysis of project-specific impacts to listed species and proposed or designated critical habitat and intra-Service consultation under Section 7, if the Service's decision may affect a listed species or designated or proposed critical habitats. In addition, Service-approved ILF programs will carry out mitigation required under general permits, and some specific permits. We will require, by agreement, that these programs avoid conducting activities that are likely to directly or indirectly affect a listed species or designated or proposed critical habitats.

Permittees are required to report to the Service any injuries or mortalities of listed species discovered at permitted projects. Such findings may result in the determination by a permittee that they need to apply for an ESA Section 10 incidental take permit.

Under all Action Alternatives, an amendment to the nest-take permitting framework will add an additional justification authorizing the take of eagle nests when necessary to protect listed species and there is no practicable alternative to nest take. Although the Service expects these nest-take permits to be rare, nest removal could potentially result in positive impacts on the immediate population of the listed species affected by the nesting eagle pair and a moderately positive impact on the listed species overall. However, because we intend this provision to address very specific, uncommon situations where a nesting eagle pair is affecting individuals or a local population of a listed species, we do not expect authorizing eagle-nest take when necessary to protect listed species will have a significant impact overall on listed species.

5.3.4 Tribal Traditional Uses, Religious Concerns, and Cultural Resources; General Public Concerns

The PEIS describes in detail the expected effects of a permitting program for incidental take of eagles on cultural and religious resources and effects to Native American Tribes and individuals (Sections 3.7.2.2 and 3.7.2.6, USFWS 2016a). We do not expect that selection of an Action Alternative would substantially interfere with cultural practices and ceremonies related to eagles or affect the ability of Tribes to use eagle feathers or parts consistent with Federal law.

As described in Section 5.3.1, all Action Alternatives include a class of general permits available for incidental take of eagles. The Service anticipates that creating the GPP(s) will result in an increase in permit applications and issued permits. As described in Section 3.7 of the PEIS (USFWS 2016a), effects to Native American Tribes or individuals could be detrimental emotionally or spiritually if the permit issuance is perceived as desecration of something sacred. Some Tribes could experience adverse effects because any permitting of existing and future incidental take of wild eagles is contrary to cultural and spiritual values. Such effects would be greater under the Action Alternatives as compared to the No Action Alternative due to the increase expected in permit applications and issued permits. As described in Section 3.7 of the PEIS (USFWS 2016a), as the nation's symbol, the bald eagle has a special significance to many Americans, and it is also a treasured species among wildlife enthusiasts. Some Americans may experience adverse effects if they perceive the concept of authorizing eagle take as offensive and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation. Such effects would be greater under the Action Alternatives as compared to the No Action Alternative due to the increase expected in permit applications and issued permits, despite the fact that increased permit coverage would reduce eagle take overall by bringing more facilities into compliance with the Eagle Act.

For reasons described in Section 5.3.1, the Service anticipates that creating the GPP(s) under the Action Alternatives will result in an increase in permit applications and issued permits compared to the No Action Alternative. Because each permit issued under the GPP(s) will include A&M measures for eagles that would not have been required outside of the permit process, the Service expects that an increase in the number of permits issued under the Action Alternatives would result in a reduction of eagle take at wind energy facilities compared to the No Action Alternative. The Service also anticipates that the overall increase in permit applications expected

for the Action Alternatives will increase the amount of compensatory mitigation for eagle take and, therefore, eagle take will decrease under any Action Alternative compared to the No Action Alternative. We therefore expect overall eagle take to be reduced under the Action Alternatives compared to the No Action Alternative due to a reduction of take at wind facilities and a reduction in take rates from other sources, via required compensatory mitigation. We anticipate that a reduction in eagle take under the Action Alternatives would also decrease the magnitude of detrimental impacts, compared to the No Action Alternative, on Native American Tribes or individuals for whom eagles are central to cultural or spiritual values. Similarly, reduced eagle take under the Action Alternatives may reduce the adverse effects on those who perceive the concept of authorizing eagle take as offensive e and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation compared to the No Action Alternative.

All Action Alternatives include a GPP covering wind energy facilities, with required concurrent, eagle fatality monitoring. Because of the expected overall increase in permit applications, eagle fatality monitoring at wind energy facilities should increase substantially under the Action Alternatives compared to the No Action Alternative. Permittees must send eagle remains found at facilities permitted under GPPs to the Service's NER which, if the eagle remains are in good condition, will distribute them to permitted members of federally recognized Tribes to be made available for cultural practices and ceremonies. Under the Action Alternatives, the Service expects that permittees will find more eagle remains during monitoring compared to the No Action Alternative, resulting in an average decrease in the wait times for Tribal members to receive eagle parts and feathers for religious and cultural use. Again, it is important to note that any increase in eagles supplied to the repository would not be the result of an increase in eagle take from implementing the Action Alternatives, but instead the result of an increase in mortality monitoring at more projects operating under permits resulting in more eagles being found at these projects.

This proposal is not likely to affect historic properties, as defined under the NHPA. The proposed federal undertaking under Alternatives 2, 3, and 4 is to amend and update the regulations governing issuance of permits authorizing eagle take. Any impacts to historic properties from specific permits are addressed, consistent with current policy, as described under the No Action Alternative (Section 5.2.4). Thus, any conditions of specific permits that may affect historic properties would continue to be analyzed on a permit-specific basis. If the Service concludes that permit conditions do not negatively impact historic properties, or that safeguards are in place to prevent such impacts, individual-permit analysis of NHPA-related impacts will either be unnecessary or greatly simplified.

We do not expect general-permit authorizations under any of the Action Alternatives to affect historic properties for several reasons. First, issuance of an eagle permit is not a prerequisite for the construction of a project or for other ground-disturbing activities that may affect historic properties. Under all Action Alternatives, general-permit conditions set forth broad requirements designed to reduce the take of eagles at a project or activity. For wind-energy general permits, eligibility and general conditions encourage siting of facilities in areas of lower risk to eagles. For example, general permits include requirements to site turbines and project boundaries away from eagle nests that are designed to reduce the likelihood of incidental take at the project. While our goal is for these conditions to guide the siting of projects, they do not dictate any individual turbine siting or placement decision by the applicant. General requirements of this nature do not prescribe where specific ground-disturbing activities will take place and thus do not directly

affect historic properties. General permit conditions for eagle disturbance are similarly conditioned on avoiding impacts to eagle nests. Disturbance general permits are not a prerequisite to building a project and do not control placement of ground-disturbing activities other than providing general guidance on where to avoid engaging in those activities. For power line general permits, power pole retrofit plans under all Action Alternatives would specifically govern mitigation measures that occur above ground and do not involve ground-disturbing activities in most cases. If a permittee wishes to conduct ground-disturbing activities as a part of these plans, for example, when burying lines or moving or replacing power poles, we will require that each applicant for a general permit either certify that their activity does not affect a property that is listed, or is eligible for listing, in the National Register of Historic Places as maintained by the Secretary of the Interior; or that they have obtained, and are in compliance with, a written agreement with the relevant State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO) that outlines all measures the applicant must undertake to mitigate or prevent adverse effects on historic properties.

While negotiated mitigation measures under specific permits have a limited potential to affect historic properties, we do not anticipate that universal conditions under general permits will. Under general permits, the Service will ensure that any final permit conditions will contain safeguards that avoid any impacts to historic properties if we receive information indicating that any proposed general-permit conditions have the potential to cause effects. Conditions with the most potential to affect historic properties involve power-pole-retrofit and compensatory-mitigation requirements. Specifically, if power pole retrofits are required as standard conditions under general permits for power line entities, or if retrofits are required under general permits for other activity types (e.g., wind energy), ground disturbance from any pole replacements could potentially affect historic properties. To safeguard against this possible impact, the Service will build language into agreements with in-lieu fee programs that prevents impacts to historic properties from occurring.

5.4 Alternative 2 – General Permits Available for Wind Energy Facilities; Eligibility Based on Distance from Nests; Flat Fee for Mitigation

5.4.1 Bald and Golden Eagles

General permits are structured to require less administrative work and Service staff review and are expected to have reduced mitigation and monitoring requirements compared to specific permits, resulting in reduced costs and much faster processing for applicants than for specific permits (see *Monitoring Considerations*, Appendix A). For these reasons, the Service anticipates that Alternative 2 will result in an increase in permit applications compared to the No Action Alternative. The breadth of activities covered under general permits in Alternative 2 (wind energy facilities only) is the same as Alternative 3 but narrower than Alternative 4 (wind energy facilities, power line entities, activities likely to cause nest disturbance, and nest take or nest removal activities). Alternative 2's flat fee for mitigation, may disincentivize smaller projects with tens of turbines from applying for take permits compared to larger projects with hundreds of turbines. Lower-risk project proponents may decide the cost of paying the flat fee exceeds the cost of potential enforcement based on perceived liability risk. For all these reasons, the Service expects Alternative 2 to result in more permit applications than the No Action Alternative, but a reduced number of permit applications compared to Alternatives 3 and 4.

Each permit includes additional A&M measures designed to reduce project impacts on eagles; therefore, the Service expects any increase in permit applications to result in reduced eagle take. Thus, the Service expects Alternative 2 to result in less actual eagle take than the No Action Alternative but a greater amount of actual eagle take than Alternatives 3 and 4. Each permit would also include a fee for mitigation. The Service anticipates that, due to the expected overall increase in permit applications, compensatory mitigation for eagle take at wind energy facilities would be greater under Alternative 2 than the No Action Alternative and less than compensatory mitigation under Alternatives 3 and 4.

Concurrent monitoring would occur at all wind energy facilities under general permits and project-specific monitoring would occur at all wind energy facilities under specific permits. Under Alternative 2, GPP eligibility is not contingent on eagle relative abundance, so some projects with comparatively high eagle relative abundance, and higher corresponding risk, will likely meet eligibility criteria for general permits. These higher-risk facilities with general permits would potentially have high levels of undetected eagle take under Alternative 2, which would be more likely detected if the facility were covered by a specific permit (as under the No Action Alternative or Alternatives 3 or 4) requiring project-specific fatality monitoring. Therefore, we conclude that the possibility of violating the preservation standard is higher under Alternative 2 compared to all other Alternatives.

Projects are eligible for general permits under Alternative 2 if all existing or proposed turbines are or will be located over one mile from bald eagle nests and over two miles from golden eagle nests. These restrictions make some projects that are expected to have higher risk to eagles due to nest proximity ineligible for general permits, but eligibility is not restricted by eBird eagle relative abundance (ERA) as it is under Alternatives 3 and 4. We expect that some projects with high ERA but not within the specified distances to eagle nests will still pose a relatively high risk to eagles even though they would qualify for general permits. Additionally, because eligibility is based on nest locations and the Service does not know where all eagle nests are or will be on the landscape, we cannot perform as rigorous an analysis of the Alternative's impacts as we have for Alternatives 3 and 4 (Appendix A). We therefore conclude that Alternative 2 has the highest uncertainty regarding impacts on eagles of any Alternative, at the project, LAP, and EMU scales.

We expect more projects overall will be eligible for general permits under Alternative 2 than under Alternatives 3 and 4 because there is no added eligibility restriction based on ERA under Alternative 2, like there is under Alternatives 3 and 4. The bald-eagle-nest-distance restriction is greater under Alternative 2 than under Alternatives 3 and 4, but the additional land area from this restriction is almost certainly less than the additional land area from the ERA restrictions under Alternative 3 and 4. Therefore we expect a larger area to be eligible for general permits under Alternative 2 than Alternatives 3 and 4. The Service was not able to delineate eligibility areas under this Alternative because we do not know where all, or even most, of the bald or golden eagle nest locations are throughout the country.

Despite more projects likely being eligible for general permits under Alternative 2, we anticipate the fee structures for mitigation would likely reduce general permit participation under Alternative 2. But, more importantly, we conclude that not including ERA-based eligibility criteria under Alternative 2 will likely result in some projects with relatively high ERA and high corresponding eagle risk (under the assumption that eagle risk is proportional to eagle use) meeting eligibility criteria for general permits, which would result in higher overall risk to eagles and higher levels of unmitigated take compared to Alternatives 3 and 4. Therefore, we would

need to build in more rigorous monitoring and increased mitigation requirements to be confident that a GPP under Alternative 2 would be compatible with the preservation standard. This, in turn, would increase costs to general-permit applicants as noted above.

5.4.2 Migratory Birds

As described in Section 5.4.1, the Service expects Alternative 2 to result in more permit applications than the No Action Alternative, and a reduced number of permit applications compared to Alternatives 3 and 4.

Under Alternative 2, the Service would develop standard A&M measures required for permitted activities under the GPP. There is a range of possible A&M measures, and their effect on migratory birds could be beneficial (e.g., removing carcasses from a wind farm could reduce corvid mortalities from turbine collisions), neutral (e.g., retrofitting power poles would have no effect on birds too small to risk electrocution) or detrimental (e.g., removing vegetation to discourage bird activity near a hazard would reduce overall habitat available). Because the Service will select A&M measures with a goal of minimizing detrimental effects to eagles, we expect that A&M measures for GPPs will have a neutral or slightly positive impact on migratory birds overall. This is because we expect these measures will have a net positive impact on migratory birds, particularly raptors with similar characteristics to eagles. Because we expect Alternative 2 would result in the implementation of A&M measures for more activities than the No Action Alternative, we expect it to produce greater positive impacts on migratory birds than the No Action Alternative, but less than Alternatives 3 and 4, resulting in implementation of A&M measures at more projects.

Each permit would include a requirement for compensatory mitigation (if warranted) and fatality monitoring. The Service anticipates that, due to the overall increase in expected permit applications, compensatory mitigation for eagle take at wind energy facilities would be greater under Alternative 2 than the No Action Alternative but less than under Alternatives 3 and 4. Mitigation funds would be administered by Service-approved ILF programs. Although we cannot anticipate how many ILF programs will ultimately be developed, two currently available ILF programs mitigate eagle take through retrofitting power poles to prevent electrocutions. Increasing the number of permitted projects will increase the mitigation funds available to these ILF programs, which will result in more power poles being retrofitted and a reduction of mortalities of eagles and other large-bodied birds that use power poles as nesting sites, roosts, or perches (likely raptors, vultures, and corvids). We also anticipate that one or more future ILF programs may mitigate eagle take through programs to reduce lead ammunition left on the landscape. Creating one or more ILFs to reduce lead that is available for uptake into food chains would result in a reduction of mortalities to other animals that scavenge gut piles (likely vultures, raptors, corvids, and mammals including rodents and canids). Some potential forms of mitigation focused on eagles (such as habitat modification) could have adverse impacts to some migratory birds and migratory bird habitats, but the effects are more likely to be moderately beneficial overall. We therefore expect that compensatory mitigation for eagle take under Alternative 2 would result in a moderate reduction of migratory bird take, and potentially a significant reduction for some species, such as raptors, vultures, and corvids, compared to the No Action Alternative. We expect that this reduction of migratory bird take would be less under Alternative 2 than it would be under Alternatives 3 and 4, where more implementation of compensatory mitigation is expected to result in a greater reduction in migratory bird take.

5.4.3 Federally Endangered and Threatened Species

See description of environmental consequences in Section 5.3.3.

5.4.4 Tribal Traditional Uses, Religious Concerns, and Cultural Resources

See description of environmental consequences in Section 5.3.4.

For the reasons described in Section 5.4.1, the Service expects Alternative 2 to result in more permit applications and issued permits than the No Action Alternative, but fewer permit applications and issued permits compared to Alternatives 3 and 4. Because each permit issued under the GPP will include A&M measures for eagles that would not have been required outside of the permit process, the Service expects that an increase in the number of permits issued under Alternative 2 would result in a reduction of eagle take at wind energy facilities compared to the No Action Alternative (although Alternatives 3 and 4 would have a greater reduction). The Service also anticipates that the overall increase in permit applications expected under Alternative 2 would increase the amount of compensatory mitigation for eagle take. Therefore, eagle take would decrease compared to the No Action Alternative, although Alternatives 3 and 4 would result in a greater increase in compensatory mitigation and greater decrease in eagle take. Therefore, we expect overall eagle take to be reduced under Alternative 2, compared to the No Action Alternative, due to a reduction of take at wind facilities and a reduction of take from other sources through implementation of required compensatory mitigation (although Alternatives 3 and 4 would result in a greater reduction in overall eagle take). A reduction in eagle take would also likely decrease the magnitude of detrimental impacts on Native American Tribes or individuals for whom eagles are central to cultural or spiritual values. Similarly, reduced eagle take may mitigate any adverse effects on those who perceive the concept of authorizing eagle take as offensive and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation.

The Service anticipates that, due to the expected overall increase in permit applications, eagle fatality monitoring at wind energy facilities will increase substantially under Alternative 2 compared to the No Action Alternative (although Alternatives 3 and 4 would result in a greater increase). Eagle remains found at facilities permitted under GPPs must be sent to the Service's NER and, if in good condition, distributed to permitted members of federally recognized Tribes to be made available for cultural practices and ceremonies. Under Alternative 2, the Service expects that more eagle remains will be found during monitoring and sent to the NER as compared to the No Action Alternative (although less than under Alternatives 3 and 4). This would result in an average decrease in the wait times for Tribal members to receive eagle parts and feathers for religious and cultural use. Again, it is important to note that any increase in eagles supplied to the repository would not be the result of an increase in eagle take from implementing the Action Alternatives, but instead the result of an increase in mortality monitoring at more projects operating under permits that would not have occurred otherwise.

The Service does not anticipate that any of the Action Alternatives discussed in this EA will impact historic resources as defined under the NHPA, as described in detail in Section 5.3.4.

5.4.5 Socioeconomics

Under Alternative 2, the anticipated number of permits that may be issued and the estimated costs of permitting are represented in Table 5-3. Currently, the Service estimates that there are 1,970 wind energy generation facilities either operating or under construction (USDOE 2021). USGS data shows a total of 70,808 turbines across the same area (Hoen et al. 2018). Therefore, for purposes of this analysis, we assume that the average wind project contains 36 turbines (70,808 turbines / 1,970 projects = 35.9 turbines per project). We further assume that approximately 85-90% of all wind energy projects would meet the criteria for a general permit under this Alternative. Without knowledge of all nest locations on the landscape, it is difficult to determine this percentage with high confidence. However, we anticipate that eligibility for general permits under this Alternative will be higher than under Alternatives 3 and 4. For this analysis, we assumed eligibility at the highest end of the estimated range – 90%. The remaining 10% of projects not eligible for general permits would need to apply for specific permits. Of the 90% of projects that would be eligible to apply for general permits, we conservatively estimate that 15% of those projects would apply. We expect a lag time between the permitting program being put in place and industry fully engaging with the program. Some firms may decide to act once the permitting program has been in place for several years and the impacts from entities getting a permit can be better understood, at the risk of enforcement discretion in the meantime. Some firms may also choose not to seek a permit at all and continue operating at the risk of enforcement discretion. Although we are proposing regulatory changes to specific permit requirements that are intended to increase the proportion of qualifying projects that apply for specific permits, the proposed general permit option will also be available to a large percentage of existing and future projects. Thus, many eligible wind projects that would have otherwise needed a specific permit are now likely to seek a general permit. Considering the likely effect of these changes to our permit regulations (one that may increase participation in specific permits and one that may decrease it), the Service expects a similar number of specific permits would be issued as have been issued under the existing permit framework.

Table 5-3. Alternative 2 – Anticipated Numbers of Permits Issued Over a Five-Year Permit Period

Type of Permit	Alternative 1: No Action (Existing)	Alternative 2: (New)	Change (increase in permits compared to Alt 1)
Wind Energy Project (General)	—	266	266
Wind Energy Project (Specific)	30	30	0
Nest Disturbance	479	479	0
Nest Take	198	198	0
Total Permits (Over 5 years)	**707**	**973**	**266**
Average Annual Permits	**141**	**195**	**53**

5.4.5.1 Financial Impacts to Permittees

Under Alternative 2, the GPP is expected to save significant time and money to applicants by streamlining the permitting process. The costs of the application fee and mitigation fees associated with a general permit are represented in Table 5-4. For wind energy projects, the permit application fee would be $1,000. The Service estimates that the cost to administer the GPP, including collecting information to inform future regulations and permitting, will be approximately $4 million every 5 years. Considering the expected GPP participation under this Alternative, we would require an administration fee of $3,000 for community-scale wind development and $12,000 for utility-scale wind development for the life of a 5-year general permit.

As described in Chapter 3, each permittee would be required to provide compensatory mitigation to offset the take of 2.4 golden eagles over 5 years (per project, regardless of size). This mitigation requirement would repeat with every new registration, generally on a 5-year basis. Based upon our $120,000 estimate for the compensatory mitigation of an eagle at a 1.2:1 ratio (see Section 4.7.1.1), this compensatory mitigation would cost a general permittee approximately $288,000 over the 5-year permit term. In addition to this mitigation, which is designed to offset take at the EMU scale, general permittees would also need to pay a general-permit, LAP-mitigation requirement of 0.04 golden eagles annually, or $4,800. This totals $24,000 over 5 years. Because existing staff at a permitted facility would likely implement fatality monitoring, we anticipate this cost would be negligible to permittees. Permittees would no longer need to conduct pre-application monitoring and project-specific fatality monitoring.

For specific permits, the application fee will be determined by the Tier that the applicant is eligible to apply under. Applications under Tier 1 will pay an application fee of $18,000 and an administration fee of $10,000 for a total cost of $28,000. Applications under Tier 2 will pay an application fee of $26,000 and an administration fee of $10,000 for a total cost of $36,000. Applications under Tier 2 with reimbursable agreement will pay the same total fees as under Tier 2 but would have an additional requirement to reimburse the Service for the costs of any additional project-specific analysis associated with permit application review. The monitoring is the same as that required under Alternative 1 and would be $1.1 million per project over a five-year period. As outlined under Alternative 1, we estimate that the cost to mitigate for golden eagles for a five-year permit term under Alternative 2 is approximately $960,000 per project. We calculated this amount in the same way as under Alternative 1 because we were unable to delineate a zone for specific permits under Alternative 2; thus, we were forced to use our nationwide priors as we did under Alternative 1. Compensatory mitigation for bald eagles would not typically be required.

The permit application fee for nest disturbance and nest take would be the same as under the No Action Alternative ($500 for noncommercial entities or $2,500 for commercial entities for up to five years).

Table 5-4. Alternative 2 – Proposed Fees and Costs to Permittees for Incidental Take Permits Over a Five-Year Permit Period

Type of Permit	Type of Fee/Cost	Basis and Requirements	Permittee Cost (over 5 years)
Wind Energy Project (General)	Permit Application Fee	Fee required for application for a permit	$1,000
	Administration Fee	Fee associated with the Service's administration of the permit	$3,000 (Distributed and Community-Scale)) $12,000 (Utility-Scale)
	Mitigation Fee	Flat fee to offset the take of golden eagles over 5 years applicable to all projects, regardless of size.	$312,000
	Average Monitoring Costs	Requirements such as pre-construction monitoring, preparation of eagle conservation plans, and certain reporting requirements will no longer be required. Fatality monitoring will be concurrent to other activities, and we expect costs would be negligible.	$0
	Total Cost Over 5 Years		**$316,000 (Distributed and Community-Scale)** **$325,000 (Utility-Scale)**
Wind Energy Project (Specific)	Permit Application Fee	Fee required for application for a permit	$18,000 (Tier 1) $26,000 (Tier 2)
	Administration Fee	Fee associated with the Service's administration of the permit	$10,000
	Mitigation Fee	Flat fee to offset the take of golden eagles over 5 years applicable to all projects, regardless of size.	$960,000
	Average Monitoring Costs	Project-level monitoring is required of all permittees.	$1,100,000
	Total Cost Over 5 Years		**$2,088,000 (Tier 1)** **$2,096,000 (Tier 2)**
Nest Disturbance	Permit Application Fee	$500 – Non-commercial/ $2,500 – Commercial	$500 - $2,500
	Other Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - $2,500**
Nest Take	Permit Application Fee	$500 – Non-commercial/ $2,500 – Commercial	$500 - $2,500

	Other Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - $2,500**

Total Costs Associated with Permits Under Alternative 2

The possible ranges (minimum to maximum) of total permit costs, including the variability of fees, range of values for mitigation costs, and representing the various types of permit applicants, are shown in Table 5-5.

Table 5-5. Alternative 2 – Estimated Permit Fee & Costs Over a Five-Year Permit Period

Type of Permit	**Application Fee[1]**	**Administration Fee[1]**	**Mitigation Fee**	**Average Monitoring Costs**	**Permit Count Estimate**	**Total Cost of Permits**	**Existing Cost of Permits**	**Marginal Change (Increase in Permit Costs Compared to Alt 1)**
Wind Energy Project (General)	$1,000	$12,000	$312,000	$0	266	$86,450,000	$0	$86,450,000
Wind Energy Project (Specific)	$26,000[2]	$10,000	$960,000	$1,100,000	30	$62,880,000	$63,120,000	($240,000)
Nest Disturbance	$2,500	$0	$0	$0	479	$1,197,500	$1,197,500	0
Nest Take	$2,500	$0	$0	$0	198	$495,000	$495,000	0
Total					**973**	**$151,022,500**	**$64,812,500**	**$86,210,000**

[1] In most cases, we assume the cost of the highest tier, where applicable.

[2] For wind energy specific permits, we assume the average project is a Tier 2 project.

Alternative 2 could disproportionately impact small businesses, as the administration fee, compensatory mitigation costs, and mitigation fees are all flat fees per project, and thus would represent a larger proportion of total revenue compared to a larger business. If small businesses chose not to apply for a permit, they would be more susceptible to future enforcement actions and associated enforcement costs.

5.4.5.2 Financial Impacts to the Service

Under Alternative 2, the Service would spend approximately the same amount of time and resources processing eagle take permits in the near term when compared to the other Alternatives. However, we expect this time would be dedicated to processing permits with higher risk to eagles or greater uncertainty surrounding that risk; thus, we expect the time spent

processing permits to result in greater benefits to eagles across all Action Alternatives. In the long run, as many interested parties on the landscape receive permits, there could be a reduction in the amount of permit applications received and a corresponding reduction in workload and cost to the Service.

As with the other Action Alternatives, the administration fee collected under each permit will be used by the Service to offset the costs of program administration. If the rate of permit applications is as expected, the financial impacts of program administration will be minimal. However, if fewer permit applications than expected are received, the Service would be required to find other sources of funding for program administration.

5.4.5.3 Societal Impacts

Under Alternative 2, the Service expects gains in eagle conservation from the increased number of permits issued and corresponding increases in compensatory mitigation compared to the No Action Alternative. However, we would still expect to issue fewer permits when compared to Alternatives 3 and 4. Table 5-6 shows the estimated eagle-offset credits that selecting Alternative 2 would provide based on the estimates of the number of projects that may apply for a permit.

Table 5-6. Alternative 2 – Estimated Eagle Offset Credits Over a Five-Year Permit Period

Activity	Average estimated eagle take reduction/offset	Number of affected entities	Eagle take offset credits
Wind Energy Project eagle offset credit (General)	2.4 eagles per project	197 projects	473
Wind Energy Project eagle offset credit (Specific)	5.5 eagles per project	30 projects	165
Wind Energy Project eagle offset credit (General LAP)	0.2 eagles per project	443 projects	89
Wind Energy Project eagle offset credit (Specific LAP)	0.2 eagles per project	30 projects	6

Note: Permits for nest disturbance and nest take will not typically require mitigation, so they are not included in this table.

The benefits to eagles under Alternative 2 would be greater than under the No Action Alternative. Correspondingly, the societal benefits of eagles described in Section 4.7 would be increased under Alternative 2 when compared to the No Action Alternative. However, societal benefits would be lower than under Alternatives 3 and 4.

5.5 Alternative 3 – General Permits Available for Wind Energy Facilities; Eligibility Based on Relative Abundance and Distance from Nests; Mitigation Fee Based on Hazardous Area

5.5.1 Bald and Golden Eagles

General permits are structured to require less administrative work and Service-staff review and are expected to have reduced mitigation and monitoring requirements compared to specific permits, resulting in reduced costs and much faster processing for applicants than for specific permits (see *Monitoring Considerations*, Appendix A). For these reasons, implementation of Alternative 3 would likely result in an increase in permit applications and a corresponding increase in the number of projects operating in compliance with the Eagle Act compared to the No Action Alternative. The breadth of activities covered under general permits in Alternative 3 (wind energy facilities only) is the same as Alternative 2 but narrower than Alternative 4 (wind energy facilities, power line entities, activities likely to cause nest disturbance, and nest take or nest removal activities). Because the mitigation requirement will be scaled by hazardous area under Alternative 3, and thus equitable regardless of project size, projects of all sizes are expected to apply for permits. This could disincentivize lower-risk projects from applying for a general permit if they determine fees are not worth paying when compared to their perceived liability risk, but that effect is expected to be lower than the potential disincentive for small projects discussed under Alternative 2. In sum, the Service expects Alternative 3 to result in more permit applications than the No Action Alternative or Alternative 2 and a reduced number of permit applications compared to Alternative 4.

Because each permit under Alternative 3 would include additional A&M measures for eagles at each permitted project, the Service expects the potential increase in permit applications to result in decreased eagle take. Thus, Alternative 3 would likely reduce actual eagle take compared to the No Action Alternative and Alternative 2 and increase actual eagle take compared to Alternative 4. Each permit would also include a fee for mitigation. The expected increase in permit applications would likely result in greater implementation of compensatory mitigation for eagle take at wind energy facilities under Alternative 3 than under the No Action Alternative or Alternative 2. However, we expect Alternative 3 to result in fewer applications than Alternative 4 and thus less implementation of compensatory mitigation overall.

The purpose of the general permit framework under Alternative 3 is to increase efficiency in permitting and increase participation in the program; however, we do not expect it to affect the number of new wind energy facilities on the landscape. Because general permits under Alternative 3 are available only in areas with relatively low ERA, the proportion of newly constructed wind energy facilities may increase over time in those areas and the proportion of newly constructed wind energy facilities in areas with high ERA may decline. Under Alternative 3, eagle take at newly constructed wind farms should, therefore, occur at a lower rate than at existing facilities or newly constructed facilities under the No Action Alternative or Alternative 2. We predict this effect will have a minor to moderate, but not significant, effect on local and regional eagle populations beginning approximately 2 years after the regulations are implemented, allowing for the time needed to plan and permit a new wind energy facility.

Under Alternatives 3 and 4, new general permits would be available primarily to projects in areas characterized by ERA values less than the values in Table 3-2 and where all existing or proposed

turbines are or will be located > 660 feet and > 2 miles from a known bald and golden eagle nest, respectively. All wind projects that qualify for and receive a general permit may retain their eligibility for general permits regardless of future changes in ERA thresholds and nest locations. These restrictions provide certainty for project proponents, while making projects that are expected to have a higher risk to eagles ineligible for general permits. We expect that fewer high-risk projects will be covered by general permits and overall eagle take will be lower under Alternatives 3 and 4 than under Alternative 2. Uncertainty about eagle impacts may be greater for individual projects under general permits than under the No Action Alternative (see Section 5.3.1). Despite potential uncertainty at the project scale, the preservation standard requires both maintaining stable or increasing breeding populations in all EMUs and persistence of LAPs throughout the geographic range of each species. Therefore, we analyzed impacts at the two scales identified in the preservation standard, the EMU and LAP. That analysis is detailed in Appendix A and summarized here.

We first analyzed the proposed GPP for wind energy facilities, which is a component of all Action Alternatives, at the EMU scale. The Service analyzed all existing turbines that qualify for general permits based on ERA eligibility criteria for Alternatives 3 and 4 (Appendix A). For the analyses of the effects of issuing general permits on bald and golden eagles, we developed prior distributions ("priors") for species-specific eagle exposure for the general permit zone and the specific permit zone (Figure 3-1; delineated by ERA) for each species using all qualifying data in the Service's possession (see Attachment 1 of Appendix A). We used the Service's CRM to estimate the fatality probability distributions for hypothetical "average" wind energy projects in the general and specific permit zones and produced fatality probability distributions for all known turbines within the general and specific permit zones in each bald or golden eagle EMU (USFWS 2021d). Table 5-7 (bald eagles) and Table 5-8 (golden eagles) below summarize the Service's analysis and provide conservative fatality estimates (60^{th} quantile for bald eagles and 80^{th} quantile for golden eagles). It is noteworthy that our analysis produced substantially decreased fatality estimates per project in the general permit zone and increased fatality estimates per project in the specific permit zone when compared to the nationwide prior that has been used previously. This expected effect is a result of the construction of new exposure priors for each zone, which effectively split out the highest eagle abundance areas from the rest of the U.S. Data from projects in areas with lower eagle abundance were used to build a species-specific prior for the general permit zone. We expected estimates produced from that prior to be lower than in the specific permit zone. Conversely, data from projects in areas with relatively high eagle abundance were used to build the prior for the specific permit zone. We expected estimates produced from that prior to be higher than the general permit estimates. We do not know where all existing nest locations are or will be on the landscape; therefore, more turbines than anticipated may not qualify for general permits. The estimates in Appendix A and Table 5-7 and Table 5-8 may overestimate take resulting from general permits in each EMU, and underestimate take resulting from specific permits in each EMU. With this in mind, we have increased confidence that authorized take will remain under the framework established by the 2016 PEIS and will not have a significant impact on bald or golden eagle populations.

Table 5-7. Bald eagle take estimates (eagles per year, 60th quantile reported) for all existing turbines that meet ERA eligibility criteria for general permits under Alternatives 3 and 4, and all turbines that are not eligible (specific permits).

EMU	EMU Take Limit	General Permit Fatality Estimate (eagles per year)	Specific Permit Fatality Estimate (eagles per year)
Atlantic	4,223	16	18
Mississippi	7,986	114	16
Central	1,521	103	33
Pacific - North	2,102	14	21
Pacific - South	15	4	6
Total	15,847	251	94

Table 5-8. Golden eagle take estimates (eagles per year, 80th quantile reported) for all turbines that meet ERA eligibility criteria for general permits under Alternatives 3 and 4, and all turbines that are not eligible (specific permits).

EMU	EMU Take Limit	General Permit Fatality Estimate (eagles per year)	Specific Permit Fatality Estimate (eagles per year)
Atlantic / Mississippi	0	24	3
Central	0	53	452
Pacific	0	10	354
Total	0	87	809

For bald eagles, take estimates for general permits would not exceed EMU take limits in any EMU, under any Action Alternative. Thus, without considering future increases in the number of wind turbines on the landscape or future increases in demand for eagle take permits from other activity types, we conservatively estimate that authorized bald eagle take from all general permits will be well within our established EMU take limits in every EMU and, thus, consistent with our preservation standard. Because none of the estimated take levels even approach the EMU take limits for bald eagles, the Service anticipates that, even allowing for an increased number of wind turbines on the landscape and permitted take from other activities, GPPs for wind energy facilities as described in Alternatives 3 and 4 can be implemented consistent with our preservation standard for bald eagles. It is noteworthy that estimated take from general permits for wind energy facilities is 27% of the EMU take limits in the Pacific - South EMU (Table 5-7). For this EMU, if general permits were issued to cover every wind turbine eligible, there would only be 11 eagles remaining under the EMU take limit.

For golden eagles, all EMU-specific take estimates exceed the EMU take limits, which are set at zero for the species (Table 5-8). However, we require all golden eagle take for projects under

general permits to be offset with compensatory mitigation at a minimum ratio of 1.2:1. Thus, even when assuming an increased number of wind turbines on the landscape and other permitted take from other activities (all of which will also require compensatory mitigation at a ratio of ≥1.2:1 for golden eagles), GPPs for wind energy facilities as described under Alternatives 3 and 4 can be implemented consistent with our preservation standard for golden eagles. Of course, there is a danger that the Service has underestimated take that will arise from the GPP under Alternatives 3 and 4. If our estimations were underestimates, there would be a concern that we are not requiring enough compensatory mitigation for projects that qualify for general permits. We reduced the risk of our compensatory mitigation rate being too small by setting the nationwide fatality estimates for general permits at the 80th quantile. By using this conservative estimate, we significantly reduce the risk of insufficient mitigation for authorized take. If, through fatality monitoring, the Service concludes that more take is occurring under general permits than has been mitigated for, we will temporarily or indefinitely suspend the GPP for wind energy facilities. Under specific permits, the Service will analyze take at the EMU and LAP scale and make decisions pre-permit issuance that are consistent with our preservation standard for golden eagles.

At the LAP scale, we analyzed hypothetical "average" wind energy projects to evaluate theoretical limits to the number of projects that could be authorized in direct proximity to one another within the general permit zone before LAP thresholds (9% or 7% of the LAP, for bald eagles and golden eagles, respectively) could be exceeded (Appendix A). The number of typical 100-turbine projects with overlapping LAPs in the general permit zone that would trigger 7% or 9% LAP thresholds by EMU for golden and bald eagles, respectively, far exceed what the Service anticipates under enrollment scenarios considered in this EA.

The number of projects with overlapping LAPs in the general-permit zone that would trigger LAP thresholds by EMU for golden and bald eagles are presented in Appendix A. For 4 of 6 EMUs, more than 300 "average" projects with a combined estimated take >120 bald eagles would be necessary to exceed the bald eagle LAP thresholds, indicating that many general permits could be issued in those EMUs without creating concerns for bald eagles at the LAP scale and remaining consistent with the preservation standard. Bald eagle LAP thresholds could be triggered with fewer projects and less authorized take for the Central Flyway EMU and Pacific - South EMU (Appendix A). Compensatory mitigation to offset LAP impacts for bald eagle take is more likely to be necessary in those EMUs for general permits to maintain consistency with our preservation standard. For golden eagles, the LAP threshold for 5 of 14 LAP density units could be exceeded by fewer than 50 projects (Appendix A). Overall, LAP thresholds are more likely to be exceeded for golden eagles than for bald eagles given population densities for each species. Siting of compensatory mitigation for golden-eagle take under general permits may need to take LAP-scale impacts into account to maintain consistency with the preservation standard.

5.5.2 Migratory Birds

As described in Section 5.5.1, the Service expects Alternative 3 to result in more permit applications than the No Action Alternative or Alternative 2 and a reduced number of permit applications compared to Alternative 4. Each permit includes a fee for monitoring and mitigation. Because of the overall increase in expected permit applications, compensatory mitigation for eagle take at wind energy facilities would be greater under Alternative 3 than

under the No Action Alternative or Alternative 2 and less than under Alternative 4. By basing fees on the hazardous area of projects, mitigation funds would be less influenced by the number of permit applications received than under Alternative 2.

Under Alternative 3, the Service would develop standard A&M measures for permitted activities under the GPP. There is a range of possible A&M measures, and their effect on migratory birds could be beneficial (e.g., removing carcasses from a wind farm could reduce crow mortalities from turbine collisions), neutral (e.g., retrofitting power poles would have no effect on birds too small to risk electrocution) or detrimental (e.g., removing vegetation to discourage bird activity near a hazard would reduce overall habitat available). Because the Service will select A&M measures designed to minimize detrimental effects on eagles, we expect that A&M measures for GPPs will have a neutral or slightly positive impact on migratory birds overall. This is because these measures would likely have a net positive impact on migratory birds, particularly raptors with similar characteristics to eagles. Because we expect Alternative 3 would result in the implementation of A&M measures for more activities than the No Action Alternative or Alternative 2, it would produce greater positive impacts on migratory birds than the No Action Alternative or Alternative 2, but less than Alternatives 4, which should result in implementation of A&M measures at more projects.

Mitigation funds would be administered by a Service-approved ILF. Although we cannot anticipate how many ILF programs will ultimately be developed, two currently available ILFs mitigate eagle take through retrofitting power poles to prevent electrocutions. Increasing the number of permitted projects will increase the mitigation funds available to these ILFs, which would result in retrofitting more power poles and reducing mortalities of eagles and other large-bodied birds that use power poles as nesting sites, roosts, or perches (likely raptors, vultures, and corvids). We also anticipate that one or more future ILF programs may mitigate eagle take through programs to reduce lead ammunition left on the landscape. Creating one or more ILFs to reduce lead that is available for uptake into food chains would result in a reduction of mortalities to other animals that scavenge gut piles (likely vultures, raptors, corvids, and mammals including rodents and canids). Some potential forms of mitigation focused on eagles (such as habitat modification) could have adverse impacts to some migratory birds and migratory bird habitats, but the effects are more likely to be moderately beneficial overall. We therefore expect that compensatory mitigation for eagle take under Alternative 3 would result in a moderate reduction of migratory bird take compared to Alternative 2, and potentially a significant reduction for some species, such as raptors, vultures, and corvids, compared to the No Action Alternative. We expect that this reduction of migratory bird take would be similar under Alternative 3 than under Alternative 4, where we expect implementation of a comparable amount of compensatory mitigation.

5.5.3 Federally Endangered and Threatened Species

See description of environmental consequences in Section 5.3.3.

5.5.4 Tribal Traditional Uses, Religious Concerns, and Cultural Resources

See description of environmental consequences in Section 5.3.4.

For reasons described in Section 5.5.1, the Service expects Alternative 3 to result in more issued permits than the No Action Alternative or Alternative 2 and a reduced number of permit

applications and issued permits compared to Alternative 4. Because each permit issued under the GPP will include A&M measures for eagles that would not have been required outside of the permit process, the Service expects any increase in the number of permits issued under Alternative 3 would reduce eagle take at wind energy facilities compared to the No Action Alternative and Alternative 2 (although Alternative 4 would have a greater reduction). The Service also anticipates that the overall increase in permit applications expected under Alternative 3 will increase the amount of compensatory mitigation for eagle take and therefore eagle take will decrease compared to the No Action Alternative and Alternative 2. This increased compensatory mitigation would reduce eagle take under Alternative 3 compared to the No Action Alternative and Alternative 2 (although Alternative 4 would have a greater reduction in overall eagle take). We anticipate that reduced eagle take would also decrease the magnitude of detrimental impacts on Native American tribes or individuals for whom eagles are central to cultural or spiritual values. Similarly, reduced eagle take may mitigate adverse effects on those who perceive the concept of authorizing eagle take as offensive and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation.

An overall increase in permit applications would also result in increased eagle fatality monitoring at wind energy facilities under Alternative 3 compared to the No Action Alternative or Alternative 2 (although Alternative 4 would result in a greater increase). Eagle remains found at facilities permitted under GPPs must be sent to the Service's NER and, if in good condition, distributed to permitted members of federally recognized Tribes and made available for cultural practices and ceremonies. Under Alternative 3, the Service expects that more eagle remains will be found during monitoring and sent to the NER as compared to the No Action Alternative or Alternative 2 (although less than under Alternative 4), resulting in an average decrease in the wait times for Tribal members to receive eagle parts and feathers for religious and cultural use. Again, it is important to note that any increase in eagles supplied to the repository would not be the result of an increase in eagle take from implementing the Action Alternatives, but instead the result of an increase in mortality monitoring at more projects operating under permits.

The Service does not anticipate that any of the Action Alternatives discussed in this EA will impact historic resources as defined under NHPA (described in detail in Section 5.3.4).

5.5.5 Socioeconomics

Under Alternative 3, the anticipated number of permits and the estimated costs of permitting are represented in Table 5-9. Currently, the Service estimates that there are 1,970 wind energy generation facilities either operating or under construction (USDOE 2021). USGS data shows a total of 70,808 turbines in the same general area (Hoen et al. 2018). Therefore, for purposes of this analysis, we assume that the average wind project contains 36 turbines (70,808 turbines / 1,970 projects = 35.9 turbines per project). For purposes of this analysis the Service estimates that 75% of all wind energy projects meet the criteria for a general permit. A project would be eligible for a new general permit if it meets relative abundance thresholds. Of the 75% of wind energy projects that would be eligible for general permits, we assume 25% of eligible projects will apply. The remaining 25% of projects that do not meet the general-permit criteria would meet the specific-permit criteria. The Service expects to issue a similar number of specific permits under Alternative 3 as have been issued under the existing framework. While many wind-energy projects that would have applied for a specific permit under the current framework would be eligible for a general permit under Alternative 3, projects that may not have applied at

all but are not eligible for a general permit may choose to apply for a specific permit based on the changes intended to streamline specific-permit issuance.

Table 5-9. Alternative 3 – Anticipated Numbers of Permits Issued Over a Five-Year Permit Period

Type of Permit	Alternative 1: No Action (Existing)	Alternative 3: (New)	Change (increase in permits compared to Alt 1)
Wind Energy (General)	—	369	369
Wind Energy (Specific)	30	30	0
Nest Disturbance	479	479	0
Nest Take	198	198	0
Total Permits (Over 5 Years)	**707**	**1,076**	**369**
Average Annual Permits	**141**	**215**	**74**

5.5.5.1 Financial Impacts to Permittees

Under Alternative 3, the GPP is expected to save significant time and money for qualifying applicants by streamlining the permitting process relative to the No Action Alternative. The costs of the permit application fee and mitigation fee associated with a general permit are represented in Table 5-10. For wind energy projects, the permit application fee would be $1,000. The Service estimates that the cost to administer a general permit program (including collecting information to inform future regulations and permitting) will be approximately $4 million every 5 years. Considering the expected GPP participation under this Alternative, we would require an administration fee of $2,500 for community-scale wind development and $10,000 for utility-scale wind development for the life of a 5-year general permit.

Each permittee would provide compensatory mitigation to offset the take of eagles at the rates (per km^3), described in Table 3-3. Under Alternative 3, we estimate an average general permit will authorize and require compensatory mitigation for approximately 0.25 golden eagles for every five-year permit. In addition, an average general permit will require compensatory mitigation for approximately 0.07 additional eagles to offset take at the LAP scale for every five-year permit. When summed, we calculate that an average general permit will require compensatory mitigation for approximately 0.31 eagles. We calculated these numbers in the same manner we calculated compensatory mitigation requirements in Section 3.4.4.4. For this analysis, however, we used nationwide take-rate estimates, rather than basing them off the golden eagle EMUs. Specifically, we took the nationwide, estimated annual fatality rate (per hazardous volume) in the general permit zone (see Table 5 in Appendix A), and multiplied it by the hazardous volume occupied by a 36-turbine project. Based upon our estimate of $120,000 to provide compensatory mitigation for one eagle at a 1.2:1 ratio (see Section 4.7.1.1), this compensatory mitigation would cost a permittee approximately $37,200 over the life of a 5-year permit. These mitigation requirements would repeat with every new registration. Since permitted facilities are likely to implement concurrent fatality monitoring using existing staff, this cost

should be negligible to permittees. Permittees would no longer need to conduct pre-application monitoring and project-specific fatality monitoring.

As under Alternative 2, for specific permits, the permit application fee and administration fee will be determined by the relevant application Tier. Applications under Tier 1 will pay an application fee of $18,000 and an administration fee of $10,000 for a total cost of $28,000. Applications under Tier 2 will pay an application fee of $26,000 and an administration fee of $10,000 for a total cost of $36,000. Applications under Tier 2 with reimbursable agreement will pay the same total fees as under Tier 2 but would also have to reimburse the Service for the costs of any additional project-specific analysis associated with permit application review. We estimate the cost of a Tier 2 with reimbursable agreement permit will average $82,000. The average permit would likely be a Tier 2 permit. The monitoring would be the same as expected under Alternative 1 - $1.1 million per project over a five-year period. Based on expected take rates (per km^3) derived using the CRM with priors applicable to specific permits, we estimate that an average (36 turbine) project receiving a specific permit will take 1.8 golden eagles annually or 9 golden eagles over five years. We derived this estimate from the expected take rates per hazardous volume (Appendix A). At a rate of $120,000 per eagle, we estimate the cost to mitigate for that many golden eagles for a five-year permit term would be $1,080,000 per project. Compensatory mitigation for bald eagles would not typically be required.

The permit application fee for nest disturbance and nest take would be the same as under the No Action Alternative ($500 for noncommercial entities or $2,500 for commercial entities for up to five years).

Table 5-10. Alternative 3 – Proposed Fees and Costs to Permittees for Incidental Take Permits Over a Five-Year Permit Period.

Type of Permit	Type of Fee/Cost	Requirements	Permittee Cost (over 5 years)
Wind Energy Project (General)	Permit Application Fee	Cost to apply for a permit	$1,000
	Administration Fee	Fee associated with the Service's administration of the permit	$2,500 (Distributed and Community-Scale) $10,000 (Utility-Scale)
	Average Compensatory Mitigation Costs	Cost to offset the take of bald and golden eagles	$37,200
	Average Monitoring Costs	Requirements such as pre-construction monitoring, preparation of eagle conservation plans, and certain reporting requirements will no longer be required. Fatality monitoring will be concurrent to other activities, and we expect costs would be negligible.	$0
	Total Cost Over 5 Years		**$40,700 (Distributed and Community-Scale)**

			$48,200 (Utility-Scale)
Wind Energy Project (Specific)	Permit Application Fee	Cost to apply for a permit, and fee for permit review	$18,000 (Tier 1) $26,000 (Tier 2) $82,000 (Tier 2 with reimbursable agreement)
	Administration Fee	Fee associated with the Service's administration of the permit	$10,000
	Average Compensatory Mitigation Costs	Compensation for anticipated take of eagles	$1,080,000
	Average Monitoring Costs	Project-level monitoring is required of all permittees.	$1,100,000
	Total Cost Over 5 Years		**$2,208,000 (Tier 1)** **$2,216,000 (Tier 2)** **$2,272,000 (Tier 2 with reimbursable agreement)**
Nest Disturbance	Permit Application Fee	$500 – Non-commercial/ $2,500 – Commercial	$500 - $2,500
	Other Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - $2,500**
Nest Take	Permit Application Fee	$500 – Non-commercial/ $2,500 – Commercial	$500 - $2,500
	Other Mitigation Requirements	No additional costs or fees required	$0
	Total Cost Over 5 Years		**$500 - $2,500**

Total Costs Associated with Permits Under Alternative 3

The estimated total permit costs including the variability of fees, range of values for mitigation costs, and representing the various types of permit applicants, are shown in Table 5-11.

Table 5-11. Alternative 3 – Estimated Permit Fees and Mitigation Costs Over a Five-Year Permit Period

Type of Permit	**Application Fee[1]**	**Administration Fee[1]**	**Average Compensatory Mitigation Costs**	**Average Monitoring Costs**	**Permit Count Estimate**	**Total Cost of Permits**	**Existing Cost of Permits**	**Marginal Change (Increase in Permit Costs Compared to Alt 1)**
Wind Energy (General)	$1,000	$10,000	$37,200	$0	369	$17,785,800	$0	$17,785,800

Wind Energy (Specific)	$26,000[2]	$10,000	$1,080,000	$1,100,000	30	$66,480,000	$63,120,000	$3,360,000
Nest Disturbance	$2,500	$0	$0	$0	479	$1,197,500	$1,197,500	$0
Nest Take	$2,500	$0	$0	$0	198	$495,000	$495,000	$0
Total					**1,076**	**$85,958,300**	**$64,812,500**	**$21,145,800**

[1] In most cases, we assume the cost of the highest tier, where applicable.

[2] For wind energy specific permits, we assume the average project to be a Tier 2 project.

Because the compensatory mitigation requirements associated with a wind energy general permit under Alternative 3 are not based upon a flat fee but upon a calculation of the anticipated take of eagles, it is less likely that Alternative 3 would disproportionately impact small businesses. However, the relative cost of permitting would likely remain a larger proportion of total revenue compared with a larger business. If small businesses chose not to apply for a permit, they would be susceptible to future enforcement actions and associated enforcement costs.

5.5.5.2 Financial Impacts to the Service

Under Alternative 3, we expect that the Service will spend approximately the same amount of time and resources processing eagle take permits in the near term when compared to the other Alternatives because we expect the number of specific permit applications to remain fairly constant. However, we expect this time to be dedicated to processing permits for activities that present a higher risk to eagles or greater uncertainty surrounding that risk; thus, that time should result in greater benefits to eagles across all Action Alternatives. In addition, many more projects would be authorized under general permits, which require little additional processing time and resources. Thus, the additional conservation benefits accruing to eagles from many more projects being authorized under permits requiring implementation of mitigation measures would come with little additional administrative cost to the Service. In the long run, as many interested parties on the landscape receive permits, there could be a reduction in the amount of specific-permit applications received and a corresponding reduction in workload and cost to the Service.

As with the other Action Alternatives, the administration fee collected under each permit will be used by the Service to offset the costs of program administration. If the rate of permit applications is as expected, the financial impacts of program administration will be minimal. However, if fewer permit applications than expected are received, the Service would be required to find other sources of funding for program administration.

5.5.5.3 Societal Impacts

Under Alternative 3, gains in eagle conservation from increased numbers of projects with permits and the corresponding increases in compensatory mitigation would be greater than under the No Action Alternative and Alternative 2. However, we still expect fewer total permits issued compared to Alternative 4. The estimated eagle-offset credits provided under this Alternative,

based on the estimated number of projects that would apply for a permit, are shown in Table 5-12.

Table 5-12. Alternative 3 – Estimated Eagle Offset Credits Over a Five-Year Permit Period

Activity	Average estimated eagle take reduction/offset	Number of affected entities	Eagle offset credits (range)
Wind Energy Project eagle offset credit (General)	0.4 eagles per project	273 projects	109
Wind Energy Project eagle offset credit (Specific)	12 eagles per project	30 projects	360
Wind Energy Project eagle offset credit (General LAP)	0.09 eagles per project	369 projects	33
Wind Energy Project eagle offset credit (Specific LAP)	0.09 eagles per project	30 projects	3

Note: Permits for nest disturbance and nest take will not require mitigation, so they are not included in this table.

The benefits to eagles under Alternative 3 are likely to be greater, perhaps substantially, than under the No Action Alternative and Alternative 2. Correspondingly, the societal benefits of eagles described in Section 4.7 would be higher under this Alternative than under the No Action Alternative and Alternative 2 and lower when compared to Alternative 4.

5.6 Alternative 4 – Implement Alternative 3 for Wind Energy Facilities; Create Additional General Permits for Power Line Entities, Activities Likely to Cause Nest Disturbance, and Nest Take Activities

5.6.1 Bald and Golden Eagles

5.6.1.1 All Permits

General permits are structured to require less administrative work and Service-staff review and would have reduced mitigation and monitoring requirements compared to specific permits, which results in reduced costs and much faster processing for applicants than for specific permits (see *Monitoring Considerations*, Appendix A). For these reasons, the Service anticipates that Alternative 4 will result in an increase in permit applications compared to the No Action Alternative. The breadth of activities that can be covered under general permits in Alternative 4 (wind energy facilities, power line entities, activities likely to cause nest disturbance, and nest take activities) is greater than for Alternatives 2, 3, and the No Action Alternative. The Service anticipates increases in permit applications received from wind energy facilities (discussed under Section 5.5.1) and power line entities under this Alternative. There may also be small increases in applications for nest disturbance or nest take permits because general permits would be available for those activities under this Alternative. All general and specific permits issued under Alternative 4, especially for wind energy facilities and for power line entities, would require A&M measures that would reduce (likely substantially for power line entities) existing take on

the landscape. Additionally, permits would require compensatory mitigation if necessary to ensure that take of eagles is consistent with our preservation standard. Thus, we expect a net benefit to eagles from increased participation in the eagle-permit program. This benefit is likely to be greater under Alternative 4 than under all other Alternatives described. Environmental consequences from unique aspects of each GPP proposed under Alternative 4 are discussed below. Overall, we do not expect implementation of Alternative 4 will have a significant impact on the environment and it will likely have greater positive impacts than the other Action Alternatives for reasons explained below.

5.6.1.2 Wind Energy Facilities GPP

The Service expects that impacts to eagles from the wind energy GPP under Alternative 4 will be similar to those described under Alternative 3 in Section 5.5.1. However, under Alternative 4, the Service anticipates an increased ability to process specific permits for wind energy facilities at a level not anticipated under Alternatives 2 or 3 or under the No Action Alternative. This is because we anticipate that the addition of GPPs for nest disturbance and nest take will result in significant time savings for the limited number of Service staff processing eagle take permits, leaving more time for Service staff to focus on review of permit applications for specific permits for all activities and significantly reducing permit processing time for applicants. This should result in decreased review times and increase rates of specific permit applications under Alternative 4, which we anticipate will result in benefits to both eagle species that would not occur under the other Alternatives.

5.6.1.3 Power Line Entities GPP

Current participation in long-term eagle take permitting by power line entities is limited. To date, the Service has received two applications for long-term eagle take authorization from power line entities (one has been requested under a Section 10 Habitat Conservation Plan (HCP)). The Service's goal in introducing a GPP for power line entities under Alternative 4 is to catalyze increased participation in the Service's eagle-take permitting program. Because power line entities have the knowledge and ability to substantially reduce eagle take rates caused by their infrastructure, especially electrocutions, the GPP we are proposing for power line entities differs from the GPP for wind energy facilities. Under general permits for power line entities, every permittee would implement standard conditions intended to limit new impacts on eagles and reduce existing impacts on eagles. Recent estimates suggest that approximately 506 golden eagles die from electrocution each year. Additionally, estimates suggest that approximately 611 golden eagles die from collisions, some of those collisions are with power line infrastructure (Table 4-3). If participation in the proposed GPP for power line entities is moderate to high, we anticipate that general permits will result in a substantial reduction in eagle mortality. Even limited participation in the GPP would provide at least a moderate net benefit to eagles over the current non-participation in our permit program as reflected in the No Action Alternative.

Additionally, general permits for power line entities would come with a standard condition to develop a plan and take actions to identify and respond to mortality on power line infrastructure from unlawful shooting of protected birds (including eagles). This source of mortality is one of the leading sources of anthropogenic mortality for golden eagles (Millsap et al. 2022; Table 4-3) and, to-date, has been difficult to address with our limited law enforcement resources. However,

we anticipate that, with the cooperation of utilities, small to moderate gains in eagle conservation may be achieved by reducing levels of unlawful shooting where it is a problem.

5.6.1.4 Activities Likely to Cause Nest Disturbance GPP

The introduction of a GPP for activities that are likely to cause nest disturbance is primarily for the benefit of applicants and permittees and for the benefit of the Service. Because the Service has learned what types of permit conditions are typically practicable, effective in reducing the potential for disturbance, and relatively easy to implement for certain activity types, we conclude that general permits issued under this GPP would likely have similar benefits to eagle populations as the permits we would issue for the same activity types under Alternatives 2 and 3, and under the No Action Alternative. As previously mentioned, however, a more streamlined and efficient permitting process for a subset of our commonly permitted activities using a GPP would free up Service time and resources to spend on processing permit applications for specific permits that may pose a higher or more uncertain risk to eagles.

Under the proposed GPP for nest disturbance permits, we would only issue general permits for activities likely to disturb bald eagle nests. Activities likely to disturb golden eagle nests would still require a specific permit. Because EMU take limits are not typically in danger of being exceeded from nest disturbance permits, the issuance of general permits under this GPP would be consistent with EMU management objectives. It is more typical, although still not common, for take authorized under nest disturbance permits to approach LAP thresholds. The Service proposes to institute several policies that will help avoid impacts to eagles at the LAP scale. Although compensatory mitigation will not be required for general permits for activities likely to cause nest disturbance, the Service may elect to require compensatory mitigation for specific permits within the project-specific LAP if necessary to remain consistent with the preservation standard.

The Service will meet with ILF programs annually to direct compensatory mitigation funds to areas where cumulative authorized take may approach or exceed levels of concern. The Service also proposes to reduce the amount of take that will be debited from LAP take thresholds in most of the country (except the southwest; see Section 3.2.2) because a recent analysis of monitoring reports required under past nest disturbance permits has revealed that nest disturbance only occurred in approximately 19.5% of the permits issued for bald eagle nest disturbance nationwide (see Attachment 3 in Appendix A). This data effectively updates the observed nationwide bald eagle take rate under nest disturbance permits from an assumed 1.33 bald eagles per year to 0.26 bald eagles per year. We can more accurately account for the impacts of our nest disturbance permits (general or specific) in the respective EMU and LAP by using this observed rate of take. This, in turn, reduces our concern that take authorized under nest-disturbance permits could impact bald eagle populations at the LAP scale.

5.6.1.5 Nest Take Activities GPP

The introduction of a GPP for nest take activities would likely have similar effects on eagles to those described for nest disturbance immediately above. Most notably, a more streamlined and efficient permitting process for nest take would free up Service time and resources to spend on processing permit applications for specific permits (for nest take or otherwise) that may pose a

higher or more uncertain risk to eagles. However, because we do not have information to update the debit amount for nest take, the Service would not alter the amount of take debited from EMU take limits and LAP thresholds like we would for nest disturbance permits under this Alternative. Thus, we would continue to debit take at 1.33 bald eagles per year. The Service may update this to reflect observed rates if information collected over time suggests it is appropriate to do so.

5.6.2 Migratory Birds

As described in Section 5.6.1, the Service predicts that implementation of Alternative 4 will result in an overall increase in permits issued compared to the No Action Alternative, Alternative 2, or Alternative 3.

Under Alternative 4, the Service would develop standard A&M measures required for permitted activities under the GPP. There is a range of possible A&M measures, and their effect on migratory birds could be beneficial (e.g., removing carcasses from a wind farm could reduce crow mortalities from turbine collisions), neutral (e.g., retrofitting power poles would have no effect on birds too small to risk electrocution) or detrimental (e.g., removing vegetation to discourage bird activity near a hazard would reduce overall habitat available). Because the Service will select A&M measures with the goal of minimizing detrimental effects to eagles, we expect that A&M measures for GPPs will have a neutral or slightly positive impact on migratory birds overall. By including GPPs for activities other than wind energy facilities, we expect Alternative 4 would result in a greater number and variety of A&M measures required of permittees due to the greater diversity of permitted activities. A&M measures for power line entities will include power pole and substation retrofits, which we expect would reduce mortalities for other large-bodied birds that use power poles or substations as nesting sites, roosts, or perches (likely raptors, vultures, and corvids). We expect the increased A&M measures under Alternative 4 would result in a reduction in migratory bird take compared to the No Action Alternative or Alternatives 2 or 3.

Because none of the additional GPPs will require compensatory mitigation (any that do will require a specific permit), we expect compensatory mitigation for eagle take under Alternative 4 to be the same as analyzed under Alternative 3. Therefore, we expect that compensatory mitigation for eagle take under Alternative 4 would result in a similar reduction of migratory bird take compared to Alternative 3, and potentially a significant reduction for some species, such as raptors, vultures, and corvids, compared to the No Action Alternative and Alternative 2. However, because we expect Alternative 4 would result in the greatest amount of A&M, it would also result in a greater reduction in migratory bird take, and benefits to migratory birds, compared to all other Alternatives and, therefore, would not have a significant impact on migratory-bird resources.

5.6.3 Federally Endangered and Threatened Species

Considering the three additional general permit types included under this Alternative, we believe that the environmental consequences for listed species are the same as those described as common to all Alternatives. Thus, see the description of environmental consequences in Section 5.3.3.

5.6.4 Tribal Traditional Uses, Religious Concerns, and Cultural Resources

See description of environmental consequences in Section 5.3.4.

For reasons described in Section 5.6.1.1, the Service expects Alternative 4 to result in more permit applications and issued permits than under all other Alternatives described. Because each permit issued under a GPP will include A&M measures for eagles that would not have been required outside of the permit process, we expect a reduction of eagle take and a net benefit to eagles from increased participation in the eagle permit program. A reduction in eagle take would also decrease the magnitude of detrimental impacts on Native American Tribes or individuals for whom eagles are central to cultural or spiritual values. Similarly, reduced eagle take may also reduce adverse effects on those who perceive the concept of authorizing eagle take as offensive and inconsistent with values they hold related to cultural beliefs, patriotism, or conservation.

Monitoring for eagle fatalities at wind facilities under Alternative 4 will be the same as under Alternative 3. Under Alternative 4, additional monitoring will be required to some extent for the three additional GPPs. Specifically, power line entities will be required to pay an administration fee to document long-term trends in eagle mortality. The Service anticipates that, because of additional administration funds contributed through the GPP for power line entities, there will be an improvement in the Service's ability to monitor eagle mortality rates across the landscape, and a slight improvement in the rates of discovery of eagle fatalities (from many sources) compared to all other Alternatives. As with Alternative 3, eagle remains found at permitted projects must be sent to the Service's NER and, if in good condition, distributed to permitted members of federally recognized Tribes and made available for cultural practices and ceremonies. Under Alternative 4, the Service expects that more eagle remains will be found during monitoring and sent to the NER as compared to the No Action Alternative or Alternative 2, and slightly greater numbers of eagle remains will be found compared to Alternative 3. As under Alternative 3, this would result in an average decrease in the wait times for Tribal members to receive eagle parts and feathers for religious and cultural use. Again, it is important to note that any increase in eagles supplied to the repository would not be the result of an increase in eagle take from implementing the Action Alternatives, but instead the result of an increase in mortality monitoring at more projects operating under permits.

The Service does not anticipate that any of the Action Alternatives discussed in this EA will impact historic resources as defined under the NHPA, as described in detail in Section 5.3.4.

5.6.5 Socioeconomics

Under Alternative 4, the Service expects general permit participation from wind energy facilities to be the same as under Alternative 3. Anticipated numbers of permits to be issued are depicted (again) in Table 5-13, below.

The estimated number of general permits expected for power line entities is 21. This figure is based on the number of special-purpose utility permits (SPUT permits) that have reported eagle take over the past 10 years. Because this is a new general permit framework, the Service expects that adoption will be relatively slow at first and will likely replicate the number of existing SPUT permittees having reported eagle take initially. Under Alternative 4, although general permits for nest disturbance and nest take would be available, the permit application and mitigation costs for

these permits are not expected to change from the No Action Alternative. The significant change to these permits would be the ability to obtain a general permit. This would allow project proponents to obtain permits faster and with less effort. The total number of potential applicants for nest disturbance and nest take under Alternative 4 are unknown; therefore, we assume for purposes of this EA that the total number of permits will not change from the No Action Alternative, as reflected below.

Table 5-13. Alternative 4 – Anticipated Numbers of Permits Issued Over a Five-Year Permit Period

Type of Permit	Alternative 1: No Action (Existing)	Alternative 4: (New)	Change (increase in permits compared to Alt 1)
Wind Energy Project (General)	—	369	369
Wind Energy Project (Specific)	30	30	0
Power Line Entities	—	21	21
Nest Disturbance (General)	—	407	407
Nest Disturbance (Specific)	479	72	(407)
Nest Take (General)	—	168	168
Nest Take (Specific)	198	30	(168)
Total Permits (Over 5 Years)	**707**	**1,097**	**390**
Average Annual Permits	**141**	**219**	**78**

5.6.5.1 Financial Impacts to Permittees

Under Alternative 4, the costs of the permit application fee and mitigation fees associated with general permits for wind energy facilities are the same as under Alternative 3 and are represented (again) in Table 5-14, below.

The proposed GPP under Alternative 4 would be expanded to include power line entities and will create new costs in the form of permit fees, administration fees, and A&M measure implementation costs. A&M measures would reduce the risk and amount of eagle take. The primary cost driver for the A&M measures established for power line entities will be the requirement to retrofit existing poles to ensure that they are avian-safe.

In 2006, the Avian Power Line Interaction Committee (APLIC) published their "Suggested Practices for Avian Protection on Power Lines" document with support from the Edison Electric Institute and the California Energy Commission (APLIC 2006). This document provides a list of best practices and general recommendations on reducing avian mortality associated with power line electrocutions. These recommendations included retrofitting existing poles to reduce the likelihood of incidental take. Many larger power line entities have since started implementing avian protection plans (APPs) to target prioritized replacement and retrofit of at-risk poles. Because some companies are already implementing APPs, the costs to power line entities calculated below may not be considered "new costs" to some entities. However, there are other,

typically smaller entities that are not currently retrofitting poles under an APP. For those entities, the costs calculated below may be "new costs."

According to electric power survey data from the U.S. Energy Information Administration (USEIA), there are almost 3,000 power line entities operating in the U.S. (USEIA 2019). These utilities were classified into three ownership types: investor-owned utilities (IOUs), publicly owned or managed utilities, and cooperatives. Publicly owned or managed utilities make up two thirds of the total number of utilities in the market. Many of these larger utilities have existing APPs in place and, may not need to expend any additional funds to qualify for a general permit.

Estimates show that there are likely over 190 million power poles in the U.S., and of those 190 million poles, we estimate that 76% are already avian-safe and will not require retrofitting (Harness 2000). This estimate is based on a single field inventory conducted in Rangely, Colorado, after an enforcement action in the year 2000. During this field inventory, over 3,000 poles were inspected for raptor fatalities (including eagles). Of those, approximately 24% required retrofitting to make them avian-safe, while the other 76% did not require retrofitting. Using those percentages and our power pole estimates, we estimate that 144 million existing poles on the landscape are avian-safe. The remaining 45.6 million poles would need to be retrofitted under the new permit program. We note that these estimates are based only on one field inventory in one part of the country and may not accurately represent the percentage of avian-safe poles across the United States.

Under Alternative 4, each power line entity receiving a general permit would be required to retrofit a portion of their existing non-avian-safe poles over the initial 5-year permit with the goal of retrofitting all unsafe poles in the next 50 years (for investor-owned entities) or 75 years (for non-investor-owned entities). The Service estimates that there are approximately 1,244 eligible power line entities. Considering the number of poles that need to be made avian-safe, the number of eligible entities, and assuming a 50-year timeframe to completion, we estimate that an average power line entity would need to retrofit approximately 733 poles each year. For investor-owned entities, 10% of baseline poles must be converted to avian-safe during each general permit tenure. We assume, for purposes of this EA, that all investor-owned entities are already implementing APPs and are already meeting this requirement. For non-investor-owned utilities, 7% of baseline poles must be converted to avian-safe during each general permit tenure. We assume, for the purposes of this EA, that non-investor-owned utilities will be able to meet this requirement in most parts of the country by simply replacing existing poles with avian-safe poles when the structure is at the end of its functional life. Any costs associated with retrofitting power poles to be avian-safe (estimated from approximately $500–$2,500 per pole) would be at least partly recouped by increased reliability and a reduction in costs associated with eagle-electrocution response. Thus, we expect that there will be no additional cost to power line entities, except to entities that are not already replacing non-avian-safe poles with avian-safe poles.

The Service does not anticipate an added cost to permitted power line entities due to the retrofit requirement. The Service assumes that power line entities most likely to apply for a permit are entities that have a risk of taking eagles. The Service reviewed eagles reported on annual reports from Special Purpose Utility Permits over the past 10 years. Based on that data, the Service estimates that 21 power line entities will apply for a permit (Table 5-13). The Service assumes the entities that will apply for a permit are the same entities who are experiencing eagle take and therefore already implementing retrofits. This is because eagle electrocutions disrupt power

delivery and decrease reliability. Industry has communicated directly to the Service and through public comment that, regardless of eagle conservation interests, power line entities that experience eagle electrocutions are incentivized to retrofit power poles and will continue to do so. Disrupted power delivery is problematic to customers as well as power line entities seeking new, large customers, such as energy development projects, data centers, and others. Therefore, the Service concludes that any costs associated with permit requirements to retrofit power poles to be avian-safe (estimated from approximately $500–$2,500 per pole) would not be additive costs. Because an eagle take permit is not required for operation, only for the take of eagles, the Service cannot fully predict which power line entities will apply for a permit. There are potentially thousands of entities, and the Service did not receive comments from every entity. As a result, there may be some incremental costs to some entities the Service did not anticipate. However, given that individual incentives to retrofit align with where there is a risk of eagle take and based on what we heard in public comment, we conclude these assumptions are accurate to the best available information.

Similar to what is being required for wind energy projects that receive general permits, we would also require power line entities to pay a permit application fee of $1,000, and an administration fee of $2,500 for non-investor-owned utilities and $10,000 for investor-owned utilities for the life of a 5-year general permit.

Additional beneficial practices associated with general permits for power line entities include the creation of plans to address eagle mortality from collision with infrastructure and illegal shooting (described in greater detail in Section 3.4.5.3). Development and implementation of both plans will likely result in some additional costs to applicants; however, we anticipate this cost will be relatively low when compared to other costs incurred from complying with general permit conditions; thus, we are not assuming a significant up-front cost for these actions. Furthermore, the likelihood of incurring these costs is variable for each project because some entities have more collision risk than others, and costs may occur outside the five-year permit window.

The areas where requirements have been added, reduced, or removed, and the estimated new cost of meeting the permit conditions for both the new general permits and the existing specific permits are shown in Table 5-14.

The general permit application fee for nest disturbance and nest take would be $100 per-year, per-nest, or $500 for five years if taking or disturbing a nest each year, which is a decrease from the No Action Alternative. Applicants for specific permits for nest disturbance or nest removal will be required to pay an application fee of $500 (for non-commercial entities) or $2,500 (for commercial entities) (for up to a 5-year permit). These costs are the same as under the current regulations. Monitoring requirements under general or specific permits are not intended to be onerous or costly and the costs should instead be negligible. Compensatory mitigation could be required under general or specific nest disturbance or nest removal permits to meet our eagle preservation standard, depending on the take that needs to be offset; however, to date such mitigation requirements have been rare and costs are assumed to be negligible. As stated in the proposed rule, we assume that 85% of both nest disturbance and nest take permits would qualify for a general permit.

Table 5-14. Alternative 4 – Proposed Fees and Costs to Applicants for Incidental Take Permits Over a Five-Year Permit Period

Type of Permit	Type of Fee/Cost	Requirements	Permittee Cost (over 5 years)
Wind Energy Project (General)	Permit Application Fee	Cost to apply for a permit	$1,000
	Administration Fee	Fee associated with the Service's administration of the permit	$2,500 (Distributed and Community-Scale) $10,000 (Utility-Scale)
	Average Compensatory Mitigation Costs	Cost to offset the take of bald and golden eagles	$37,200
	Average Monitoring Costs	Requirements such as pre-construction monitoring, preparation of eagle conservation plans, and certain reporting requirements will no longer be required. Fatality monitoring will be concurrent to other activities, and we expect costs would be negligible.	$0
	Total Cost Over 5 Years		**$40,700 (Distributed and Community-Scale)** **$48,200 (Utility-Scale)**
Wind Energy Project (Specific)	Permit Application Fee	Cost to apply for a permit, and fee for permit review	$18,000 (Tier 1) $26,000 (Tier 2) $82,000 (Tier 2 with reimbursable agreement)
	Administration Fee	Fee associated with the Service's administration of the permit	$10,000
	Average Compensatory Mitigation Costs	Compensation for anticipated take of eagles	$1,080,000
	Average Monitoring Costs	Pre-construction monitoring, project specific background data, mitigation proposal, adaptive management, fatality monitoring and reporting	$1,100,000
	Total Cost Over 5 Years		**$2,208,000 (Tier 1)** **$2,216,000 (Tier 2)**

Type of Permit	**Type of Fee/Cost**	**Requirements**	**Permittee Cost (over 5 years)**
			$2,272,000 (Tier 2 with reimbursable agreement)
Power Line Entity (General)	Permit Application Fee	Cost to apply for a permit	$1,000
	Administration Fee	Fee associated with the Service's administration of the permit	$2,500 (Non-Investor Owned) $10,000 (Investor Owned)
	Retrofit Costs	Power pole retrofitting and other requirements	$0
	Total Cost Over 5 Years		**$3,500 (Non-Investor Owned)** **$11,000 (Investor Owned)**
Nest Disturbance (general)	Permit Application Fee	$100 annually	$500
	Other Mitigation Requirements	Minimal	$0
	Total Cost Over 5 Years		**$500**
Nest Disturbance (specific)	Permit Application Fee	$500 (noncommercial) $2,500 (commercial)	$500 (Non-Commercial) $2,500 (Commercial)
	Other Mitigation Requirements	Minimal	$0
	Total Cost Over 5 Years		**$500 (Non-Commercial)** **$2,500 (Commercial)**
Nest Take (general)	Permit Application Fee	$100 annually	$500
	Other Mitigation Requirements	Minimal	$0
	Total Cost Over 5 Years		**$500**
Nest Take (specific)	Permit Application Fee	$500 $2,500	$500 (Non-Commercial) $2,500 (Commercial)
	Other Mitigation Requirements	$0	$0
	Total Cost Over 5 Years		**$500 (Non-Commercial)** **$2,500 (Commercial)**

Total Costs Associated with Permits Under Alternative 4

The estimated total permit costs including the variability of fees, range of values for mitigation costs, and various types of permit applicants, are shown in Table 5-15.

Table 5-15. Alternative 4 - Estimated Permit Fee and Mitigation Cost Over a Five-Year Permit Period

Type of Permit	Application Fee[1]	Administration Fee[1]	Average Compensatory Mitigation Costs	Average Monitoring Costs	Permit Count Estimate	Total Cost of Permits	Existing Cost of Permits	Marginal Change (Increase in Permit Costs Compared to Alt 1)
Wind Energy (General)	$1,000	$10,000	$37,200	$0	369	$17,785,800	$0	$17,785,800
Wind Energy (Specific)	$26,000[2]	$10,000	$1,080,000	$1,100,000	30	$66,480,000	$63,120,000	$3,360,000
Power Line Entities	$1,000	$10,000	$0	$0	21	$231,000	$0	$231,000
Nest Disturbance (General)	$500	$0	$0	$0	407	$203,500	$1,017,500	($814,000)
Nest Disturbance (Specific)	$2,500	$0	$0	$0	72	$180,000	$180,000	$0
Nest Take (General)	$500	$0	$0	$0	168	$84,000	$420,000	($336,000)
Nest Take (Specific)	$2,500	$0	$0	$0	30	$75,000	$75,000	$0
Total[1]					**1,097**	**$85,039,300**	**$64,812,500**	**$20,226,800**

[1] In most cases, we assume the cost of the highest tier, where applicable.

[2] For wind energy specific permits, we assume the average project to be a Tier 2 project.

Because the compensatory mitigation requirements associated with a wind energy general permit under Alternative 4 are not based on a flat fee, but on a calculation of the anticipated take of eagles, it is less likely that Alternative 4 could disproportionately impact small businesses. However, the relative cost of permitting would likely remain a larger proportion of total revenue as compared to a larger business. If small businesses chose not to apply for a permit, they would be susceptible to future enforcement actions and associated enforcement costs.

Project Financing Costs

The operational risk and uncertainty for all industries permitted under this program revision would decrease substantially. This will ease financial uncertainties related to unpredicted post-construction incidental take events by allowing a project to preemptively obtain a permit and secure liability protections against enforcement actions if they follow the permit conditions and requirements. This would reduce the cost to industry of securing financing, purchasing insurance, and thereby increase the number of projects considered financially viable. A more streamlined permitting process would also provide projects with the ability to buy down risk more readily in the form of avoiding enforcement actions, with the permit acting as a form of insurance against unpredicted take.

5.6.5.2 Enforcement Impacts

For projects that would otherwise take eagles without obtaining authorization under an eagle permit, the lower barrier to obtaining a permit under Alternative 4 would provide a financial benefit by reducing potential enforcement costs.

5.6.5.3 Financial Impacts to the Service

Under Alternative 4, the Service would spend approximately the same amount of time and resources processing eagle take permits in the near term when compared to the other Alternatives. However, we expect this time to be dedicated to processing permits with higher risk to eagles or greater uncertainty surrounding that risk; therefore, we expect that time to result in greater benefits to eagles across all Action Alternatives. As many interested parties on the landscape receive permits, there could be a long-term reduction in the amount of permit applications received and a corresponding reduction in workload and cost to the Service.

As with the other Action Alternatives, the administration fee collected under each permit will be used by the Service to offset the costs of program administration. If the rate of permit applications is as expected, the financial impacts of program administration will be minimal. However, if fewer permit applications than expected are received, the Service would be required to find other sources of funding for program administration.

5.6.5.4 Societal Impacts

Under Alternative 4, we expect positive gains in eagle conservation from the increased number of issued permits and corresponding increases in compensatory mitigation required under those permits when compared to the No Action Alternative and Alternatives 2 and 3. The estimated eagle-offset credits that would be provided under Alternative 4 based on the estimates of the number of projects that apply for a permit are shown in Table 5-16. Note that the cumulative reduction in take from all activities may be less than the sum listed in the table. Power line retrofits are currently the offsetting-mitigation source used for the in-lieu mitigation program. A wind energy project that purchases one credit used to pay for retrofitting a power line will offset the take of one eagle.

Table 5-16. Alternative 4 – Estimated Eagle Offset Credits Over a Five-Year Permit Period

Activity	Average estimated eagle take reduction/offset	Number of affected entities	Eagle offset credits (range)
Wind Energy Project eagle offset credit (General EMU)	0.4 eagles per project	273 projects	109
Wind Energy Project eagle offset credit (Specific EMU)	12 eagles per project	30 projects	360
Wind Energy Project eagle offset credit (General LAP)	0.09 eagles per project	369 projects	33
Wind Energy Project eagle offset credit (Specific LAP)	0.09 eagles per project	30 projects	3
Power Line Entities fatality reduction from retrofits	0.0036 deaths per pole per year	21 entities 733 poles per entity	55

Note: Permits for nest disturbance and nest take will not require mitigation, so they are not included in the table.

The benefits to eagles under Alternative 4 are likely to be greater than under the No Action Alternative and Alternatives 2 and 3. Correspondingly, societal benefits of eagles described in Section 4.7.2 would also be higher under this Alternative.

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Appendix A Effects of a General Permit for Wind Energy Facilities on Bald and Golden Eagles, 2023 Update

Note: the information in this appendix may also be found in 'Effects of a general permit for wind energy facilities on bald and golden eagles, 2023 update'. Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington D.C., USA. <https://www.sciencebase.gov/catalog/item/6584c3a2d34eff134d42da66>

Contents

Executive Summary

This report includes updates to assessment work conducted to inform the U.S. Fish and Wildlife Service's (Service) draft Environmental Assessment and Proposed Rule for permitting incidental take of eagles and eagle nests (see U.S. Fish and Wildlife Service 2022*a–d*). It also presents new assessment work completed to inform a Final Rule decision by the Service after receiving public comments for the Proposed Rule.

To consider a general permit for eagle incidental take by wind facilities, the Service needed to account for the potential impacts of authorizing incidental take of eagles through general permits, whiles remaining consistent with our management objectives and preservation standard as detailed in the Service's 2016 Programmatic Environmental Impact Statement for the Eagle Rule Revision (U.S. Fish and Wildlife Service 2016*a*). The Service also prioritized clear eligibility requirements to minimize review necessary prior to general permit issuance. To accomplish this for general permits for wind facilities, we pre-analyzed the effect incidental take at general permit eligible projects could have on bald and golden eagles by: 1) identifying geographic areas of lower eagle abundance throughout the year, 2) estimating potential eagle fatalities across all wind turbines within the lower eagle abundance areas, and 3) determining any mitigation offsets necessary based on potential population effects locally or at the eagle management unit scale. The threshold for eagle abundance for bald eagles was more liberal than for golden eagles due to differences in species status. Areas of the U.S. that are eligible for general permits for wind are below the designated abundance thresholds for both species.

In this report, we reemphasize the advantages—especially given the specific management context—of geographically delineating areas where there are data to support the assumption that wind turbines pose lower risk to eagles and we can quantify and account for the relative uncertainty about actual risk across the U.S. Using the geographic eligibility zones allows the Service to calculate potential impacts in the general permit zone upfront, which subsequently allows us to calibrate required mitigation to ensure that those impacts are appropriately offset and consistent with Service management objectives. Relative abundance—a modeled data product produced by the Cornell Lab of Ornithology—remains the best information available on eagle abundance comparable across the U.S. and throughout the year. Therefore, we updated the modeled relative abundance values and resulting thresholds from 2018 to 2020. This update also allowed us to improve the resolution of the eligibility zone map. Based on updates to the wind permit eligibility zones, we also updated our estimated eagle fatalities in each zone by eagle management unit based on models incorporating project-specific information specific to the updated zones and the turbine infrastructure present on the landscape (Hoen 2018). Comparing the distributions of eagle use and collision rates from projects in the revised general permit zone with projects outside the general permit zone, we anticipate lower eagle use and much lower fatality risk from turbines in the defined general permit zone—especially for golden eagles.

We also evaluated several potential monitoring scenarios for eagle mortalities at projects that obtain general permits in the general permit eligible zone as described. The Service had included a more intensive mortality monitoring program for generally permitted projects in the Proposed Rule but reconsidered the need for such rigorous on-site monitoring given the associated costs for the projects and considering the anticipated collision risk for projects geographically eligible for general permits. We evaluated potential monitoring scenarios using simulation models and found that quarterly, low-intensity monitoring at all generally permitted projects each year would

allow the Service to assess whether the mitigation rate for general permits is sufficiently offsetting take authorized under general permits. However, there are notable tradeoffs in terms of the potential degradation in scientific rigor of the data, the anticipated precision of estimates of fatalities, and limitations to extrapolating beyond what is sampled given this approach. As a result, data from the low-intensity monitoring are not likely to allow the Service to improve estimates of collision risk for general permit eligible wind projects over time. Previous monitoring efforts across all projects have allowed the Service to considerably refine our understanding of eagle use across projects and the landscape and the magnitude and variability of collision risk to those eagles. Moving forward the Service will be monitoring eagle risk in the general permit zone—where eagle risk is lower and less variable—at a programmatic scale (i.e., across all general permit projects), limiting our ability to further improve our understanding of project-specific impacts for these projects.

Introduction

The U.S. Fish and Wildlife Service's (Service) National Raptor Program (NRP) initially evaluated the effects of several possible general permit scenarios for wind energy facilities on bald and golden eagles to inform the eagle incidental take regulations proposed by the Service in 2022 (U.S. Fish and Wildlife Service 2022a, 2022c). The Service received comments from the public and reconsidered several aspects of the general permit as proposed. NRP was subsequently asked to evaluate impacts of several changes to the general permit for wind on bald and golden eagles. Updates to some of the analyses from the initial report and assessment of additional options considered are presented in this report.

The Service intended for any general permit option introduced into the current eagle incidental take permitting framework to be consistent with the eagle management objectives established in the Service's 2016 Programmatic Environmental Impact Statement covering the eagle permit regulations (PEIS, U.S. Fish and Wildlife Service 2016*a*). One objective of the general permit type for wind is to reduce Service review necessary for permit applications in areas where risk of eagle fatalities from turbine collisions is low. We do this by assessing the requirements necessary to preauthorize the incidental take of eagles in areas of the United States where take at individual locations is expected to be low. By accounting for incidental take that may occur under general permits in advance, the Service can appropriately debit eagle management unit (EMU) take thresholds or require the appropriate amount of offsetting mitigation, and account for potential local area population level impacts, while minimizing review of eligible permit applications. The program will theoretically greatly reduce the workload and costs to industry in applying for and complying with permits and to the Service in issuing permits. By facilitating participation by entities that have avoided seeking permits previously, the Service expects that a higher proportion of facilities and activities that take eagles will obtain general permits. Since take of eagles that exceeds EMU take limits will be required to be offset with compensatory mitigation under general permits, enrollment by eligible projects could result in more ongoing incidental take of golden eagles being offset. Although similar approaches may be useful in analyzing the effects of general permits for other activities, our assessment focuses on the delineation of a general permit zone to facilitate incidental take permitting for onshore wind energy projects.

In the 2016 PEIS, the Service also committed to conduct population and other monitoring necessary to update the population size estimates and demographic information used to set the take limits. The results of those ongoing efforts are reflected in the EMU population estimates, EMU take limits, and local area population calculations.

Framework for Delineating A Priori Eligibility for a General Permit for Wind Energy Projects

The Service has previously advocated for development of a "low-risk" eagle incidental take permit for wind energy facilities based on predicted low eagle relative abundance (U. S. Fish and Wildlife Service 2018, Ruiz-Gutierrez et al. 2021). Industry groups and some conservation organizations have advocated against using eagle relative abundance as a proxy for risk, and instead proposed that the general permit be made available anywhere that an applicant can attest that their facility is of low risk to eagles (American Clean Power 2021, Bean 2021). These groups argued that eagle abundance is a poor predictor of eagle fatalities at wind energy facilities, an assertion that has some support in the scientific literature (e.g., De Lucas et al. 2008). Designation of areas of lesser risk at the scale under consideration here, however, does depend on eagle abundance at a fundamental level – a site where few eagles are exposed to risk on an annual basis cannot result in more fatalities than the number of individuals exposed. Sites where eagle abundance is high have the potential to cause more fatalities than sites where few eagles are present. The zone-specific golden eagle distributions for golden eagle exposure and golden eagle collision probability based on eagle surveys and mortality monitoring at individual projects support this general idea. Because the Service is preauthorizing take in the absence of local information on eagle abundance or use, a strong argument can be made to use broader indices of relative abundance as the basis for designating areas of the United States where general permits are preapproved in the absence of any site-specific data.

Another important advantage of using eagle relative abundance to establish an a priori general permit zone is that eagle relative abundance can be mapped. Mapping allows the Service to use data from wind projects in the mapped area to estimate the amount of eagle take that would be expected to occur under a general permit. There are many sources of data that have been used to map eagle relative abundance, including GPS tagging data (Brown et al. 2017, McCabe et al. 2021), nesting locations (Dunk et al. 2019), and data from widespread targeted surveys (Nielson et al. 2016). Although there are many advantages to these kinds of data, four major disadvantages for the Service's need to evaluate relative abundance at a continental scale are that (1) none of these analyses are geographically comprehensive; (2) some of the datasets are not seasonally comprehensive and thus do not provide information on relative abundance throughout the year; (3) in some cases they are based on inferences from a subset of the overall population that may or may not be representative of regional eagle use in general; and (4) they are not easily updatable, a requirement for use for eagle regulatory purposes given the Service's commitment to regularly updating the information sources used for eagle permitting (U.S. Fish and Wildlife Service 2016a).

An alternative is to use geographically and seasonally comprehensive citizen-science data sets such as eBird (Sullivan et al. 2009) to map eagle relative abundance. eBird is coordinated by the Lab of Ornithology at Cornell University, and current methods of screening, processing, and analyzing eBird checklists have provided spatially explicit relative abundance data useful for a variety of conservation purposes (Fink et al. 2013, Kelling et al. 2015, Robinson et al. 2018, Howell et al. 2022). Ruiz-Gutierrez et al. (2018) demonstrated that predicted relative abundances derived from eBird data performed well in identifying areas of high importance to bald eagles at the continental scale, and that the inverse of such a map could be used to identify areas of relatively lower risk. Similarly, U.S. Fish and Wildlife Service (2021), in collaboration with Cornell University, found that May eBird relative abundance was strongly associated with

estimates of the number of occupied bald eagle nests derived from aerial plot surveys; they used eBird relative abundance to predict bald eagle density in areas not covered by the aerial survey. A possible disadvantage of eBird expressed by some raptor biologists is its partial reliance on birdwatcher access to lands to collect data, combined with regionally varying detectability of golden eagles, might result in a failure to identify some eagle high-use areas. We acknowledge this possibility, but believe the more comprehensive coverage, ability to model relative abundance consistently everywhere, and ability to continually update eBird estimates makes it the better platform for modeling eagle relative abundance on a continental scale.

Ideally, we would have preferred to have more time to evaluate the performance of eBird information relative to other data sets. The pace of this rulemaking effort precluded that. In 2018, however, we evaluated the performance of eBird relative abundance at different thresholds for capturing important bald eagle nesting and wintering areas (Ruiz-Gutierrez et al. 2021), and golden eagle nesting areas (U. S. Fish and Wildlife Service 2018). eBird relative abundance was able to correctly capture the target of > 90% of these important eagle use areas at a threshold of the 50th quantile of the relative abundance probability distribution for bald eagles and at the 30th quantile of the relative abundance distribution for golden eagles (U. S. Fish and Wildlife Service 2018, Ruiz-Gutierrez et al. 2021). In the future it might be possible to integrate both targeted survey and tagged eagle data with eBird to generate improved maps of relative abundance. The Service and Cornell University recently developed a composite model that integrates eBird relative abundance data with golden eagle aerial transect survey data (Nielson et al. 2014; Stillman et al. 2023), similar to what has been done for bald eagles (U.S. Fish and Wildlife Service 2021a) and for golden eagles using Breeding Bird Survey data (Millsap et al. 2013). Similar efforts to integrate eBird data with data from GPS-tagged golden eagles might also improve relative abundance estimates from eBird data. For now, however, we base our assessment of the effects of the general permit for wind on bald and golden eagles on eagle relative abundance maps developed from eBird relative abundance data (Fink et al. 2021), following methods we used previously for bald eagles (Ruiz-Gutierrez et al. 2021) and described below.

Updates and Additional Considerations

This report summarizes or updates our previous work (U.S. Fish and Wildlife Service 2022*a*) and presents additional assessment work prompted by the Service's consideration of public comments on the proposed Eagle Permit Rule (U.S. Fish and Wildlife Service 2022). We present the methods and results of analyses intended to inform the final Eagle Permit Rule and Environmental Assessment and refer to our previous report for assessment work that informed decisions for the proposed Eagle Permit Rule.

Methods

Updating Population Size Estimates and Take Limits

The 2016 Programmatic Environmental Impact Statement (PEIS) and accompanying status report provided population size estimates, allowable take rates, and allowable take limits for bald and golden eagles (U.S. Fish and Wildlife Service 2016*a,c*). The PEIS also established that the Service will use the 20th quantile of the probability distribution for population size as the basis for setting the take authorization limits. The Service's eagle take permitting program was designed to ensure compliance with the take limits and associated conservation measures outlined in the PEIS. The PEIS also committed the Service to conduct population and other monitoring necessary to update the population size estimates and demographic information used to set the take limits. The PEIS required that the population size estimates be reassessed at least once every six years.

The Service has implemented monitoring programs that provide data for conducting such updates for at least the majority of each eagle species' range in the United States. Based on that monitoring, the Service has formally updated population size (U.S. Fish and Wildlife Service 2021a) and allowable take estimates (U. S. Fish and Wildlife Service 2022) for bald eagles in four of six bald eagle EMUs since publication of the 2016 PEIS, and the methods and approach for these updates are presented in Zimmerman et al. (2022). Similarly, the Service has collected and analyzed updated demographic and population monitoring information for golden eagles in one and parts of a second golden eagle EMU, which collectively cover about 85% of the species U.S. population. The results of those analyses have recently been peer-reviewed and published (Millsap et al. 2022).

The bald eagle population size update released in 2021 used data from the Service's plot-based nesting survey in 2018 (Atlantic, Central, and Pacific Flyways) and 2019 (Mississippi Flyway) and eBird relative abundance data (U.S. Fish and Wildlife Service 2021*a*, Stuber et al. 2022); estimates of breeding population size were combined with demographic data in an integrated population model (IPM) to obtain estimates of total population size. This update did not include the Pacific Flyway South or Alaska bald eagle management units, so the Service continues to use the 2016 population size estimates for those EMUs. As part of this update, we used a prescribed take level model, with input from the IPM, to update the bald eagle allowable take rate (Zimmerman et al. 2022) given our management objective of maintaining stable bald eagle numbers measured against the baseline of population size in 2009 (U.S. Fish and Wildlife Service 2016a).

The golden eagle population size update published in 2022 used the Service's golden eagle westwide survey data through 2016 along with Breeding Bird Survey data from 1997–2016 from the coterminous U.S. portions of the Central and Pacific flyways. These count data were combined with demographic data from 1997–2016 in an IPM, and the vital rate estimates from that model were used to update our estimate of the allowable take rate for these parts of the two golden eagle EMUs. As with bald eagles, golden eagle population size and allowable take rates in the EMUs where updates have not occurred remain as in 2016.

For both bald and golden eagles, the prescribed take level model used by the Service to update the allowable take rate incorporated improvements over the form of the model used in the 2016 status report. For the update, we allowed for nonlinear density dependence in the model, which is

more appropriate and realistic for birds with life history strategies like bald and golden eagles. Model results for both bald and golden eagles suggested the demographic effects of density dependence are greater as populations of these species approach carrying capacity. This leads to slightly higher estimates of the allowable take rate than under the assumption density dependent effects increase linearly.

For golden eagles, much of the survival information came from 512 individuals tagged with GSM-GPS transmitters. The Service and collaborators partnered to recover and obtain cause-of-death information from as many of these eagles as possible. Within the golden eagle IPM, we implemented a cause-of death model to estimate the frequency of each primary cause of mortality. Because transmitters largely avoid recovery biases inherent in band recoveries and incidentally found dead eagles, we believe the estimates from this model provide reasonable information on the frequency and population-level effects of different mortality factors (Millsap et al. 2022). This information is important when considering compensation mitigation strategies and the potential to offset anticipated levels of take that could be authorized under a general permit for wind.

In this document we consolidate and present the results of these updates, and we incorporate by reference the original reports and publications that describe the data collection, data, methods, and analytical approaches used (U.S. Fish and Wildlife Service 2021a, Millsap et al. 2022, U. S. Fish and Wildlife Service 2022, Zimmerman et al. 2022).

Mapping Relative Abundance

To inform the recently proposed rule for eagle permitting, we evaluated defining the geographic area where projects may qualify for general permit using different quantiles of the species-specific, seasonal relative abundance distributions to delineate the lower and higher eagle abundance areas (see U.S. Fish and Wildlife Service 2022*a* for additional details). We used processed eBird relative abundance data from 2020 provided by the Lab of Ornithology, Cornell University (Fink et al, 2021) to develop bald and golden eagle relative abundance maps. eBird relative abundance values are a modeled data product that represent the average number of eagles of each species expected to be seen by an expert eBirder who observes for 1 hour at the optimal time of day for detecting the species, and who travels no more than 1 kilometer during the observation session (see eBird FAQs at ebird.org/spain/science/status-and-trends/faq#mean-relative-abundance). The strength of the relative abundance models is the standardization of approach across the entire contiguous U.S. and the ability to consider environmental covariates, data from neighboring cells, and information from the past in determining the relative abundance value of a particular cell. The dataset we used provided relative abundance estimates for bald and golden eagles throughout the coterminous United States at ~3 km^2 resolution for each of four seasonal time-periods (pre-breeding migration, breeding, post-breeding migration, and non-breeding; see below). Using multiple seasons of data provides better measures of relative abundance for mapping purposes (Johnston et al. 2020), and our goal was to identify locations with high relative abundance in any one season.

To inform the proposed rule, we were asked to develop maps depicting potential golden eagle general permit zones under three alternative scenarios: with (1) 30%, (2) 50%, and (3) 70% of the overall golden eagle abundance distribution included in the general permit zone (hereafter RA30, RA50, and RA70, respectively). For bald eagles, we were asked to prepare and evaluate

general permit zones under three different alternative scenarios: with (1) 92.5%, (2) 95%, and (3) 97.5% of the overall bald eagle abundance distribution included in the general permit zone (hereafter RA92.5, RA95, and RA97.5, respectively). For this update for the final Rule, we focused on RA50 for golden eagles and RA95 for bald eagles as the Service decided on those thresholds for the final rule. To accomplish this, for each species we first excluded cell values of zero when defining the thresholds delineating general and specific permit for each seasonal raster Our assumption was that including zero-value cells in creating those seasonal thresholds would include areas where eagles were not at risk for colliding with turbines because they were not predicted to occur in those cells, during a given season. Density plots of the eBird relative abundance distributions for each scenario for bald eagles are in Figure 1 and for golden eagles in Figure 2. We then reclassified raster grid cells in each seasonal raster as zero (general permit; below the 50^{th} and 95^{Th} quantile for golden and bald eagles, respectively) and one (high risk; above the 50^{th} and 95^{Th} quantile for golden and bald eagles, respectively). We combined seasonal rasters into species-specific maps, defining a cell as general permit if all overlapping grid cells were a zero in every season.

To create a single operational general permit zone map that incorporated risk tolerance for both bald and golden eagles, we combined the golden eagle RA50 and bald eagle RA95 maps. A value of zero represents a general permit raster cell for both species whereas values greater than zero represent a specific permit raster cell. All analyses were completed using custom R scripts (R Core Team 2021).

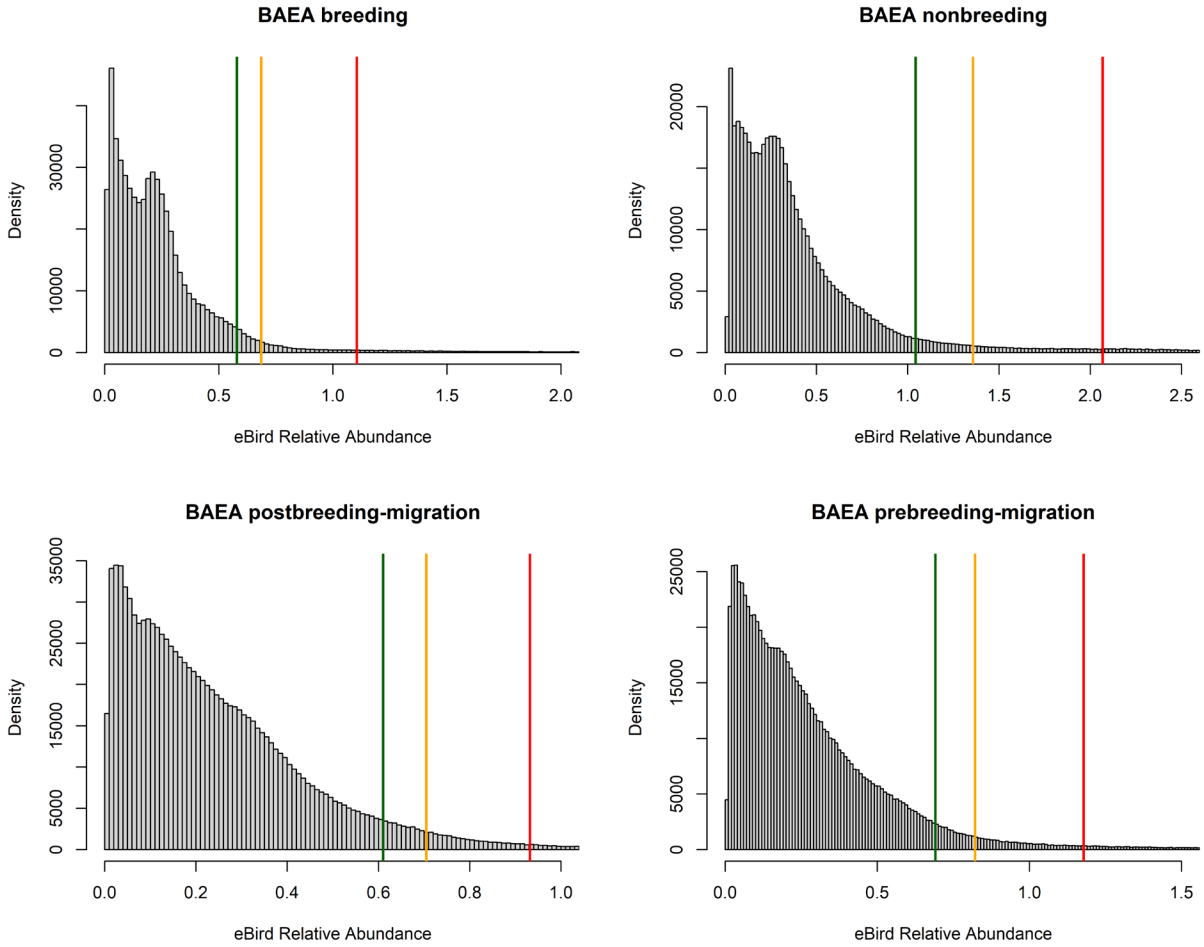

Figure 1. Seasonal density plots of bald eagle relative abundance based on eBird relative abundance model predictions. The vertical green, yellow, and red lines denote the relative abundance thresholds for RA92.5, RA95, and RA97.5, respectively.

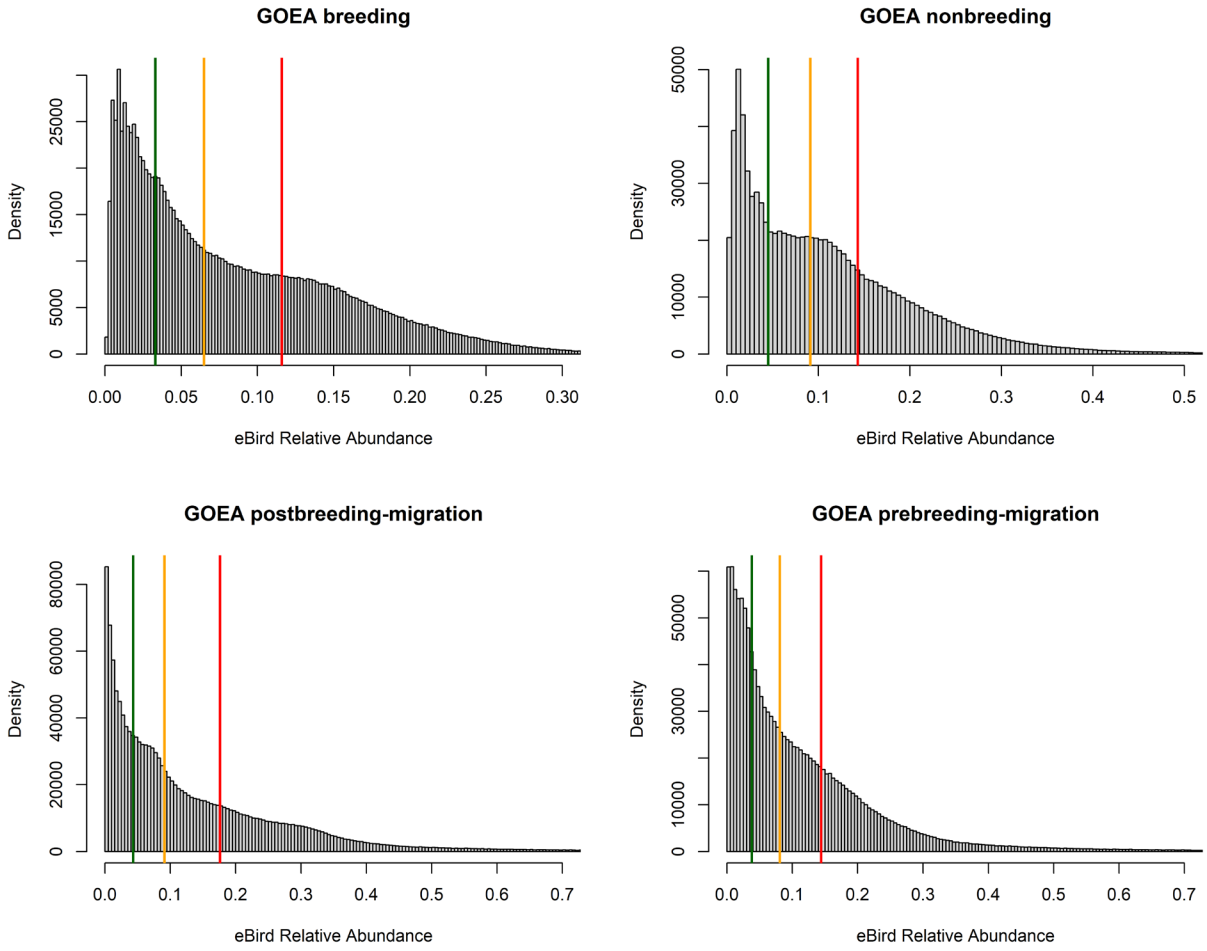

Figure 2. Seasonal density plots of golden eagle relative abundance based on eBird relative abundance model predictions. The vertical green, yellow, and red lines denote the relative abundance thresholds for RA30, RA50, and RA70, respectively.

Collision Risk Model Exposure Prior Distributions

The Service uses a collision risk model (CRM) to estimate take at wind energy projects (New et al. 2015, 2021). The model was developed with the constraint that it only requires data typically collected at wind energy facilities to meet recommendations in the Service's Land-based Wind Energy Guidelines (U. S. Fish and Wildlife Service 2012). The CRM uses species-specific pre-construction eagle use information (eagle exposure), information on the amount of hazardous airspace created by a wind project (an expansion factor), and information on collision rates for eagles that enter the hazardous airspace (collision probability) to estimate annual fatalities at individual projects or groups of projects. The model is implemented in a Bayesian framework, and information collected at sites in the past for eagle use and collisions are incorporated into the modeling process. In the absence of adequate site-specific eagle exposure and eagle fatality data (necessary to estimate collision probability), the model can be run using only the prior information; "priors-only" model runs produce fatality probability distributions representative of

the suite of wind projects included in the prior distribution. Species-specific priors for eagle exposure and collision probability are updated with new information periodically as part of the adaptive management process associated with the eagle incidental take permit program (U.S. Fish and Wildlife Service 2013 2021b, New et al. 2021).
For the analyses of the effects of a general permit on golden eagles, we updated prior distributions for eagle exposure for the areas of lower eagle abundance (below the 50th quantile of the relative abundance distribution for golden eagles and below the 95th quantile of the relative abundance distribution for bald eagles) and the areas of higher eagle abundance (the inverse relative abundance values) using all qualifying data in the Service's possession (see Supplementary Information). We used the criteria and methods described in New et al. (2021) to develop the exposure prior distributions, except that we also filtered out any new projects that (1) used <800-m radius for eagle point counts, and (2) did not conduct eagle-use surveys across the period(s) when each species of eagle was expected to be present in the area. The initial priors were developed in 2013 with a total of 11 projects (U.S. Fish and Wildlife Service 2013). Upon further review of the data, two of those were dropped in 2015 because they did not meet required assumptions, so the priors created by New et al. (2015) used 9 projects. In 2021, the Service updated the exposure priors using data from 61 sites for golden eagles and 59 sites for bald eagles (U. S. Fish and Wildlife Service 2021b). For this update, we updated the 2015 exposure prior distribution with additional data: 109 datasets for bald and 88 for golden eagles. (Attachment 1).

Estimating Eagle Take for General Permits

We used the Service's CRM to estimate the fatality probability distributions under each scenario in two ways. First, we produced *nationwide* fatality probability distributions for the number of turbines within the general and specific permit zones in each bald or golden eagle management unit. Second, we produced fatality probability distributions for hypothetical wind energy projects of 100 average-sized turbines in the general and specific permit zones. For both analyses we used the exposure prior distributions described above and the 2021 nationwide prior distribution for collision probability (New et al. 2021, U. S. Fish and Wildlife Service 2021b) in the CRMs.

The expansion term in the CRM uses the amount of hazardous volume created by turbines and the number of daylight hours that eagles are exposed to the hazardous space. For the average project CRM runs we used daylight hours for the center of the coterminous U.S. in the expansion term and assumed a 95.7 m rotor diameter for each turbine.

We explored standards for existing projects outside the defined general permit zone to potentially qualify for a general permit that would be consistent with the expected general permit eagle fatality and mitigation rates. We also used the average project estimates to evaluate theoretical limits to wind projects that could be authorized in direct proximity to one another within the general permit zone before the impacts on local area populations (LAP) might reach a level that requires additional scrutiny or even focused mitigation efforts.

For the nationwide model runs we acquired turbine data from the U.S. Wind Turbine Database (USWTDB, Hoen et al. 2018) on 10 February 2022. This database provides information on individual turbine locations and specifications throughout Alaska and the coterminous U.S. We used these data to estimate the hazardous volume for each turbine in the U.S.; for turbines where specifications were not provided, we assigned the mean rotor diameter from all turbines in the

database. We calculated the number of daylight hours of exposure for each turbine in the U.S. based on its location. We also used the location information to adjust the number of hours of exposure to reflect the migratory behavior of each eagle species; for any months when a species of eagle is expected to be absent, daylight hours in the model were set to zero. We used eBird Status and Trend abundance maps (Fink et al. 2021), with input from the Service's Regional Eagle Permit Biologists, to determine eagle presence. We spatially stratified the CRM by EMU to calculate EMU-specific fatality estimates. Stratifying the model by EMU also allowed us to combine the estimated fatality distributions for the individual EMUs by summing the estimates to generate the overall estimated number of fatalities for bald and golden eagles across the U.S.

For the analysis of the effects of the combined bald and golden eagle general permit zone scenarios, we combined the RA95 bald eagle and RA50 golden eagle maps to delineate species-specific general and specific zones and identified areas where the bald eagle specific zone overlapped the golden eagle general zone, and conversely, where the golden eagle specific zone overlapped the bald eagle general zone. Individual turbines that fell into each of these zones were grouped to estimate take for each zone. In areas where the bald eagle specific zone overlapped the golden eagle general zone, golden eagle general zone priors were used to estimate golden eagle take for this group of turbines and this take was included in the specific permit zone total for this EMU. Conversely, bald eagle general zone priors were used to estimate bald eagle take for the grouped turbines in the area where the golden eagle specific zone overlapped the bald eagle general zone, and this take was included in the specific permit zone take total. Attachment 1 provides a more detailed description of the nationwide take analyses.

Compensatory Mitigation Considerations

We were asked to calculate the number of bald and golden eagles estimated to be taken per m^3 of hazardous airspace created by wind turbines in each EMU under the combined bald eagle RA95 and golden eagle RA50 scenario. This value can be used to calculate the compensatory mitigation fee that would have to be associated with each authorization under a general permit, provided the location, size, and number of wind turbines for each authorization are known. We had information on the size and relevant daylight hours of operation for each turbine from the nationwide take analysis described above. To calculate the expected eagle take per m^3 of hazardous airspace, we divided the estimated number of annual fatalities in the EMU by the volume of hazardous airspace (we converted to m^3 for ease of reporting).

Monitoring Considerations

The 2016 PEIS required or implied that the Service would implement monitoring to: (1) verify ongoing adherence to EMU take limits and local population take thresholds; (2) update population size estimates for bald and golden eagles; and (3) evaluate all available data that could be used to update estimates of vital rates and allowable take limits. The PEIS specified that evaluation of population take thresholds and updates to take limits should occur not less than once every six years. The Service has invested considerable resources in collecting data to inform objectives (1) and (2) above, but less so for (3). And, for (1), the Service has only just begun to attempt to use these data to estimate overall take under permits, and we must verify that tools like the nationwide take analysis used here are providing accurate estimates of authorized take. With respect to (3), the Service has shown that past investments in opportunistic demographic monitoring for golden eagles yielded substantial improvements to estimates of

golden eagle vital rates and provided data useful in estimating frequencies of causes of mortality (Millsap et al. 2022). This work suggests that demographic monitoring in the form of deploying and maintaining a targeted sample of GPS-transmitter tagged golden eagles in the population could not only allow for regular updates to critical demographic parameters (e.g., the adult survival rate), but it could also potentially detect reductions in some mortality factors due to compensatory mitigation efforts, as well as provide a source of information independent from (1) above on the frequencies of mortality at wind energy facilities. It may be that after a few years of such monitoring, we would learn that the nationwide take modeling combined with a consistent level of demographic monitoring could be sufficient to achieve the Service's primary monitoring objectives, thus more expensive fatality monitoring could be discontinued. In this section, we evaluated sample size requirements and costs associated with establishing Service-controlled operational programs for the first and third monitoring components. The Service already conducts bald and golden eagle population monitoring using existing budget resources, so we ignore the second monitoring component in this assessment.

Permit-level fatality monitoring for eagle take at wind facilities has been the responsibility of the permittee in the past. The Service included a Service managed monitoring program for general permit projects in the proposed rule. Public comments the Service received expressed concerns about the estimated cost of such a program. For the final rule, the Service also wanted to balance the intensity and cost of monitoring with the anticipated low risk of eagle fatalities at an average project in the general permit zone. Subsequently, we were asked to evaluate whether low-intensity monitoring conducted at all general permit projects every year on a quarterly basis would be sufficient to allow the Service to evaluate whether the general permit mitigation rate is high enough to demonstrate that authorized take is offset at levels compatible with Service management objectives.

We conducted this analysis only for golden eagles because numbers of expected bald eagle fatalities in the general permit zone were nearly equal to or higher than the number of expected golden eagle fatalities in each EMU (or combined EMU) (i.e., if sampling is sufficient to estimate take for golden eagles, it should be sufficient to quantify the higher take expected for bald eagles). For this analysis, we used the median annual take estimates for each EMU from the nationwide take analysis as the expected number of annual eagle fatalities within an EMU and then ran simulations that assess bias and precision in estimating fatalities across a specified total number of turbines (based on expected enrollment rates presented in the environmental assessment) as a function of a proportion of turbines sampled and a range of assumed turbine scale detection rates (i.e., the detection rates in the simulations are specific to individual turbines). The general approach is to estimate fatalities at sample of turbines that are monitored, and then make inferences to the total number of turbines by dividing the estimated fatalities by the proportion of turbines sampled. Because this is a ratio estimator, changes in estimated fatalities over a range of proportion of turbines sampled is not linear and asymptotically approaches the true number of fatalities. The simulations are conducted by: (1) specifying a range of *g*-values, (2) simulating data sets based on a specified number of fatalities and total turbines (*N*) for each of the *g*-values, and (3) for each g-value and range of sampled turbines (i.e., $n < N$) randomly select *n* turbines a specified number (*y*) times (i.e., *y* = number of repetitions for each *n*) and estimate *M* (number of fatalities) given the number of observed fatalities in the y^{th} rep, and (4) after estimating number of fatalities for the sites sampled at each rep, divide by the proportion of sites sampled (i.e*., n/N)*. For example, if the estimate of fatalities at sites sampled

was 10, and half the sites were sampled, then the total fatalities would be 20 (10/0.5). We then summarized the results across *y* for each sample size (*n*).

Probability of detection is the probability that eagle remains are detected during a survey (searcher efficiency and proportion of the possible fall area searched) given that it was available to be detected (persistence probability, e.g., not removed by scavengers) over the proportion of the area searched. We used the Evidence of Absence software (Dalthrop et al. 2014) for this analysis because it acknowledges that zero counts are not equivalent to zero mortalities (i.e., when detection rates are less than 1, bird remains may be missed by observers). For a more detailed description of these analyses see Attachment 2. We used information available to the Service on fatality monitoring costs to calculate funding levels necessary supplement monitoring with Service managed bias trials to test a subset of projects to evaluate the necessary assumptions about persistence and searcher efficiency. We previously explored the relative efficiency of sampling the randomly selected facilities with increasing effort (i.e., higher detection rates), vs sampling more facilities; we considered the inverse scenarios this time and evaluated estimates when all turbines are monitoring with low effort. Monitoring for specific permits would still be a condition of individual permits and was not included in our analyses.

For demographic monitoring of golden eagles, we were interested in evaluating how many GPS tags would need to be deployed annually to regularly update estimates of several key demographic parameters with reasonable levels of precision. The most important demographic parameter relative to the population growth rate is adult survival; Millsap et al. (2022) estimated the elasticity of this parameter from the population matrix equals 0.76. Accordingly, we targeted this parameter in our sample size assessment. We were also interested in being able to use the cause-of-death submodel in the 2022 integrated population model (IPM, Millsap et al. (2022)) to detect changes in the frequency of specific causes of mortality, and so we evaluated the sensitivity of our design scenarios to that as well, using electrocution as the example mortality factor. This latter objective would also allow us to evaluate the efficacy of compensatory mitigation methods. For this assessment, we extracted the survival/cause of death submodel from the 2022 IPM, and then randomly ran subsets of the data of various sizes through the model to obtain estimates for the parameters of interest and standard errors. We evaluated sample sizes between 50 and 1,000, with a goal of assessing at what sample size the coefficient of variation (CV) for adult survival dropped below 10%. See Attachment 2 for a complete description of our methods.

Bald Eagle Nest Disturbance Take Limit Debit

Currently, the Service debits the bald eagle EMU take limits by 1.33 (expected mean productivity per occupied nesting territory [territories where breeding is attempted]) for each occupied nesting territory for each nest disturbance permit that is issued. The Service requires monitoring to determine nest fates for each disturbance permit. We undertook a review of these monitoring reports to determine the probability that a disturbance permit for a used bald eagle nest results in actual nest failure. We conducted the analysis using a Bernoulli model in a Bayesian framework (Gedir et al. 2023). In keeping with the Service's risk management policy for eagles (U.S. Fish and Wildlife Service 2016*a*), we selected the 80th quantile of the posterior distribution of the probability of nest failure as basis for adjusting the take limit debit. The proposed adjustment to the take limit debit for bald eagle nest disturbance is 1.33 * 80th quantile

of probability of nest failure. For more details on the approach used for this analysis see Attachment 3.

Results

Updated Bald and Golden Eagle Population Size and Take Limits

The current bald and golden eagle population size estimates, allowable take rates, and take limits are shown in Table 1. These values are used where relevant in this report. We also provide updated estimated frequencies of golden eagle causes of death in Table 2.

Table 1. Current bald and golden eagle EMU-specific population size and take limits. Population size (N) for management purposes, which is what is reported here, is the 20th quantile (Q20) of the probability distribution for N (U.S. Fish and Wildlife Service 2016*a*). This updates information in Tables 3 and 10 in U.S. Fish and Wildlife Service (2016*b*) and Tables 3-2 and 3-7 in U. S. Fish and Wildlife Service (2016*a*).

Species EMU	Year Updated	Current Allowable Take Rate	Current Population Size Estimate (Q20)	Current Take Limit (Q20)
Bald Eagle				
Atlantic Flyway[a]	2021/2022	0.090	72,990	4,223
Mississippi Flyway[a]	2021/2022	0.090	137,917	7,986
Central Flyway[a]	2021/2022	0.090	26,253	1,521
Pacific Flyway North[a]	2021/2022	0.090	36,302	2,102
Pacific Flyway South[b]	2016	0.038	391	15
Alaska[b]	2016	0.060	62,935	3,776
Golden Eagle[c]				
Atlantic-Mississippi Flyways[b]	2016	0.050	3,180	0
Central & Pacific Flyways[d]	2022	0.070	30,958	0
Alaska[b,e]	2016	0.050	4,002	0

[a]Sources for the information for these bald eagle management units are U. S. Fish and Wildlife Service (2021), U. S. Fish and Wildlife Service (2022), and Zimmerman et al. (2022).

[b]The source for the information for these bald eagle management units is U. S. Fish and Wildlife Service (2016*a*).

[c]Estimates of current anthropogenic mortality for golden eagles likely exceed the allowable take for all golden eagle management units, hence there is no remaining available take for this species (U.S. Fish and Wildlife Service 2016*a*, Millsap et al. 2022).

[d]The source of the information for these golden eagle management units is Millsap et al. (2022). The Central and Pacific flyway management units are combined because we did not estimate population size separately for each EMU in the 2022 analysis.

[e]Alaska is considered part of the Pacific Flyway golden eagle management unit, however population size estimates have not been updated for that part of the Pacific Flyway since 2016, so it is reported separately here.

Table 2. Estimated number of golden eagles that die annually from nine major causes of death in the interior western coterminous U. S., 1997–2016, reprinted from Table 2 in Millsap et al. (2022). This updates Table 8 in U. S. Fish and Wildlife Service (2016*b*).

	Median	Lower 95% Credible Interval	Upper 95% Credible Interval
First Year			
Collision	51	11	143
Electrocution	69	20	174
Shot	69	20	174
Poisoned	32	4	109
Caught in trap	88	30	203
Fight	32	4	109
Disease	88	30	204
Accident	182	86	346
Starvation	656	416	1001
After First Year			
Collision	560	322	877
Electrocution	437	231	731
Shot	601	354	926
Poisoned	395	201	675
Caught in trap	191	67	409
Fight	191	68	408
Disease	150	45	351
Accident	274	118	523
Starvation	150	45	348

Bald eagle populations have increased 4.4 times the size of the 2009 population estimate in the coterminous U.S. and appear to be growing at a rate of about 10% per year (Zimmerman et al. 2022). Golden eagle populations in the western U.S. appeared stable through 2016, but there is increasing evidence anthropogenic mortality exceeds the allowable take rate (Millsap et al. 2022), potentially leading to declines in the future.

Defining General Permit and Specific Permit Zones by Relative Abundance Thresholds

Table 3 shows the updated relative abundance value thresholds by season for bald and golden eagles based on the updated distributions of seasonal relative abundance values (Figures 1-2).

The analyses in this report assume that the pre-analyzed general permit zone will be areas of the coterminous U.S. that have Cornell Lab of Ornithology status and trend relative abundance values less than the reported thresholds. Our analyses and results are not applicable to other measures of eagle relative abundance.

Table 3. Bald and golden eagle relative abundance (RA) value thresholds by season. Bald eagle thresholds are based on the 95th quantile of non-zero RA values and golden eagle thresholds are based on the 50th quantile of non-zero RA values.

Season	2020 Seasonal RA threshold	Effective Date Range
bald eagle pre-breeding migration	0.821	15 February–23 May
bald eagle breeding	0.686	24 May–19 July
bald eagle post-breeding migration	0.705	20 July–20 December
bald eagle nonbreeding	1.357	21 December–14 February
golden eagle pre-breeding migration	0.081	8 February– 6 June
golden eagle breeding	0.065	7 June– 30 August
golden eagle post-breeding migration	0.091	31 August–6 December
golden eagle nonbreeding	0.091	7 December–7 February

Relative Abundance Maps

Our initial analyses focused on providing information on the effects of the three scenarios on golden eagles to inform a decision regarding which eBird relative abundance quantile to use to produce a general permit map for this species. Figure 3 shows a combined version of the RA92.5, RA95, and RA97.5 maps for bald eagles. Figure 4 shows a combined version of golden eagle maps for scenarios RA30, RA50, and RA70. Figure 5 shows the combined bald eagle RA95 and the golden eagle RA50 maps. An online version of both maps that facilitates close inspection is available at https://www.fws.gov/story/2022-03/eagle-wind-permit-eligibility.

Exposure Priors

The updated prior distributions for bald and golden eagle exposure are provided in Table 4. An anonymized list of the projects used in each prior are provided in Supplemental Information.

Expected Annual Take at Typical Wind Projects

Estimates of expected annual golden eagle take at a hypothetical wind project of 100 turbines with a rotor diameter of 95.7 m in the general permit and specific permit zones are presented in Figure 6.

Take Rates for Existing Projects in the Specific Permit Zone Compatible with General Permits

The risk of bald and/or golden eagle collision for wind projects located in the Specific Permit zone may, in some cases, be low enough to be consistent with a general Permit once site-specific data on mortalities is available for Service review. Annual take rates per km^3 of wind turbine hazard for typical projects in the specific permit zone that are consistent with the rates associated with general permit zone projects are presented in Table 5.

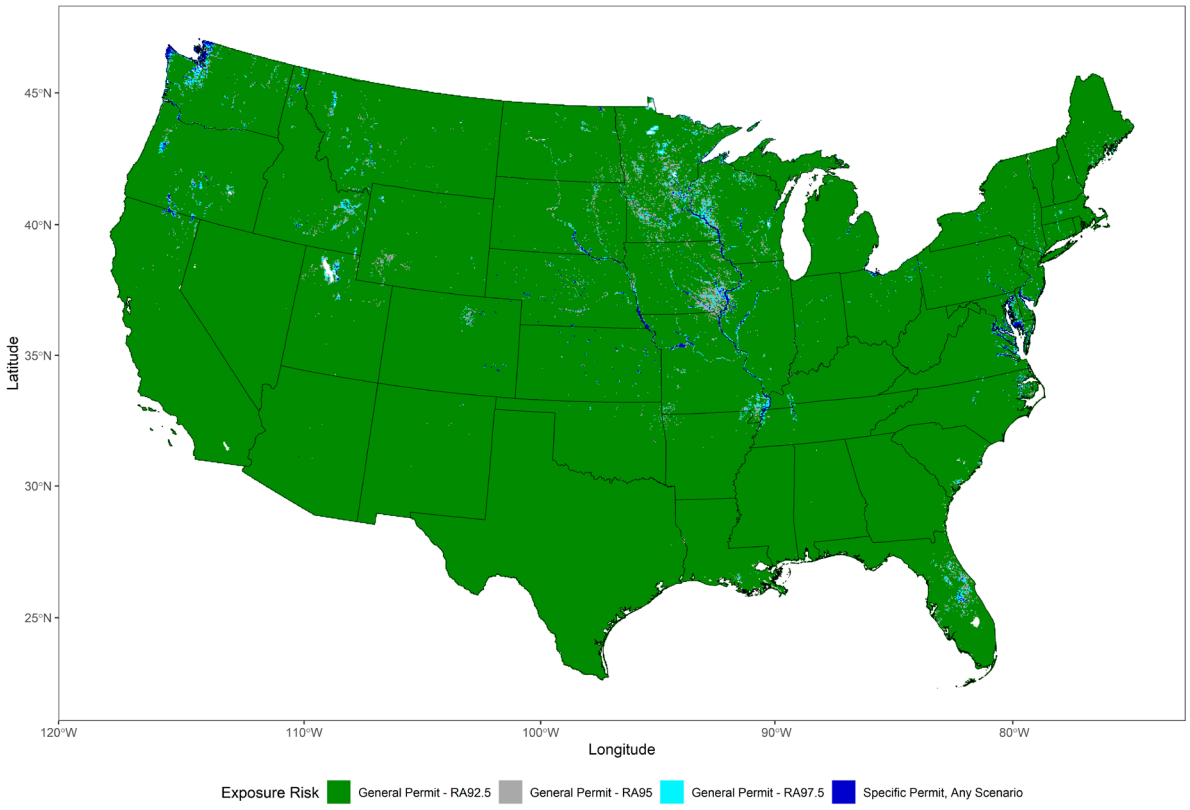

Figure 3. Map showing the general permit zone and, conversely, the specific permit zones for bald eagles under the three scenarios explored. The RA92.5 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 92.50% of the relative abundance distribution in the specific permit zone (gray plus light blue plus dark blue; the general permit zone in this scenario is the green). The RA95 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 95% of the relative abundance distribution in the specific permit zone (light blue plus dark blue; the general permit zone in this scenario is green plus gray). The RA97.5 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 97.5% of the relative abundance distribution in the specific permit zone (dark blue; the general permit zone in this scenario is green plus gray plus light blue). To access an interactive version of this map, go to <https://www.fws.gov/node/4519786>.

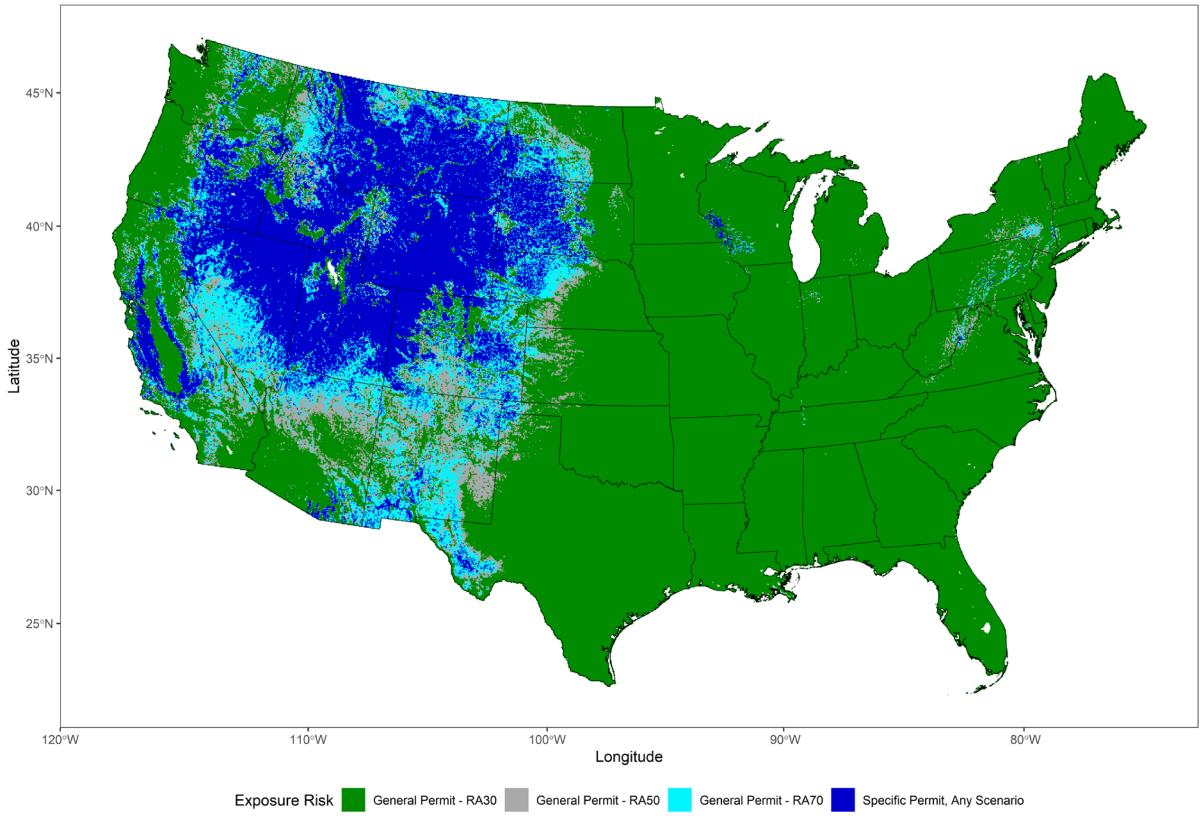

Figure 4. Map showing the general permit zone and, conversely, the specific permit zones for golden eagles under the three scenarios explored. The RA30 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 70% of the relative abundance distribution in the specific permit zone (gray plus light blue plus dark blue; the general permit zone in this scenario is the green). The RA50 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 50% of the relative abundance distribution in the specific permit zone (light blue plus dark blue; the general permit zone in this scenario is green plus gray). The RA70 scenario places all ~3 km^2 map cells that have eBird relative abundance values in the top 30% of the relative abundance distribution in the specific permit zone (dark blue; the general permit zone in this scenario is green plus gray plus light blue). To access an interactive version of this map, go to <https://www.fws.gov/node/4519786>.

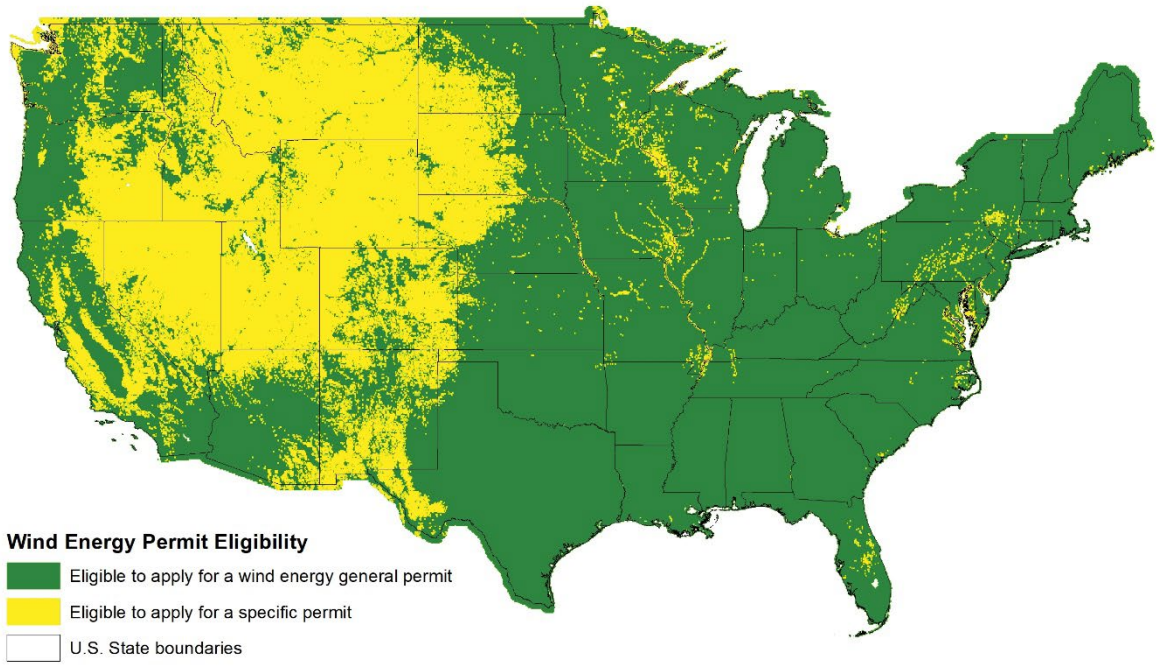

Figure 5. Map showing the general permit zone (green) and, conversely, the specific permit zone (yellow) combining the bald eagle RA95 and golden eagle RA50 scenarios. This map places all ~3 km^2 map cells that have eBird relative abundance values in the top 50% of the golden eagle relative abundance distribution, and all cells that have bald eagle eBird relative abundance values in the top 5% of the bald eagle relative abundance distribution, in the specific permit zone. To access an interactive version of this map, go to <https://www.fws.gov/node/4519786>.

Table 4. Statistics, gamma parameters, and sample sizes for the exposure prior distributions for bald and golden eagles under each relative abundance scenario explored. Exposure prior distributions are used in the Service's collision risk model to estimate eagle take under each scenario. Note that for the Nationwide priors, an additional project in NY was included. This project was not included in the permit zone-specific priors because it fell within a raster cell with missing values (i.e., no eBird relative abundance estimate available).

Species	Distribution Characteristics		Gamma Parameters		Number of Projects
Scenario	Mean	SD	α	β	
Bald Eagle					
RA 95 General	0.43	0.8	0.29	0.67	105
RA95 Specific	6.57	7.37	0.8	0.12	4
Nationwide	0.67	1.98	0.11	0.17	110
Golden Eagle					
RA 50 General	0.06	0.12	0.24	4	49
RA50 Specific	1.48	2.28	0.43	0.29	39
Nationwide	0.69	1.67	0.17	0.25	89

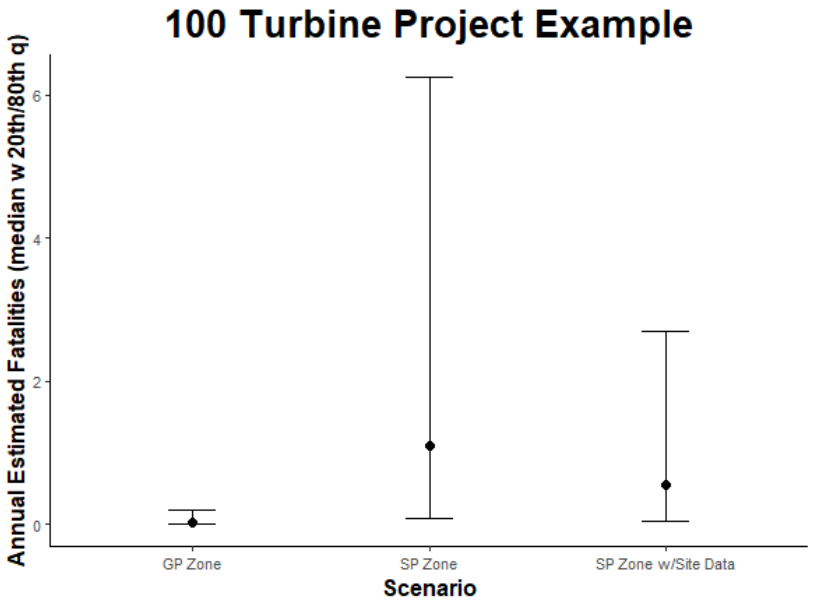

Figure 6. Estimated annual golden eagle fatalities (median ± 20th/80th quantiles) for a hypothetical 100 turbine project with averaged-sized rotors (97.5 m diameter) in the general permit zone defined by the 50th quantile relative abundance threshold; this example uses an average per hazardous km^3 annual fatality rate for illustrative purposes.

Table 5. Thresholds for the 60th and 80th quantiles of estimated annual bald and golden eagle take rates in the specific permit zone, respectively, that projects must meet for consistency with general permit standards for eagle risk, mitigation, and monitoring. We assumed data informing the estimates would represent a minimum of five years of mortality monitoring with an annual average overall detection probability of 35 percent or greater. Turbines represented are average-sized (rotor diameter of 95.7 m) based on the U.S. Wind Turbine Database (Hoen et al. 2018).

Species (RA Threshold)	Annual Fatality Rate	
	per hazardous km^3	per 100 turbines
Bald Eagle (RA95 Specific)	7.00	1.01
Golden Eagle (RA50 Specific)	0.46	0.07

Expected Annual Take by Combined Permit Zone

The estimated annual take for both eagle species under the combined bald eagle RA95 and golden eagle RA50 scenario are provided in Table 6.

Table 6. Estimates of bald and golden eagle take throughout Alaska and the coterminous U.S. (nationwide) by EMU under the combined bald-golden eagle general and specific permit zones. Standard deviations of the mean estimates can be found in Attachment 1, Tables 4 and 5. The Service uses the 60th (Q60) and the 80th (Q80) quantiles of the fatality probability distribution for bald and golden eagles, respectively, as the take number debited from the EMU take limit (U.S. Fish and Wildlife Service 2016*a*).

Species EMU Permit Zone	% Turbines[a]	Mean	Median	Q60/Q80[b]
Bald Eagle				
Nationwide				
General	81.4%	806	122	251
Specific	18.6%	227	54	94
Atlantic				
General	94.7%	52	8	16
Specific	5.3%	28	11	18
Mississippi				
General	99.7%	367	55	114
Specific	0.3%	25	11	16
Central				
General	83.6%	330	50	103
Specific	16.4%	104	17	33
Pacific North				
General	52.1%	45	7	14
Specific	47.9%	51	12	21
Pacific South				
General	36.1%	12	2	4
Specific	63.9%	19	3	6
Golden Eagle				
Nationwide				
General	81.4%	81	8	87
Specific	18.6%	620	145	809
Atlantic - Mississippi				
General	98.9%	22	2	24
Specific	1.1%	2	1	3
Central				
General	83.6%	50	5	53
Specific	16.4%	347	81	452
Pacific				
General	43.1%	9	1	10
Specific	56.9%	271	63	354

[a] Total number of turbines in Alaska and the coterminous U.S. = 70,605 (Hoen et al. 2018)
[b] 60th quantile for bald eagles (U.S. Fish and Wildlife Service 2021a)

Compensatory Mitigation Considerations

Estimated annual take of bald and golden eagles per km^3 of hazardous airspace in the combined bald eagle RA95 and golden eagle RA50 scenario is presented in Tables 7–8. The Service requires that offsetting compensatory mitigation for eagle take above the take limits be at a 1.2:1 ratio (U. S. Fish and Wildlife Service 2016*a*), so for mitigation purposes the number of eagles estimated to be taken must be multiplied by 1.2.

Table 7. Estimated annual take of bald eagles at the 60th quantile (Q60) per km^3 of hazardous space in the combined bald eagle RA95 and golden eagle RA50 general permit zone.

Bald Eagle EMU	Number of Turbines (as of 2022)	Hazardous Volume (km^3)	Estimated Annual Fatalities (Q60)	Fatalities per hazardous space (km^3)
Atlantic	3,069	3.87	16	4.13
Mississippi	17,630	27.30	114	4.18
Central	31,759	52.32	103	1.97
Pacific North	2,660	3.35	14	4.18
Pacific South	2,378	2.83	4	1.41
Total	57,496	89.67	251	2.80

Table 8. Estimated annual take of golden eagles at the 80th quantile (Q80) per km^3 of hazardous space in the combined bald eagle RA95 and golden eagle RA50 general permit zone. The fatalities per km^3 of hazardous space values for golden eagles can be converted to numbers of eagles that must be offset with compensatory mitigation by multiplying by 1.2 (U. S. Fish and Wildlife Service 2016*a*).

Golden Eagle EMU	Number of Turbines (as of 2022)	Hazardous Volume (km^3)	Estimated Annual Fatalities (Q80)	Fatalities per hazardous space (km^3)
Atlantic - Mississippi	20,699	31.10	24	0.77
Central	31,759	52.40	53	1.01
Pacific	5,038	6.18	10	1.62
Total	57,496	89.68	87	0.97

Local Area Population Considerations

We do not know where new wind facilities may be constructed in the general permit zone, however, the local area populations for hypothetical projects in the coterminous U.S. range from 637-3,989 bald eagles (excluding the Pacific Flyway South) and 62-2,127 golden eagles (U.S. Fish and Wildlife Service, 2022*a*). Based on the fatalities per hazardous space (Table 7) and low annual estimated take for a typical 100-turbine project in the general permit zone (Figure 6; approximately 0.4 bald eagles and 0.14 golden eagles), enrollment of enough projects and associated hazardous space to trigger the 7% or 9% LAP thresholds for golden and bald eagles, respectively, should be rare in most EMUs within the general permit zone. This would be approximately 31-1064 completely overlapping "typical" projects in the general permit zone (5 for bald eagles in the Pacific Flyway South EMU). The Service should continue to track LAP impacts as projects enroll in general permits and may need to update future mitigation requirements to address LAP impacts under general permits to ensure consistency with Service management objectives.

Monitoring Considerations

For demographic monitoring, the CV for adult survival dropped below 10% in simulations if we maintained 150 GPS tagged eagles in the population annually (Figure 7, also see Attachment 2). With this level of demographic monitoring, we would have a modest ability to detect a change in frequency in a prevalent mortality factor like electrocution (Figure 8). Expected annual costs for demographic monitoring would vary for the first five years depending on the number of transmitters being monitored, with expected costs increasing from approximately $320,000 in year one to approximately $450,000 in year 4 (Table 9). We expect annual costs would level off to approximately $450,000 from year six on.

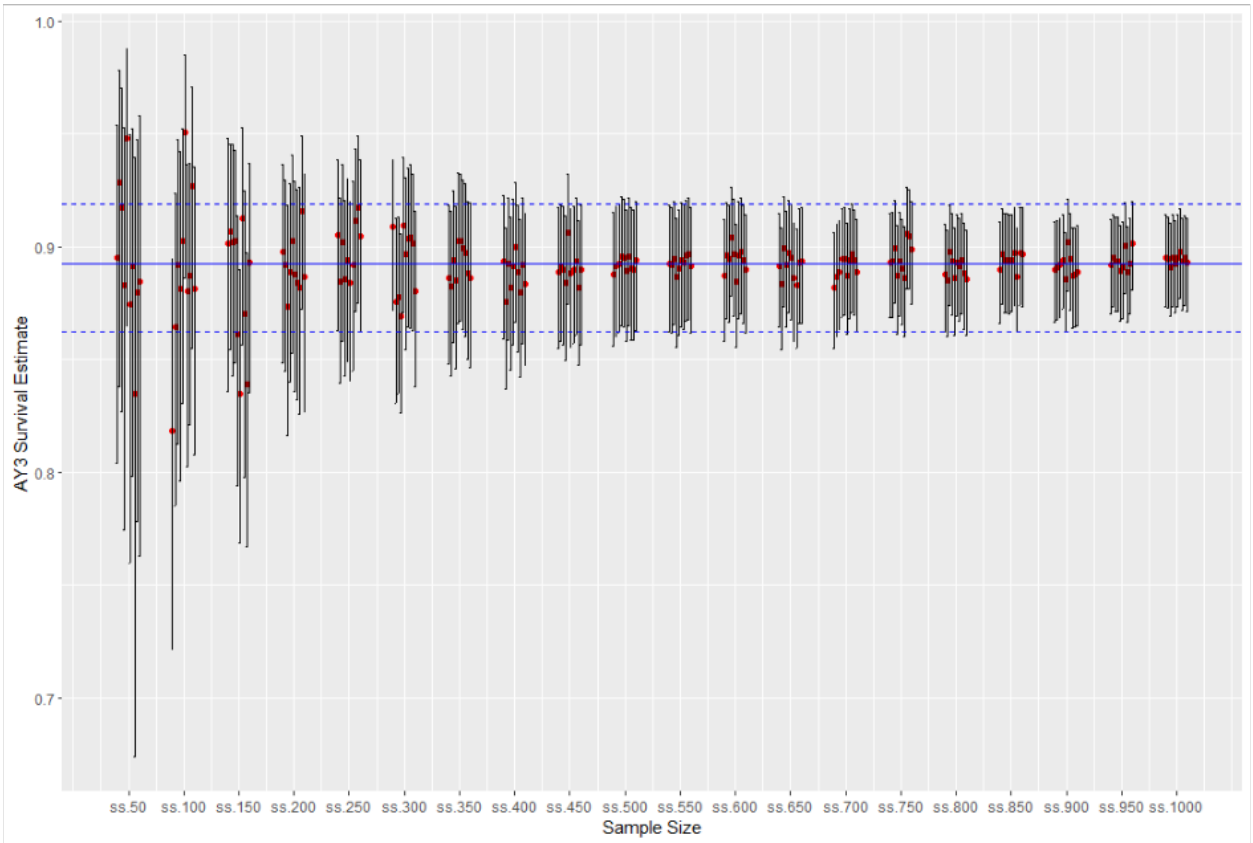

Figure 7. Plots showing median (red dot) and 95% credible intervals (CI) for each of 10 estimates of adult survival at each sample size (50–1000). Blue lines represent the median (solid line) and 95% CI (dotted lines) for survival using the full sample of 512 individuals.

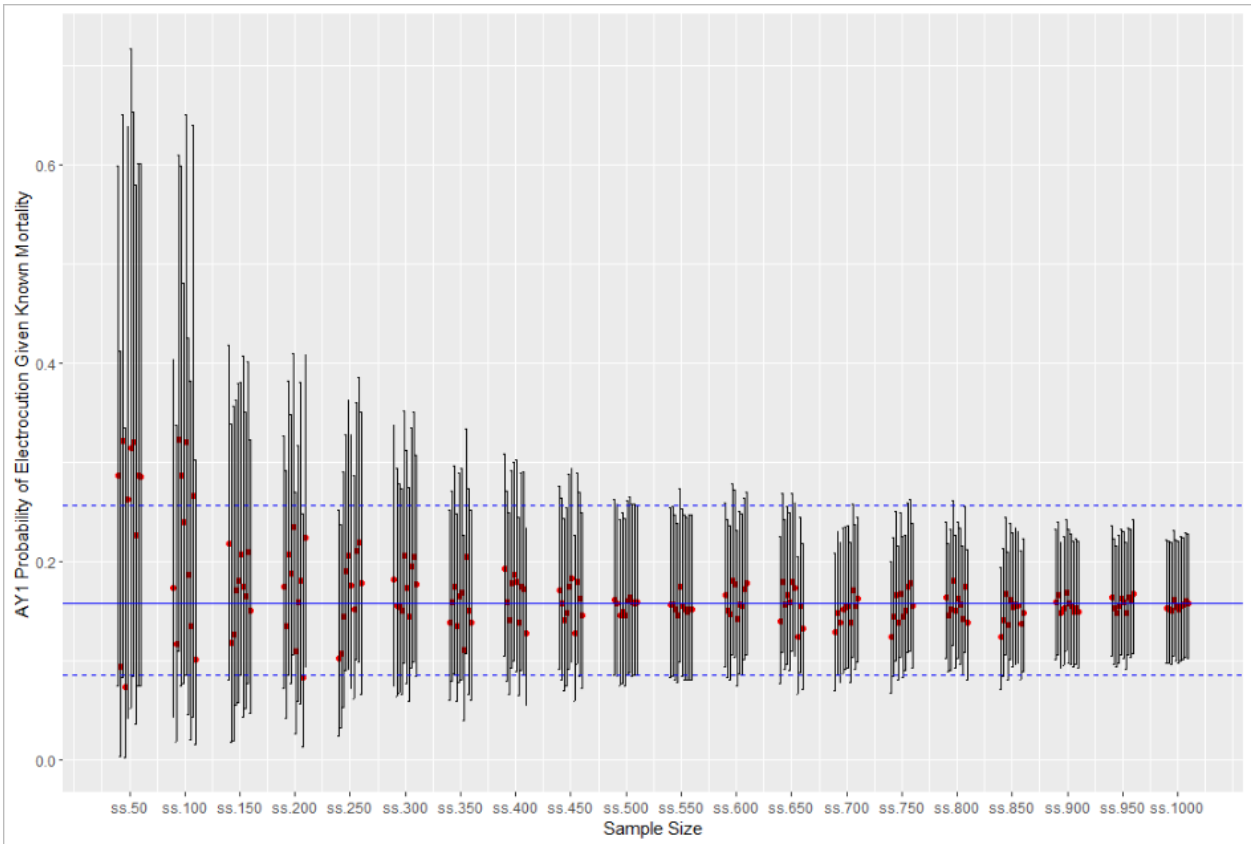

Figure 8. Plots showing median (red dot) and 95% credible interval (CI) for each of 10 estimates of adult golden eagle electrocution probability at each sample size (50–1,000). Blue lines represent the median (solid line) and 95% CI (dotted lines) for electrocution using the full sample of 512 individuals.

Table 9. Yearly costs to deploy and maintain a sample of 150 GPS-tagged adult golden eagles annually. The number of tagged eagles stabilizes after 50 tags are deployed per year in years 1–3, and 15 are deployed annually each year thereafter.

Budget Item	Year					
	1	2	3	4	5	>6
Personnel	$108,050	$108,050	$108,050	$108,050	$108,050	$86,425
GPS Tags - New[a]	$175,000	$175,000	$175,000	$175,000	$175,000	$122,500
Argos Service	$36,000	$77,760	$111,600	$141,840	$169,200	237,600
Total Cost	$319,050	$360,810	$394,650	$424,890	452,250	446,525
Cost per km^3 hazardous volume[b]	$4,153	$4,696	$5,137	$5,530	$5,886	$5,812

[a]Cost based on purchasing 50 units in years 1–5, and 35 annually thereafter.

[b]Hazardous volume from Table 12.

Figure 9 shows results of the monitoring simulations. The number of turbines that need to be monitored to accomplish the objective of ensuring actual take is less than permitted take under general permits in each EMU depends on the number of wind energy projects that enroll in the general permit program. This is because the expected number of fatalities decreases as the number of enrolled turbines decreases, and sampling intensity is linked to the expected number of fatalities. The key message from this analysis is that the monitoring fee associated with general permits should not be based on an overestimate of enrollment, as such would result in insufficient funds to meet the monitoring objectives.

These analyses suggest that an effective fatality monitoring program that satisfies the Service's fatality monitoring objective and which provided consistent demographic data on golden eagle survival could be implemented for $125,000 - $620,000 per km^3 of enrolled hazardous volume annually, depending on enrollment. Assuming an average turbine size of 0.0014 km^3 of hazardous volume and an average wind project size of 100 turbines, the annual monitoring contribution for a typical wind energy facility under the general permit program would be from ~$17,000–$87,000 annually.
For comparison, according to comments provided by the wind energy industry on the Service's October 2021 Advanced Notice of Proposed Rulemaking, annual costs for eagle fatality monitoring under current eagle take permits range from $87,000–$130,000 per year (American Clean Power 2021).

Bald Eagle Nest Disturbance Take Limit Debit

Our analysis of nest failure data indicated that the proportion of bald eagle nesting efforts subjected to potential disturbance that failed ranged from 16%–25%, depending on which subset of permits is considered (Attachment 3). Given the Service's risk tolerance policy for eagle management, we would use the 80^{th} quantile of the probability distribution for management (U.S. Fish and Wildlife Service 2016*a*). Using the 80^{th} quantile for the nest season distribution, we would set the take debit at 1.33 * 0.195 = 0.259. If this adjustment were to be incorporated, future bald eagle nest disturbance permits would be debited from the EMU take limits as 0.26 rather than 1.33.

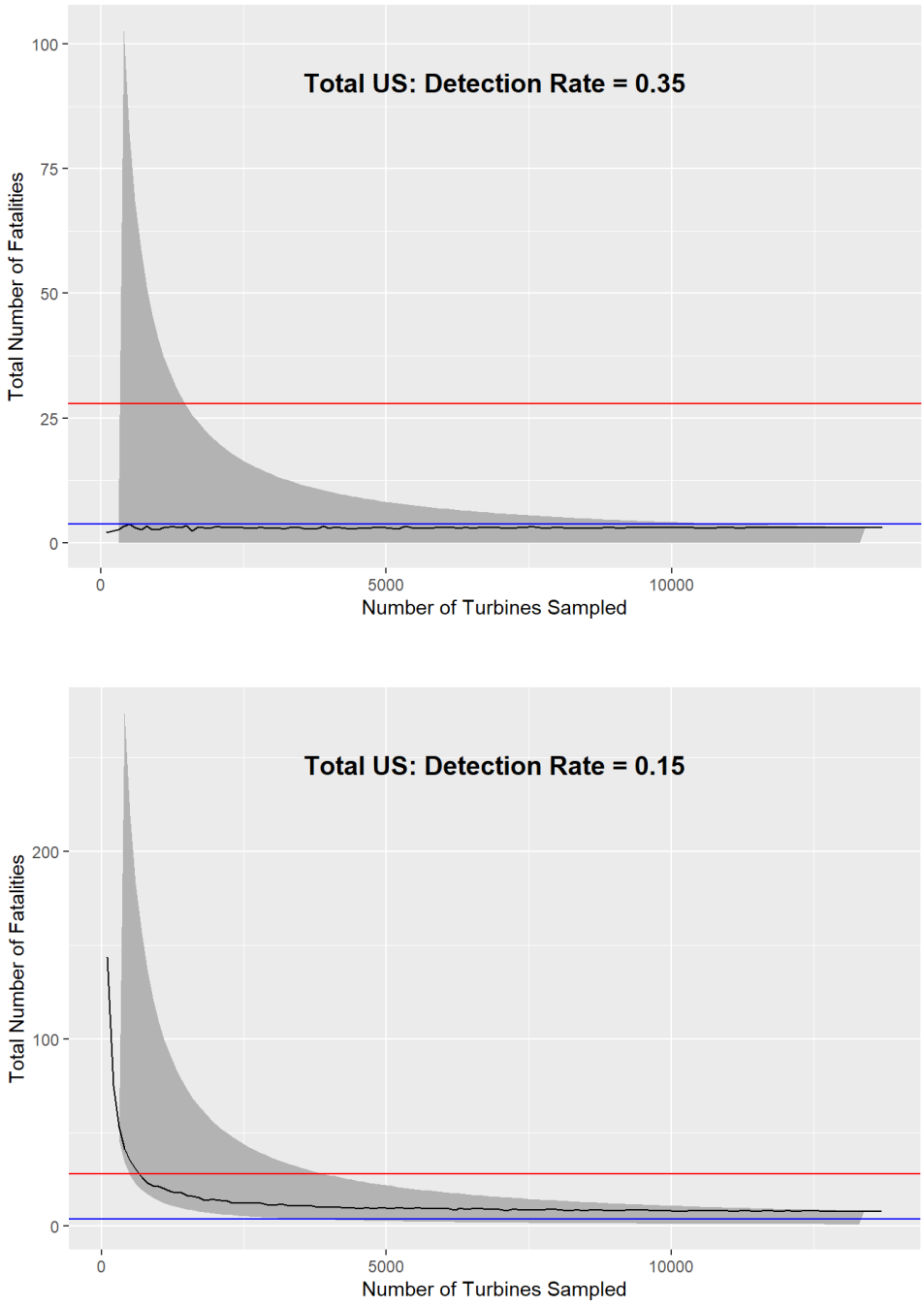

Figure 9. Monitoring simulation results for the entire general permit zone in the coterminous U.S. For these simulations, we assumed that turbine searches would be conducted with sufficient intensity that the probability of detecting a golden eagle carcass killed at a sampled turbine is 0.35 (top) or 0.15 (bottom). The blue line represents the expected number of total annual fatalities, and the red line represents the 80th quantile of the probability distribution of the number of fatalities; the 80th quantile is used as the permitted take level for debits to the EMU take limits. The gray polygon is the 95% credible interval for the estimated number of fatalities.

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Supplemental Information

Table S1 presents the list of wind energy projects used to compute prior distributions for eagle exposure for bald eagles (top) and golden eagles (bottom) in the Service's analyses.

Table S1. Anonymized list of wind energy projects, state project occurs in, mean (bird-min $hr^{-1}km^{-3}$) and variance used to construct prior distributions for eagle exposure in the Service's analyses.

Bald Eagle				
Name	State	RA95	Mean	SD
Project_1	NY	General Permit	1.20	2.03
Project_2	NY	General Permit	1.18	1.99
Project_3	NY	General Permit	1.20	2.02
Project_4	OK	General Permit	1.21	2.06
Project_5	NY	General Permit	1.21	2.10
Project_6	MO	General Permit	1156.61	1274.26
Project_7	MN	General Permit	5.75	7.34
Project_8	NY	General Permit	1.20	2.06
Project_9	NY	General Permit	1.21	2.06
Project_10	NY	General Permit	1.20	2.08
Project_11	NY	General Permit	1.19	2.03
Project_12	WA	General Permit	11.48	13.20
Project_13	OR	General Permit	3.91	5.73
Project_14	OH	General Permit	1.09	2.09
Project_15	MN	General Permit	38.64	42.91
Project_16	WV	General Permit	1.21	2.12
Project_17	NY	General Permit	1.18	2.01
Project_18	NY	General Permit	1.20	2.03
Project_19	OR	General Permit	1.09	1.88
Project_20	ME	General Permit	1.21	2.83
Project_21	NY	General Permit	1.20	2.07
Project_22	NY	General Permit	1.20	2.08
Project_23	WY	General Permit	1.08	1.85
Project_24	NY	General Permit	1.21	2.28
Project_25	NY	General Permit	1.21	2.12
Project_26	WY	General Permit	15.69	17.37
Project_27	NY	General Permit	7.64	9.31

Project_28	NY	General Permit	7.63	8.90
Project_29	NY	General Permit	1.19	1.98
Project_30	NY	General Permit	1.19	1.96
Project_31	NY	General Permit	7.64	9.20
Project_32	NY	General Permit	7.61	9.31
Project_33	NY	General Permit	7.64	9.24
Project_34	NY	General Permit	7.60	9.19
Project_35	NY	General Permit	1.19	1.97
Project_36	NY	General Permit	1.20	2.06
Project_37	NY	General Permit	1.20	2.03
Project_38	NY	General Permit	1.20	2.03
Project_39	NY	General Permit	7.53	8.86
Project_40	NY	General Permit	7.53	8.88
Project_41	NY	General Permit	1.20	2.01
Project_42	NY	General Permit	1.19	1.99
Project_43	WY	General Permit	1.09	1.82
Project_44	MO	General Permit	1.20	2.02
Project_45	SD	General Permit	1.19	2.10
Project_46	MI	General Permit	192.92	224.71
Project_47	ME	General Permit	1.21	2.04
Project_48	AZ	General Permit	5.65	6.71
Project_49	WY	General Permit	2.40	3.47
Project_50	MN	General Permit	1.20	2.10
Project_51	OR	General Permit	1.21	2.10
Project_52	NY	General Permit	1.18	2.09
Project_53	OH	General Permit	31.36	36.67
Project_54	WY	General Permit	1.19	2.04
Project_55	OH	General Permit	635.55	753.30
Project_56	OK/TX	General Permit	232.21	245.98
Project_57	FL	General Permit	15.73	17.86
Project_58	MN	General Permit	1447.33	1533.03
Project_59	MD	Specific Permit	1.20	2.05
Project_60	OH	General Permit	13.56	15.00
Project_61	OH	General Permit	5.77	7.12
Project_62	CA	General Permit	22.25	23.72

Project_63	WY	General Permit	5.76	7.08
Project_64	WY	General Permit	5.69	7.74
Project_65	WI	General Permit	70.22	70.90
Project_66	WA	General Permit	2.37	3.56
Project_67	OR	General Permit	1.09	1.79
Project_68	WA	General Permit	13.74	16.26
Project_69	MO	General Permit	1.21	2.07
Project_70	UT	General Permit	1.21	2.08
Project_71	NY	General Permit	1.21	2.05
Project_72	WY	General Permit	3.96	5.17
Project_73	WA	General Permit	3.99	5.66
Project_74	ID	General Permit	1.10	1.87
Project_75	MD	Specific Permit	426.50	465.52
Project_76	ME	General Permit	1.20	1.98
Project_77	CO	General Permit	1.20	2.04
Project_78	WV	General Permit	1.21	2.12
Project_79	WV	General Permit	1.17	1.96
Project_80	CA	General Permit	1.20	2.13
Project_81	MO	General Permit	1.19	2.02
Project_82	ME	General Permit	1.19	2.02
Project_83	NY	General Permit	1.21	2.07
Project_84	MN	Specific Permit	1.22	2.09
Project_85	NC	Specific Permit	108.70	116.13
Project_86	MN	General Permit	11.54	12.71
Project_87	MN	General Permit	7.68	8.85
Project_88	OH	General Permit	1.20	2.02
Project_89	NY	General Permit	1.21	2.04
Project_90	NY	General Permit	1.20	2.01
Project_91	WI	General Permit	1.20	2.15
Project_92	AZ	General Permit	1.08	1.82
Project_93	MN	General Permit	47.79	51.51
Project_94	OH	General Permit	3.98	5.29
Project_95	MT	General Permit	1.21	2.05
Project_96	PA	General Permit	1.19	2.02
Project_97	PA	General Permit	1.19	1.99

Project_98	CA	General Permit	1.08	1.82
Project_99	OH	General Permit	1.22	2.13
Project_100	OH	General Permit	20.16	22.09
Project_101	MN	General Permit	1.09	1.88
Project_102	MI	General Permit	22.11	26.56
Project_103	WY	General Permit	1.08	1.83
Project_104	IA	General Permit	1.21	2.03
Project_105	CA	General Permit	1.07	1.82
Project_106	ME	General Permit	1.19	1.97
Project_107	OR	General Permit	1.21	2.26
Project_108	WY	General Permit	1.08	1.98
Project_109	WA	General Permit	2.36	3.38

Golden Eagle				
Name	State	Permit	Mean	SD
Project_1	NY	General Permit	0.73	1.21
Project_2	NY	General Permit	0.73	1.21
Project_3	NY	General Permit	0.73	1.21
Project_4	CA	Specific Permit	41.83	29.56
Project_5	NM	General Permit	0.64	1.12
Project_6	OK	General Permit	0.73	1.23
Project_7	NY	General Permit	0.73	1.22
Project_8	MO	General Permit	18.14	13.53
Project_9	NY	General Permit	0.73	1.21
Project_10	NY	General Permit	0.73	1.20
Project_11	NY	General Permit	0.73	1.23
Project_12	NY	General Permit	0.73	1.21
Project_13	WA	Specific Permit	12.85	9.88
Project_14	OR	Specific Permit	17.97	12.96
Project_15	WV	Specific Permit	0.73	1.23
Project_16	NY	General Permit	0.73	1.20
Project_17	NY	General Permit	0.74	1.22
Project_18	OR	Specific Permit	10.30	8.20
Project_19	ME	General Permit	0.73	1.25
Project_20	NY	General Permit	0.73	1.24
Project_21	WY	Specific Permit	246.52	177.82
Project_22	NY	General Permit	0.72	1.19
Project_23	NY	General Permit	0.74	1.23
Project_24	WY	Specific Permit	0.64	1.10
Project_25	NY	General Permit	0.73	1.22
Project_26	WY	Specific Permit	241.85	173.09
Project_27	WY	Specific Permit	1.93	2.25
Project_28	MO	General Permit	0.63	1.10
Project_29	MI	General Permit	15.38	12.57
Project_30	ME	General Permit	0.73	1.20
Project_31	AZ	General Permit	10.32	7.81
Project_32	WY	Specific Permit	72.41	50.56

Project_33	MN	General Permit	0.73	1.20
Project_34	OR	Specific Permit	0.72	1.20
Project_35	NY	General Permit	0.74	1.21
Project_36	WY	Specific Permit	0.73	1.20
Project_37	OK/TX	General Permit	245.28	181.40
Project_38	MN	General Permit	3.74	3.56
Project_39	MD	General Permit	0.63	1.12
Project_40	OH	General Permit	0.64	1.09
Project_41	CA	General Permit	1.91	2.23
Project_42	WY	Specific Permit	44.96	31.36
Project_43	WY	Specific Permit	15.25	11.30
Project_44	WA	Specific Permit	1.91	2.23
Project_45	OR	Specific Permit	48.13	33.81
Project_46	WA	Specific Permit	3.74	8.70
Project_47	MO	General Permit	0.74	1.22
Project_48	UT	Specific Permit	0.74	1.22
Project_49	WY	Specific Permit	111.05	86.91
Project_50	NY	General Permit	0.73	1.21
Project_51	WY	Specific Permit	38.72	27.71
Project_52	WA	Specific Permit	45.04	31.53
Project_53	CA	Specific Permit	0.73	1.21
Project_54	ID	Specific Permit	3.76	3.55
Project_55	MD	General Permit	0.63	1.10
Project_56	ME	General Permit	0.74	1.25
Project_57	CO	Specific Permit	0.73	1.22
Project_58	WV	General Permit	0.73	1.19
Project_59	WV	General Permit	0.73	1.23
Project_60	CA	Specific Permit	0.74	1.25
Project_61	MO	General Permit	0.73	1.24
Project_62	CA	Specific Permit	114.41	80.00
Project_63	ME	General Permit	0.73	1.23
Project_64	NY	General Permit	0.74	1.22
Project_65	CA	General Permit	32.57	23.07
Project_66	AZ	General Permit	58.52	40.96
Project_67	MN	General Permit	0.63	1.08

Project_68	NY	General Permit	0.74	1.24
Project_69	NY	General Permit	0.74	1.22
Project_70	WY	Specific Permit	0.74	1.24
Project_71	AZ	Specific Permit	29.36	20.74
Project_72	MN	General Permit	0.64	1.11
Project_73	MT	Specific Permit	0.74	1.25
Project_74	CA	Specific Permit	12.79	9.74
Project_75	PA	General Permit	0.73	1.21
Project_76	PA	General Permit	0.73	1.23
Project_77	CA	Specific Permit	5.76	4.86
Project_78	OH	General Permit	0.64	1.12
Project_79	WY	Specific Permit	429.38	305.51
Project_80	CA	Specific Permit	1.95	2.27
Project_81	IA	General Permit	0.65	1.13
Project_82	CA	Specific Permit	15.26	11.42
Project_83	ME	General Permit	0.74	1.72
Project_84	OR	Specific Permit	0.74	1.23
Project_85	WY	Specific Permit	29.27	20.57
Project_86	AZ	Specific Permit	8.03	6.49
Project_87	WY	Specific Permit	177.46	124.50
Project_88	WA	Specific Permit	32.11	22.55

Attachment 1: Estimating Bald and Golden Eagle Take from Wind Turbines in the United States

Introduction

Wind energy is a rapidly growing industry in the United States with the power capacity of wind turbines more than tripling since 2008 (U.S. Department of Energy 2021). Coincident with this marked increase in the number of turbines on the landscape is the risk of bird collisions and potential impacts on their populations. Mortality from wind turbine collisions has been estimated to exceed half a million birds annually, including more than 80,000 raptors (Smallwood 2013). Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are particularly vulnerable to wind-turbine mortality as a result of much of their important habitat overlapping with areas where wind resources are amenable for developing wind energy facilities (Buehler 2000; Katzner et al. 2020; National Renewable Energy Laboratory 2017). Therefore, it is important to quantify the influence of wind energy development on eagle populations when formulating management and conservation strategies.

The U.S. Fish and Wildlife Service's (Service) National Raptor Program (NRP) was tasked to evaluate the effects of a proposed general eagle incidental take permit on bald and golden eagle populations (U.S. Fish and Wildlife Service 2022); NRP then updated take estimates for the preferred alternative for the final rule. The Service intends for the general permit to be consistent with the eagle management objectives established in the 2016 Programmatic Environmental Impact Statement covering the eagle permit regulations (U.S. Fish and Wildlife Service 2016). The objective of the general permit type is to preauthorize the incidental take of eagles in areas of the U.S. where take at individual locations is expected to be minimal. A fundamental initial decision the Service must make is how the area in which general permits will be made available will be determined. Because the Service is preauthorizing take in the absence of local information on eagle abundance or use, a strong argument can be made to use broader indices of relative abundance as the basis for designating areas of the U.S. where general permits are preapproved. For this we used bald and golden eagle relative abundance maps developed from eBird relative abundance data, following methods previously used for bald eagles (Ruiz-Gutierrez et al. 2021).

Collision risk models (CRMs) are a valuable tool for assessing the potential impacts of wind turbines on birds (Masden and Cook 2016). A CRM generally requires site-specific data, including a count of the number of birds within a hazardous space (i.e., to estimate the likely number of collision events) and a calculation of the probability of a collision occurring. However, there is often a lack of site-specific data to inform a CRM, particularly at larger spatial scales. New et al. (2015, 2021) developed a CRM that is structured in a Bayesian framework, whereby site-specific data in the model can be replaced with prior-probability distributions derived from wind energy facilities throughout the U.S. This serves as an ideal modelling approach for the Service's aim of estimating take of bald and golden eagles at a nationwide scale.

Our objectives were to, (1) delineate a general permit zone that represents a lower risk (based on relative abundance) of bald and golden eagle collisions with wind turbines, and (2) use a CRM to estimate annual bald and golden eagle mortalities from wind turbines in Alaska and the coterminous U.S. based on the current level of wind energy development in the U.S.

Methods

Turbine Data

We downloaded turbine data from the U.S. Geological Survey (USGS) U.S. Wind Turbine Database (Hoen et al. 2018), which provides turbine locations and specifications. We used these data to estimate the hazardous space for each turbine when operating during daylight hours. We calculated turbine-specific number of daylight hours based on turbine locations and for turbines where specifications were not reported, we imputed the mean rotor diameter across turbines where specifications were provided.

Collision Risk Model

We used a CRM developed by New et al. (2015, 2021) for estimating avian fatalities at wind energy facilities to estimate bald and golden eagle mortalities due to wind-turbine collisions. The CRM parameters are modeled in a Bayesian framework where uncertainty surrounding eagle exposure and collision probability are defined by prior-probability distributions (priors) for each parameter, which are estimated from wind energy facilities across the U.S. (see *Collision Risk Model Exposure Prior Distributions* section below). Site-specific pre-construction eagle use and post-construction eagle mortality monitoring data can then be used to update these priors, which decrease the uncertainty of the parameter estimates and results in more precise estimates of annual eagle fatalities at a site (New et al. 2015).

We ran the CRM in R 4.1.2 (R Core Team 2021) to estimate annual take of bald and golden eagles across all onshore wind-energy facilities in Alaska and the coterminous U.S. Site-specific eagle-use data were not available for all wind energy facilities, and thus, we used priors for eagle exposure and collision probability in the CRM to estimate annual eagle fatalities. The CRM incorporates, (1) a prior for pre-construction eagle use (eagle exposure), which accounts for the time eagles spend in the turbine's hazardous space as a function of survey effort (eagle-minutes$\cdot$hour$^{-1}\cdot$km^{-3}), (2) a prior for the probability of an eagle colliding with a turbine while within the turbine's hazardous space (collision probability, eagles$\cdot$eagle-minute^{-1}), and (3) the hazardous space of a turbine (expansion factor, Eqn 1); the only site-specific data included in the CRM.

$$\text{Expansion factor} = th\pi r^2 \qquad (1)$$

Here, t is turbine location-specific daylight hours (i.e., both species of eagle exhibit diurnal behavior), h is turbine hazardous space height (a constant set at 200 m to correlate with the designated height for eagle-use surveys), and r is turbine rotor radius (m). In our models, we treated each turbine independently and turbines were assumed to be operating during all daylight hours.

Eagle Management Units and Migratory Behavior

The CRMs were spatially stratified by the Service bald or golden eagle management unit (EMU) and/or sub-EMU based on regional species-specific migratory behavior, and EMU-specific annual take estimated. We used eBird status and trend abundance maps (Fink et al. 2022) to determine seasonal eagle presence, with input from the Service's Regional Eagle Permit Biologists. Therefore, within each EMU or sub-EMU, we adjusted daylight hours to reflect the

migratory behavior of each species (i.e., for any period when a species is expected to be absent, daylight hours in the model are set to zero) and used these adjusted daylight hours to calculate the expansion factor.

Eagle Relative Abundance

The Cornell University Lab of Ornithology provided us with processed eBird relative abundance data from 2020 to develop combined bald and golden eagle relative abundance maps. eBird relative abundance values represent the average number of eagles of each species expected to be seen by an expert eBirder who observes for 1 hour at the optimal time of day for detecting the species, and who travels no more than 1 km during the observation session (for more details on eBird data collection methods, see https://ebird.org/spain/science/status-and-trends/faq#mean-relative-abundance). The dataset we used provided relative abundance estimates for bald and golden eagles throughout the coterminous U.S. at a ~3-km^2 resolution for each of four periods (non-breeding, 7 December–1 February; pre-breeding migration, 8 February–31 May; breeding, 7 June–24 August; and post-breeding migration, 31 August–30 November). Using multiple seasons of data provides better measures of relative abundance for mapping purposes; our goal was to identify locations with high relative abundance in any single season.

Our objective was to identify regions in the coterminous U.S. that represent areas of lower relative abundance for bald and golden eagles whereby existing or potential wind energy facilities can apply for a permit that preauthorizes incidental take of eagles due to take in these areas expected to be minimal (i.e., general permit zone). Wind energy facilities outside of this general permit zone (i.e., in areas of higher bald and golden eagle relative abundance) would still be required to apply for the current type of permit to authorize eagle take based on data collected at that site (i.e., specific permit zone). Based on population estimates for bald and golden eagles, and thus species-specific risk tolerance, we mapped the threshold between the general and specific permit zones at the 95th quantile for bald eagles (RA95) and the 50th quantile for golden eagles (RA50).

We started by removing cells (map pixels) with relative abundance values of zero, before defining the thresholds delineating general and specific permits for each seasonal raster in R 4.1.2 (R Core Team 2021). If we had included zero-value cells, we would have been including a large amount of area where eagles are not at risk from being struck by wind turbines, because they do not occur there. We identified all ~3-km^2 cells that had relative abundance values in each season that exceeded the relevant species-specific quantile and combined these to identify all cells that exceeded the threshold in any single season. We then created maps delineating the general (i.e., grid cells that did not exceed the relative abundance threshold in any season) and specific permit zones.

We wanted to determine an operational general permit zone that incorporated risk tolerance for both bald and golden eagles, and so we created a map combining both RA95 and RA50 into a single map and identified areas where the bald eagle specific zone overlapped the golden eagle general zone, and conversely, where the golden eagle specific zone overlapped the bald eagle general zone. Individual turbines that fell into each of these zones were grouped to estimate take for each zone. All wind energy facilities located within these overlapping zones, when applying for an eagle take permit, would require a specific-zone permit.

Estimation of Priors

The exposure and collision probability priors that we used in the CRM to estimate bald and golden eagle take were derived from pre-construction and mortality monitoring data, respectively, collected at wind energy facilities across the U.S. The mean and variance of the exposure and collision probability priors were calculated from a mixture distribution based on these data and were assumed to come from gamma and beta distributions, respectively (New et al. 2015). We used criteria described in New et al. (2021) to filter the data used to derive the exposure and collision probability priors. In addition, for the estimation of exposure priors, we excluded data from wind energy facilities where they did not conduct eagle-use surveys across all periods when each species is expected to be present in the area or the radius of survey plots was < 800 m.

We developed permit zone-specific exposure priors for both bald and golden eagles based on which zone the wind energy facilities that were used for estimating the priors were located. In areas where the bald eagle specific zone overlapped the golden eagle general zone, golden eagle general zone exposure priors were used to estimate golden eagle take for this group of turbines and this take was included in the specific permit zone total for this EMU. Conversely, bald eagle general zone priors were used to estimate bald eagle take for the grouped turbines in the area where the golden eagle specific zone overlapped the bald eagle general zone, and this take was included in the specific permit zone take total. The initial priors were developed in 2013 with data from 11 wind energy facilities (U.S. Fish and Wildlife Service 2013). Upon further review, the data from two of these facilities were removed in 2015, so the priors created in 2015 used data from 9 wind energy facilities (New et al. 2015). For this update, we updated the 2015 exposure prior distribution with additional data; 109 datasets for bald and 88 for golden eagles.

The collision probability priors used in the CRM to estimate bald and golden eagle take were taken from New et al. (2021) and were not permit zone specific (Table A1.1). These priors were calculated from data from 14 wind energy facilities for bald eagles and 21 facilities for golden eagles.

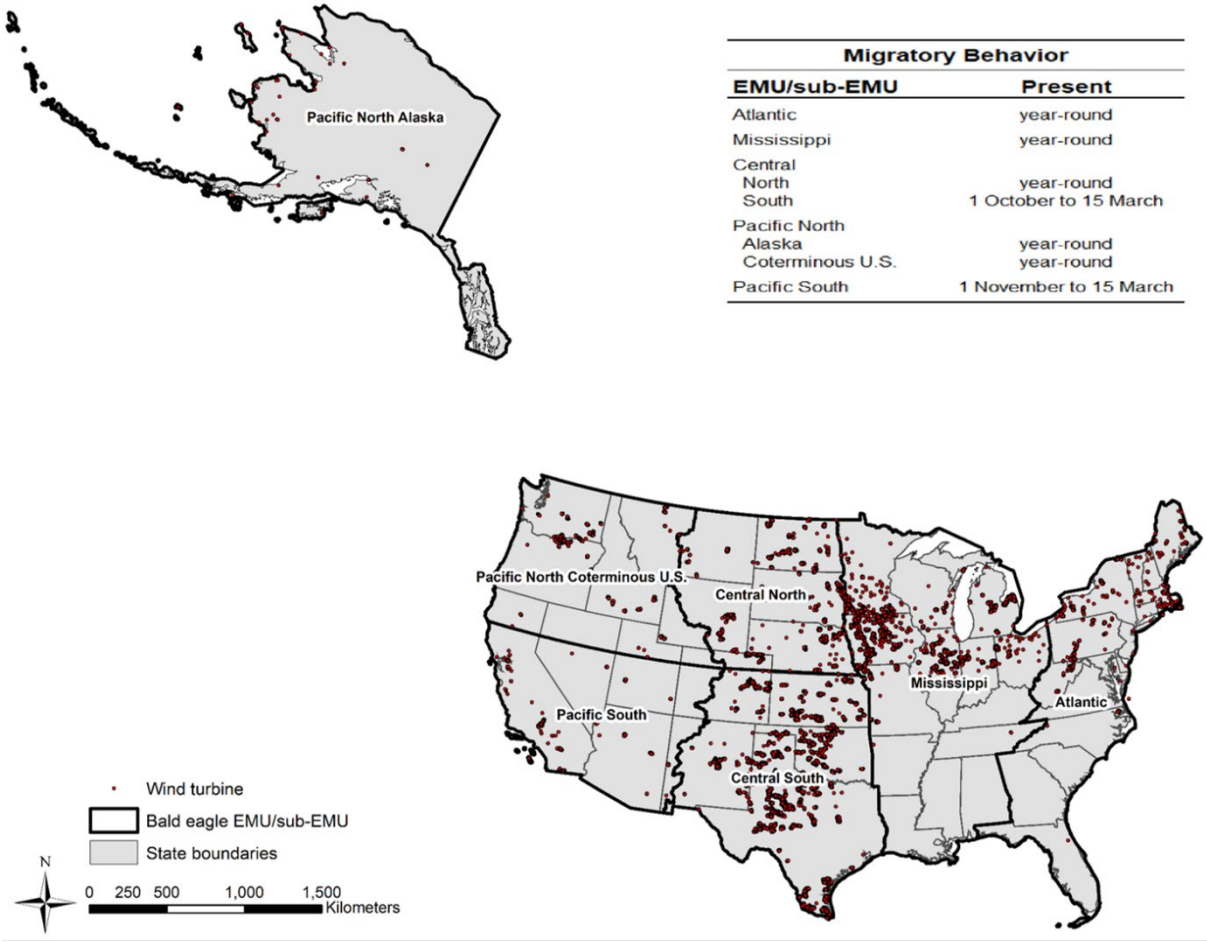
Table A1.1. Bald and golden eagle distribution parameters by permit zone used in the collision risk model to estimate eagle take in Alaska and the coterminous U.S.

Species	Permit Zone	Eagle Exposure			Collision Probability		
		Mean ± SD	Gamma		Mean ± SD	Beta	
		eagle-minutes·hour^{-1}·km^{-3}	α	β	eagles·eagle-minute^{-1}	α	β
Bald Eagle	General	0.43 ± 0.80	0.2888	0.6704	0.007 ± 0.005	1.61	228.2
	Specific	6.57 ± 7.37	0.7961	0.1211			
Golden Eagle	General	0.06 ± 0.12	0.2437	4.0003	0.006 ± 0.005	1.29	227.6
	Specific	1.48 ± 2.28	0.4256	0.2866			

Results

Turbine Data

The USGS U.S. Wind Turbine Database contained 70,809 turbines as of January 2022 (Hoen et al. 2018). For our analyses, we removed turbines located in Hawaii, Puerto Rico, and Guam (n = 196), non-island-based offshore turbines (n = 5), and turbines with unspecified locations (n = 3), leaving a total of 70,605 onshore turbines covering Alaska and the coterminous U.S. (Tables A1.2 and A1.3). Data on rotor diameter were absent for 5,394 turbines (8%) to which we assigned the average rotor diameter of 95.7 m. More than half of the turbines (54%) are located in the Central Flyway and one quarter (25%) are in the Mississippi Flyway (Figs. A1.1 and A1.2; Tables A1.2 and A1.3). The proportions of turbine hazardous volume in each EMU are similar to the proportions of turbines (Tables A1.2 and A1.3), indicating that there is little variation in turbine sizes among EMUs.



Migratory Behavior	
EMU/sub-EMU	**Present**
Atlantic	year-round
Mississippi	year-round
Central	
North	year-round
South	1 October to 15 March
Pacific North	
Alaska	year-round
Coterminous U.S.	year-round
Pacific South	1 November to 15 March

Figure A1.1. Map showing the Service's bald eagle management units (EMUs) and sub-EMUs, location of wind turbines in Alaska and the coterminous U.S. as of January 2022, and bald eagle migratory behavior by EMU and sub-EMU.

Table A1.2. Number of wind turbine generators (WTGs), hazardous volume (HazKm^3, km^3), and daylight hours (DayLtHr, million) by bald eagle management unit (EMU) and permit zone in Alaska and the coterminous U.S. as of January 2022.

	General Permit Zone			Specific Permit Zone			Total		
EMU	WTGs	HazKm^3	DayLtHr	WTGs	HazKm^3	DayLtHr	WTGs	HazKm^3	DayLtHr
Atlantic	3,069	3.87	13.7	173	0.26	0.8	3,242	4.13	14.5
Mississippi	17,630	27.30	78.6	58	0.12	0.3	17,688	27.42	78.9
Central	31,759	52.32	66.4	6,230	9.72	22.5	37,989	62.04	88.9
Pacific North	2,660	3.35	11.9	2,442	2.75	10.9	5,102	6.10	22.8
Pacific South	2,378	2.83	3.4	4,206	4.57	5.9	6,584	7.40	9.3
Total	57,496	89.67	173.9	13,109	17.42	40.4	70,605	107.09	214.3

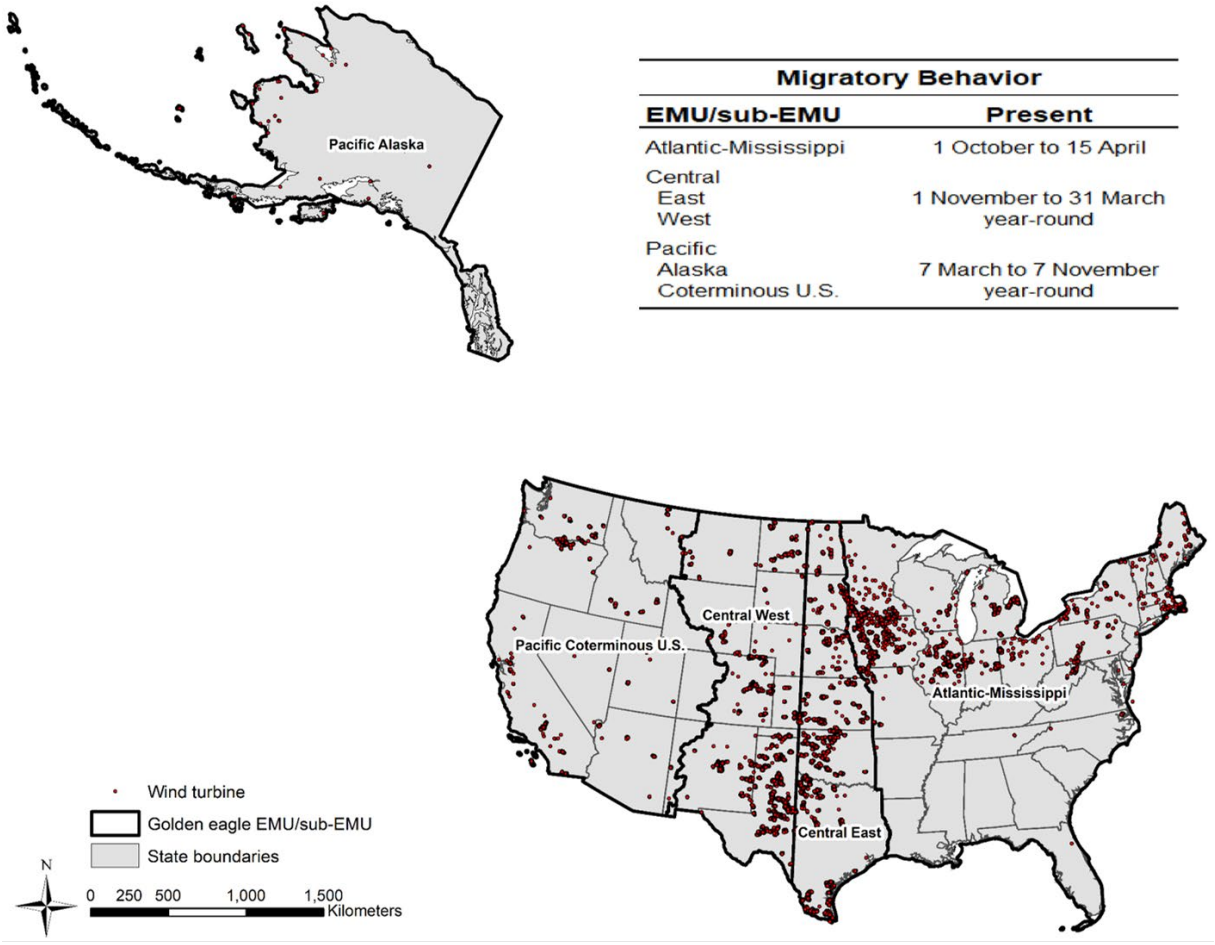


Figure A1.2. Map showing the Service's golden eagle management units (EMUs) and sub-EMUs, location of wind turbines in Alaska and the coterminous U.S. as of January 2022, and golden eagle migratory behavior by EMU and sub-EMU.

Table A1.3. Number of wind turbine generators (WTGs), hazardous volume ($HazKm^3$, km^3), and daylight hours (DayLtHr, million) by golden eagle management unit (EMU) and permit zone in Alaska and the coterminous U.S. as of January 2022.

	General Permit Zone			Specific Permit Zone			Total		
EMU	WTGs	$HazKm^3$	DayLtHr	WTGs	$HazKm^3$	DayLtHr	WTGs	$HazKm^3$	DayLtHr
Atlantic - Mississippi	20,699	31.10	43.1	231	0.38	0.5	20,930	31.48	43.5
Central	31,759	52.40	91.6	6,230	9.72	26.3	37,989	62.12	118.0
Pacific	5,038	6.18	22.5	5,038	7.32	29.1	11,686	13.50	51.6
Total	57,496	89.68	157.2	13,109	17.43	55.9	70,605	107.11	213.1

Eagle Management Units and Migratory Behavior

Bald eagles are generally present year-round in the eastern U.S. (Atlantic and Mississippi Flyways) and the northern half of the western and central U.S., and Alaska (Central and Pacific North Flyways), whereas in most of the Central South and Pacific South, they are only present during winter (Fig. A1.1). In contrast, golden eagles can be found year-round in the western half of the coterminous U.S. and only in winter in the eastern half, and in summer in Alaska (Fig. A1.2). Due to differing periods of eagle presence within the Central Flyway, it was subdivided into Central North and South for bald eagles and Central East and West for golden eagles (Figs. A1.1 and A1.2).

Eagle Relative Abundance

When the bald eagle RA95 and the golden eagle RA50 are combined in a map, 82% of the turbines are in the general permit zone and 18% are in the specific permit zone (Figure. A1.1 and Figure A1.2; Table 4 and 5). For bald eagles, 18% of the turbines that are in the general permit zone overlap with the golden eagle specific permit zone, and these wind energy facilities would require a specific zone permit to authorize eagle take (Figure A1; Table A1.4). For golden eagles, <1% of the turbines that are in the general permit zone overlap with the bald eagle specific permit zone, and these wind energy facilities would require a specific zone permit to authorize eagle take (Figure A2; Table A1.5).

Table A1.4. Annual estimates of mean bald eagle take and standard deviation (SD), median take (50Q), and take at the 60th quantile (60Q) by bald eagle management unit (EMU), permit zone, and exposure prior used in the collision risk model for Alaska and the coterminous U.S.

EMU	Permit Zone	Exposure Prior	Turbines (#)	Mean	SD	Q50	Q60
Atlantic	General	General	3,069	52	129	8	16
	Specific	General	111	2	4	0	1
	Specific	Specific	62	26	42	11	17
Mississippi	General	General	17,630	367	912	55	114
	Specific	General	0	0	0	0	0
	Specific	Specific	58	25	41	11	16
Central	General	General	31,759	330	822	50	103
	Specific	General	6,226	103	257	16	32
	Specific	Specific	4	1	2	1	1
Pacific North	General	General	2,660	45	113	7	14
	Specific	General	2,298	36	90	5	11
	Specific	Specific	144	15	15	7	10
Pacific South	General	General	2,378	12	30	2	4
	Specific	General	4,206	19	48	3	6
	Specific	Specific	0	0	0	0	0
Total			70,605	1,033		176	345

Table A1.5. Annual estimates of mean golden eagle take and standard deviation (SD), median take (50Q), and take at the 80th quantile (80Q) by golden eagle management unit (EMU), permit zone, and exposure prior used in the collision risk model for Alaska and the coterminous U.S.

EMU	Permit Zone	Exposure Prior	Turbines (#)	Mean	SD	Q50	Q80
Atlantic-Mississippi	General	General	20,699	22	63	2	24
	Specific	General	120	0	1	0	0
	Specific	Specific	111	2	5	1	3
Central	General	General	31,759	50	140	5	53
	Specific	General	4	0	0	0	0
	Specific	Specific	6,226	347	770	81	452
Pacific	General	General	5,038	9	27	1	10
	Specific	General	3	0	0	0	0
	Specific	Specific	6,645	271	600	63	354
Total			70,605	701		153	896

Estimation of Priors

As of 2022, we had eagle-use survey data from an additional 100 wind energy facilities for bald eagles and 79 for golden eagles to update the New et al. 2015 exposure prior distributions (Figure. A1.3 and Figure A1.4). The 2022 exposure prior used to estimate take of bald eagles in the general permit zone was Gamma(0.29, 0.67) with a mean ± SD of 0.43 ± 0.80 eagle minutes $hour^{-1}$ $(km^3)^{-1}$ and was estimated with data from 105wind energy facilities (Table A1.1). The

bald eagle exposure prior for the specific permit zone was Gamma(0.80, 0.12) with a mean ± SD of 6.57 ± 7.37 eagle minutes hour^{-1} (km^3)$^{-1}$ and was estimated with data from 4 wind energy facilities. The exposure prior used to estimate take of golden eagles in the general permit zone was Gamma(0.24, 4.00) with a mean ± SD of 0.06 ± 0.12 eagle minutes hour^{-1} (km^3)$^{-1}$ and was estimated with data from 49 wind energy facilities (Table A1.1). The golden eagle exposure prior for the specific permit zone was Gamma(0.43,0.29) with a mean ± SD of 1.48 ± 2.28 eagle minutes hour^{-1} (km^3)$^{-1}$ and was estimated with data from 39 wind energy facilities.

The collision probability prior used to estimate take of bald eagles was Beta(1.61, 228.2) with a mean ± SD of 0.007 ± 0.005 eagles/minute of exposure (Table A1.1). The collision probability prior used to estimate take of golden eagles was Beta(1.29, 227.6) with a mean ± SD of 0.006 ± 0.005 eagles/minute of exposure (Table A1.1).

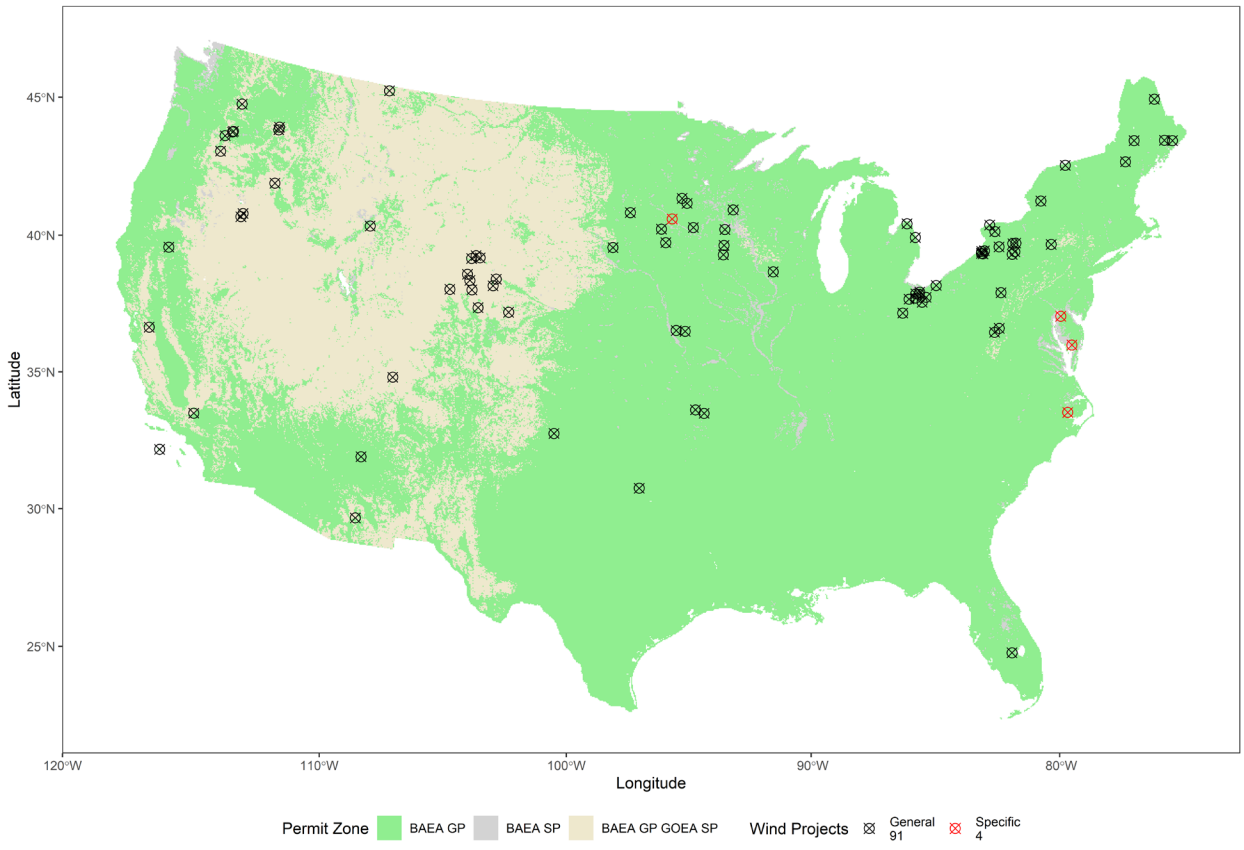


Figure A1.3. Map showing bald eagle general (BAEA GP) and specific (BAEA SP) permit zones based on bald eagle relative abundance at the 95th quantile; areas where bald eagle general permit zone overlaps golden eagle specific permit zone based on eBird golden eagle relative abundance at the 50th quantile (BAEA GP GOEA SP), and locations of wind energy projects that were included in the estimation of the general and specific permit zone-specific bald eagle exposure priors. Alaska (not shown) is in the specific permit zone.

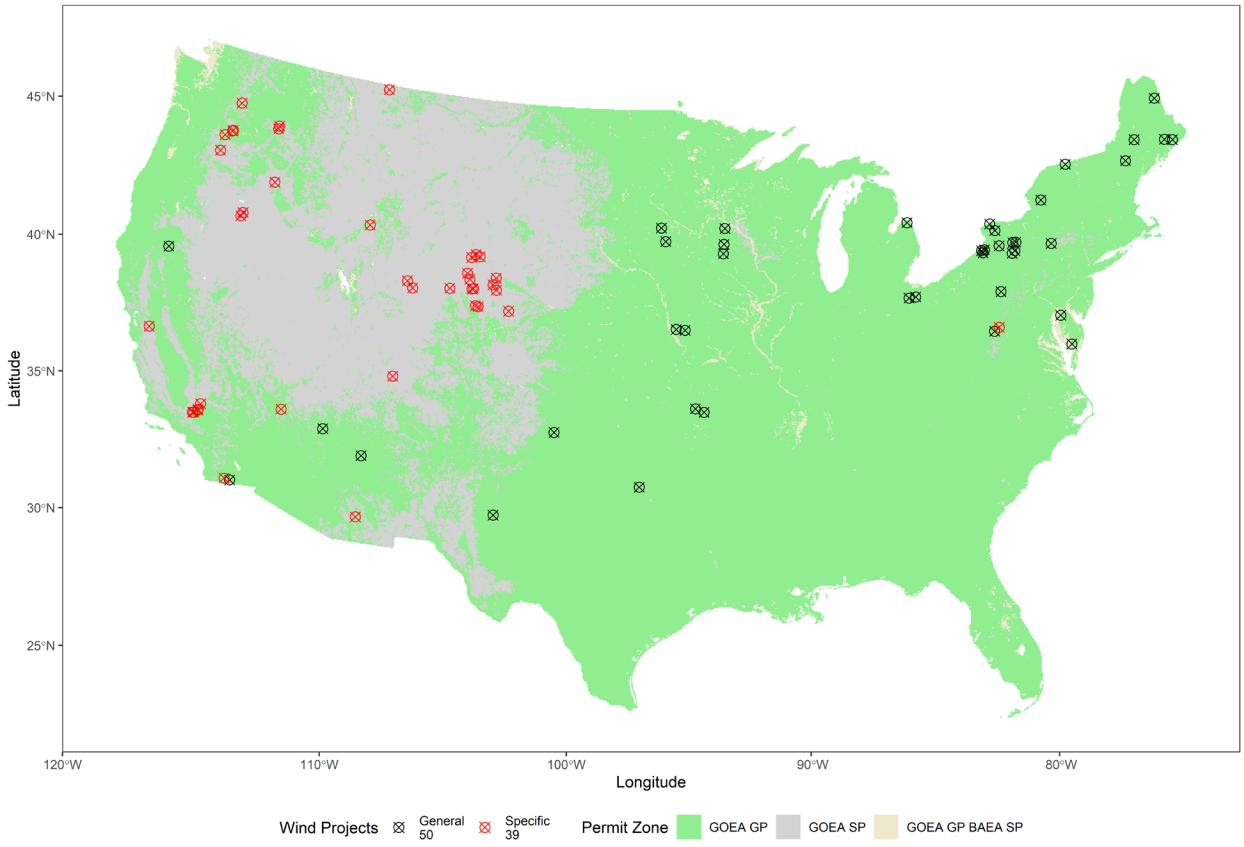


Figure A1.4. Map showing golden eagle general (GOEA GP) and specific (GOEA SP) permit zones based on eBird golden eagle relative abundance at the 50th quantile; areas where golden eagle general permit zone overlaps bald eagle specific permit zone based on eBird bald eagle relative abundance at the 95th quantile (GOEA GP BAEA SP), and locations of wind energy projects that were included in the estimation of the general and specific permit zone-specific golden eagle exposure priors. All of Alaska (not shown) is in the specific permit zone.

Eagle Take

The Service uses the 60th and the 80th quantile of the fatality probability distribution as the take estimate for debiting bald and golden eagle EMU take limits, respectively. The total estimated bald eagle take across Alaska and the coterminous U.S. at the 60th quantile was 345 individuals, ranging from 10 in the Pacific South to 136 in the Central (Table A1.4; Fig. A1.5). Estimated bald eagle take in the general permit zone was 251 individuals and 94 in the specific permit zone (Table A1.4). The total estimated golden eagle take across Alaska and the coterminous U.S. at the 80th quantile was 896 individuals, ranging from 27 in Atlantic-Mississippi to 505 in Central (Table A1.5; Fig. A1.6). Estimated golden eagle take in the general permit zone was 87 individuals and 809 in the specific permit zone (Table A1.5).

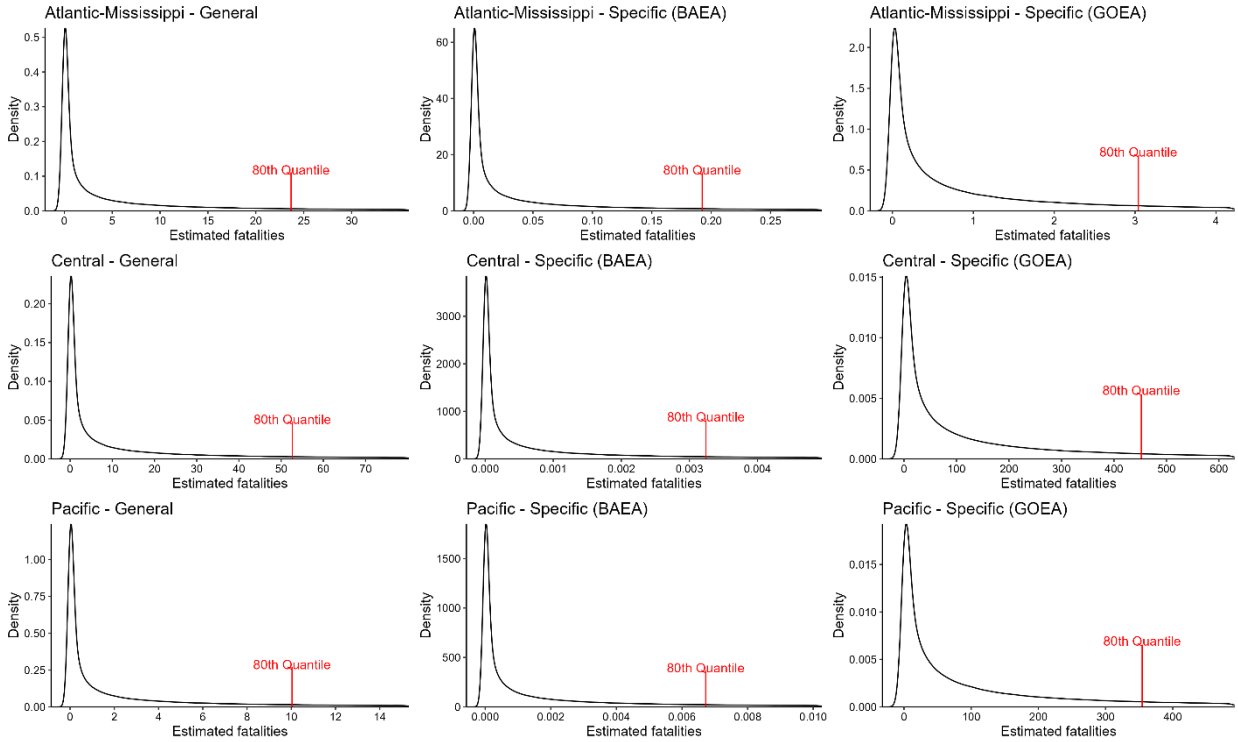


Figure A1.5. Bald eagle posterior density distributions of annual fatality estimates by bald eagle management unit and permit zone (General or Specific) in Alaska and the coterminous U.S. The eagle species in parentheses refer to the specific permit zone for that species.

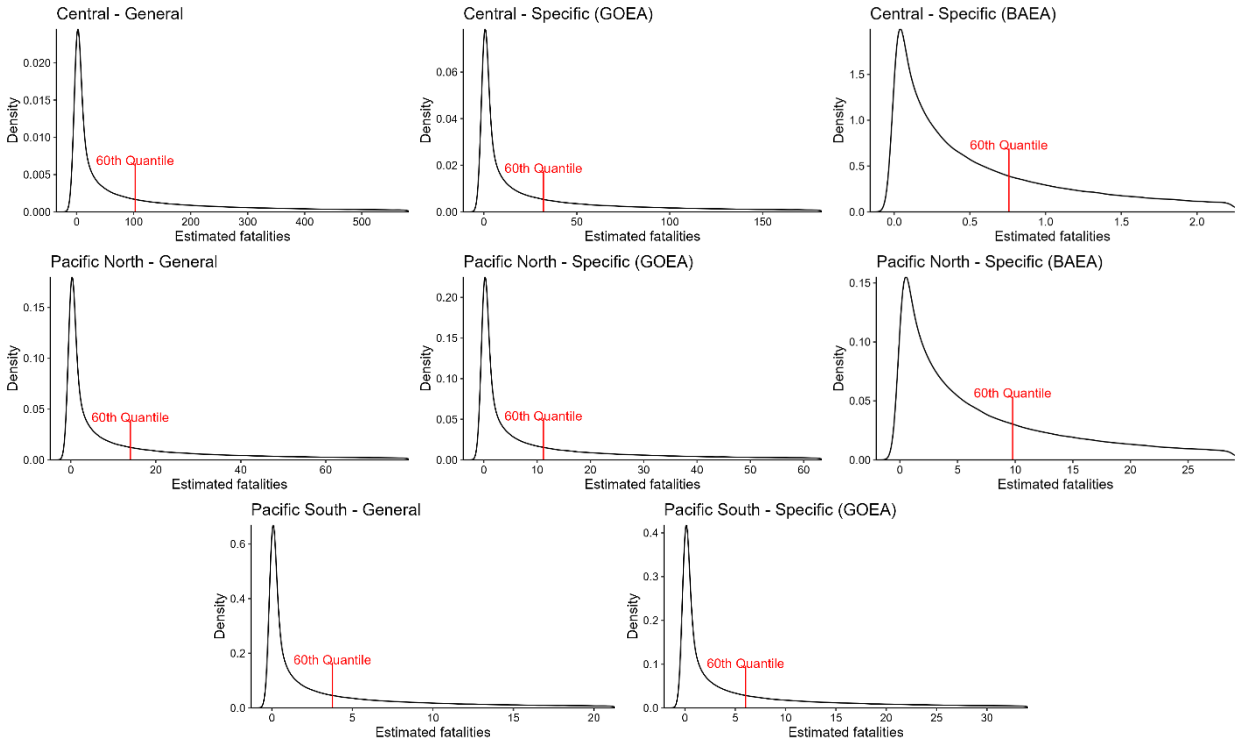


Figure A1.6. Golden eagle posterior density distributions of annual fatality estimates by golden eagle management unit and permit zone (General or Specific) in Alaska and the coterminous U.S. The eagle species in parentheses (BAEA = bald eagle; GOEA = golden eagle) refer to the specific permit zone for that species.

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Attachment 2: Golden Eagle PTT Monitoring

PTT Monitoring (GOEA only)

Use of PTT data. Previously, we used PTT data from 512 individual golden eagles in an integrated population model to estimate survival and cause of death from 1997–2016 (Millsap et al. 2022). Eagles were banded by several independent researchers throughout the coterminous US, which provided a reasonable representation of vital rates throughout the region. Specifically, we were able to estimate survival rates for first-year (Y1), second-year (Y2), third-year (Y3), and after third-year (AY3) (Table A2.1); and cause of death from 9 sources (i.e., collision, electrocution, shooting, poisoned, caught in trap, fight, disease, accident, and starvation) for two age classes (i.e., first-year, and after first-year) (Table A2.2). The cause of death model accounts for PTT failure and the probability that cause of death can be determined. Thus, the probabilities in Table 3 represent the probability of cause of death due to each factor given that the cause of death could be determined.

Table A2.1. Golden Eagle survival probabilities estimated from IPM developed by Millsap et al (2022).

Age Class	Mean	SD	Lower 95CI	Median	Upper 95CI
First-year	0.70	0.02	0.66	0.70	0.74
Second-year	0.83	0.02	0.79	0.83	0.86
Third-year	0.88	0.02	0.84	0.88	0.91
After Third-year	0.90	0.01	0.88	0.90	0.91

We extracted the PTT survival and cause of death submodel from the IPM and used the data to explore how various sample sizes of PTT would influence estimates of survival and cause of death. For this assessment, we randomly sampled transmitters from the full data set and ran the survival and cause of death models to generate estimates and standard errors. We used sample sizes from 50 to 1,000 (20 different sample sizes) and ran 10 replicates for each sample size (200 model runs). Each run of the model took approximately 6 hours to complete. We used the full dataset and then randomly sampled individuals to enter the analysis for a second time in the dataset for that run. Therefore, some individual records were used twice for an individual run at sample sizes >552. We collapsed the number of categories for cause of death from the 9 above to 2 (electrocution vs other) to explore how different sample sizes could help us monitor specific causes of mortality (e.g., is electrocution less likely a cause of death over time due to mitigation efforts). We calculated concentration (Link and Barker 2009) as a measure of relative uncertainty at different sample sizes (e.g., a binomial form of a CV). We presented three plots for each of the six parameters of interested (Y1, Y2, Y3, and AY3 survival; and Y1 and AY1 electrocution probability): (1) box plots to illustrate quantiles and outliers for the 10 replicates at each sample size; (2) mean and sd of concentration of the 10 replicates against each sample size to explore how expected relative uncertainty changes as a function of sample size; and (3) a plot comparing the results from each replicate for each sample size to the estimates from the full sample (512) of birds. Figures A2.4-A2.7 illustrate the influence of sample size on point estimates, bias, precision, and outliers for survival (Fig A2.3 = Y1, Fig A2.4 = Y2, Fig A2.5 = Y3, and Fig A2.6 = AY3), and Figures A2.7-A2.8 illustrate the influence of sample size on estimates of the probability of electrocution given cause of mortality is known (i.e., our ability to estimate the cause of death associated with a particular source of mortality. These figures appear to indicate

that at low sample sizes, cause of death could be very imprecise and greatly biased (high) compared to survival.

Table A2.2. Golden Eagle cause of death (COD) probabilities for known sources of mortality estimated from IPM developed by Millsap et al. (2022).

Age	COD_Type	Mean	SD	Lower 95CI	Median	Upper 95CI
First-year	Collision	0.04	0.02	0.01	0.04	0.10
First-year	Electrocution	0.06	0.03	0.02	0.05	0.12
First-year	Shot	0.06	0.03	0.02	0.05	0.12
First-year	Poison	0.03	0.02	0.00	0.02	0.08
First-year	Trap	0.07	0.03	0.02	0.07	0.14
First-year	Fight	0.03	0.02	0.00	0.02	0.08
First-year	Disease	0.07	0.03	0.02	0.07	0.14
First-year	Accident	0.14	0.04	0.07	0.14	0.23
First-year	Starve	0.50	0.06	0.38	0.50	0.62
After First-year	Collision	0.19	0.04	0.11	0.18	0.28
After First-year	Electrocution	0.15	0.04	0.08	0.14	0.24
After First-year	Shot	0.20	0.05	0.12	0.20	0.30
After First-year	Poison	0.13	0.04	0.07	0.13	0.22
After First-year	Trap	0.07	0.03	0.02	0.06	0.13
After First-year	Fight	0.07	0.03	0.02	0.06	0.13
After First-year	Disease	0.05	0.03	0.01	0.05	0.11
After First-year	Accident	0.09	0.03	0.04	0.09	0.17
After First-year	Starve	0.05	0.03	0.01	0.05	0.11

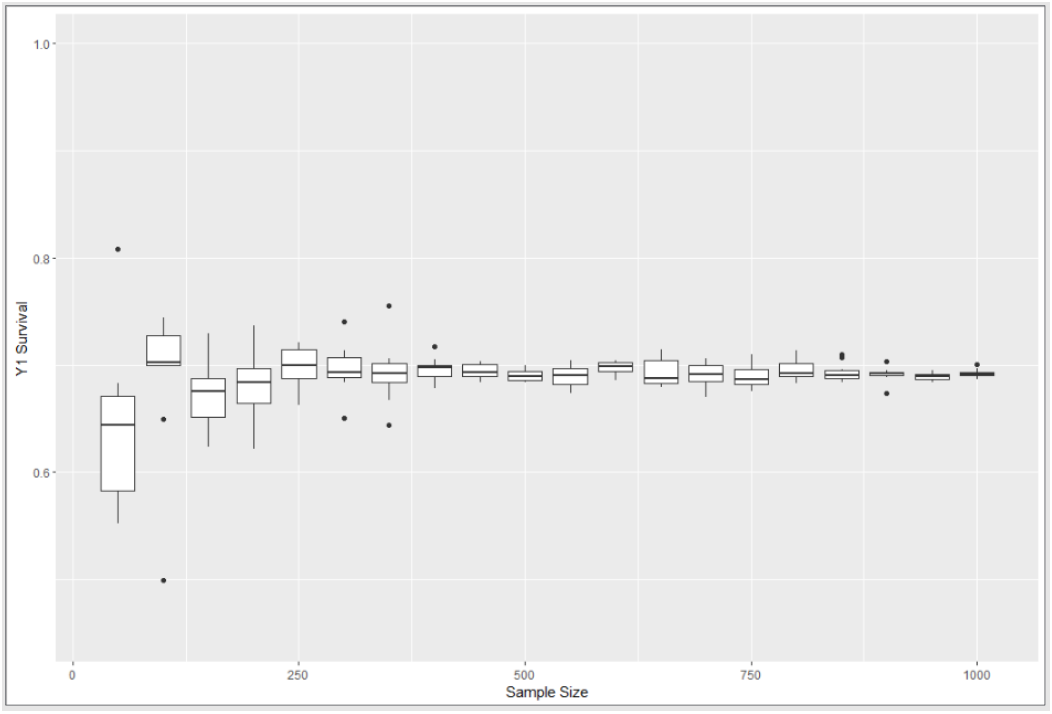

Figure A2.3a. Box plots showing quantiles for 10 runs of Y1 survival at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

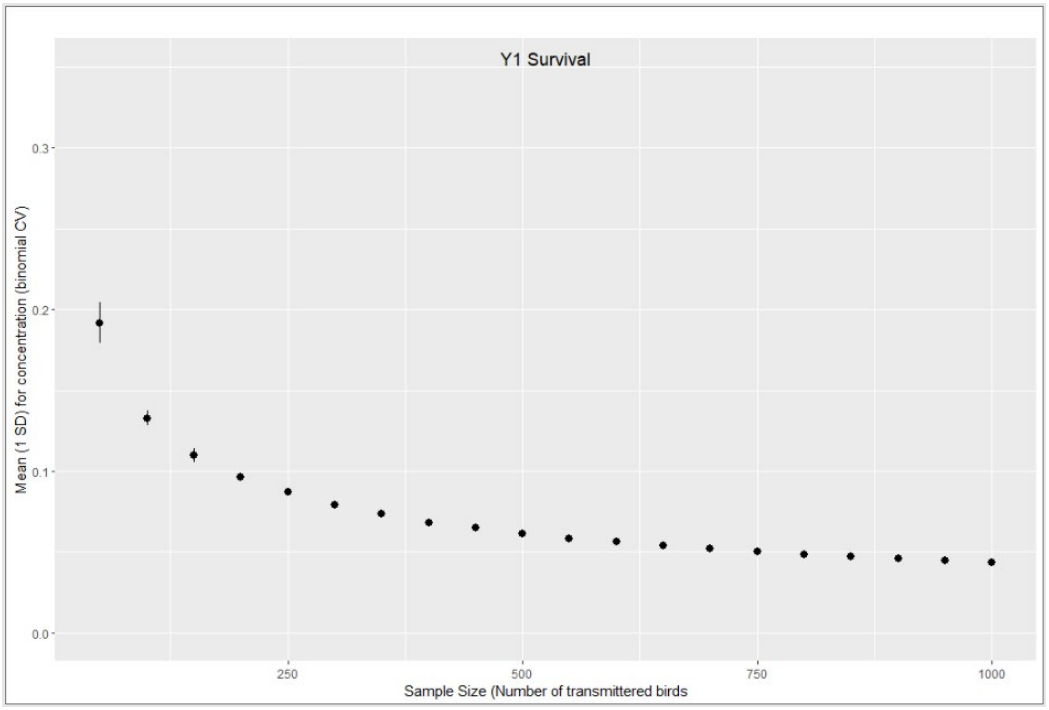

Figure A2.3b. Mean concentration (lines represent 1 SD) for 10 estimates of Y1 survival at each sample size.

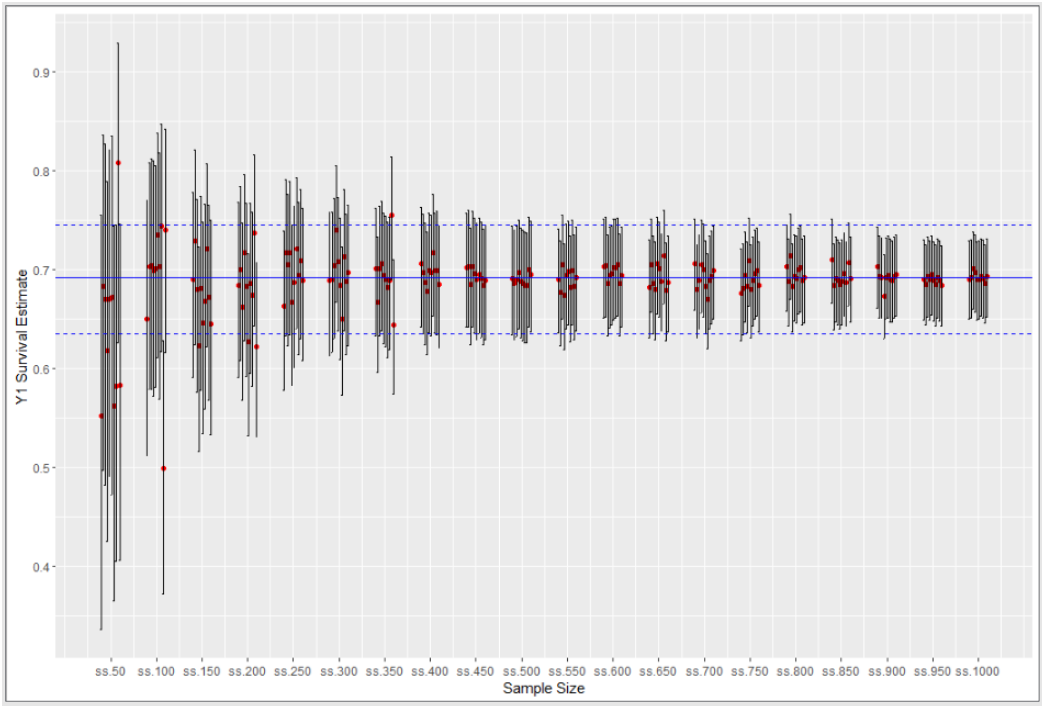

Figure A2.3c. Median (red dot) and 95% CI for each of 10 estimates of Y1 survival at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for survival using the full sample of 512 individuals.

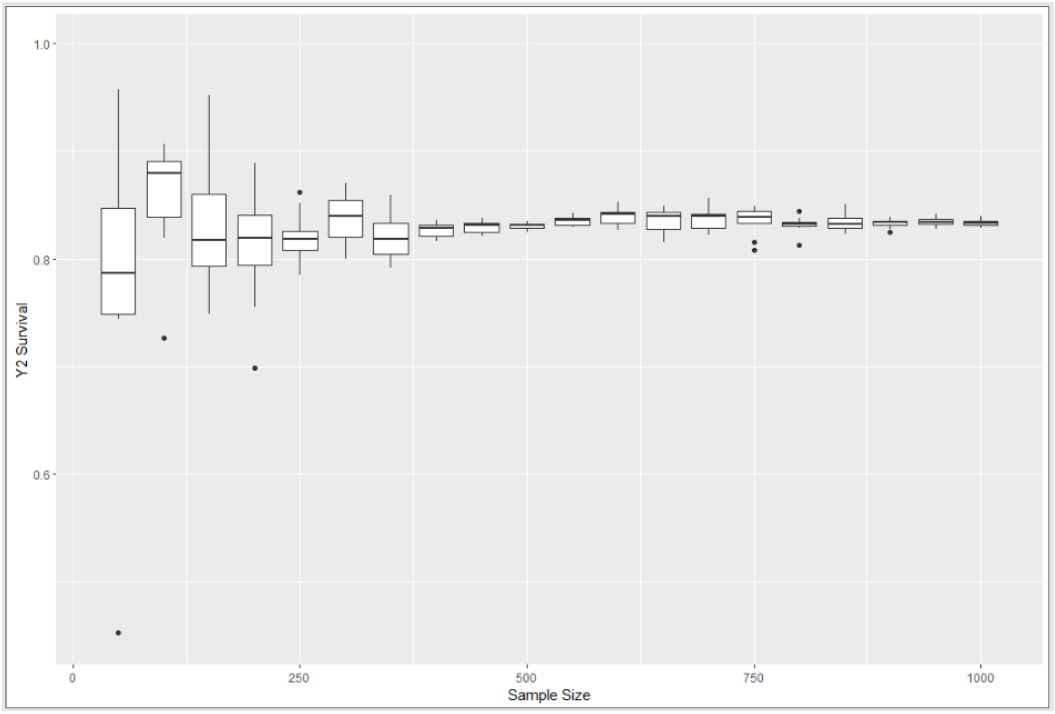

Figure A2.4a. Box plots showing quantiles for 10 runs of Y2 survival at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

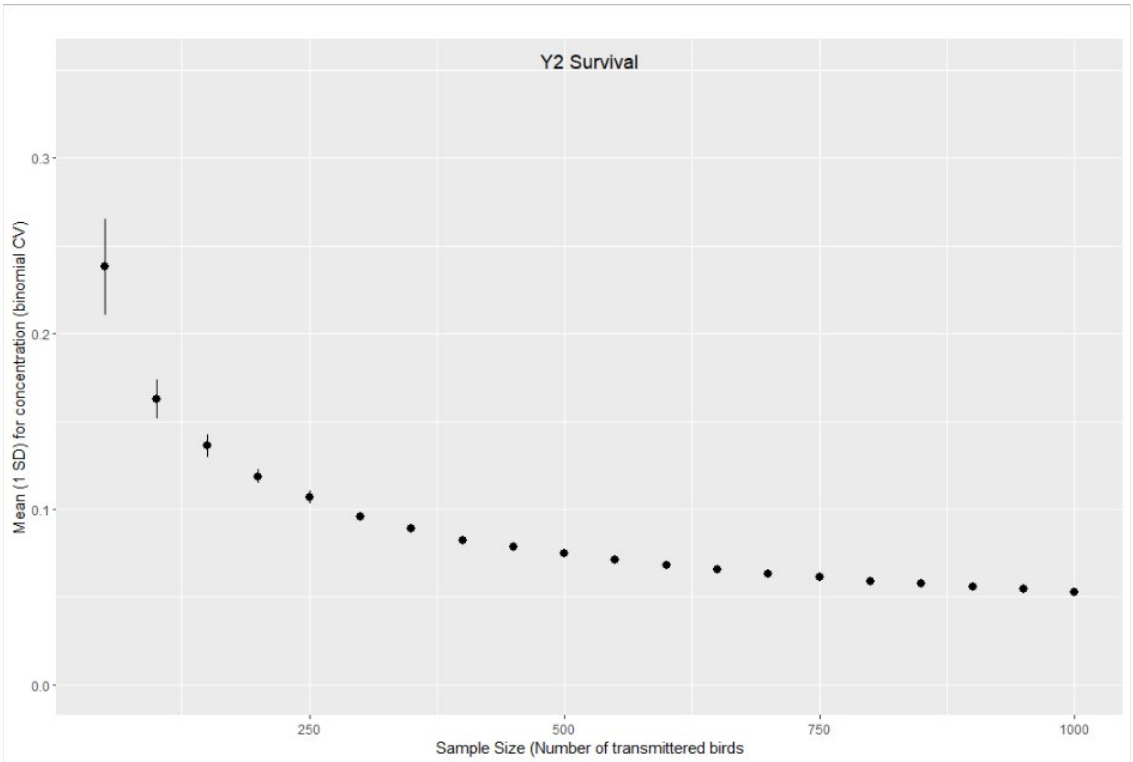

Figure A2.4b. Mean concentration (lines represent 1 SD) for 10 estimates of Y2 survival at each sample size.

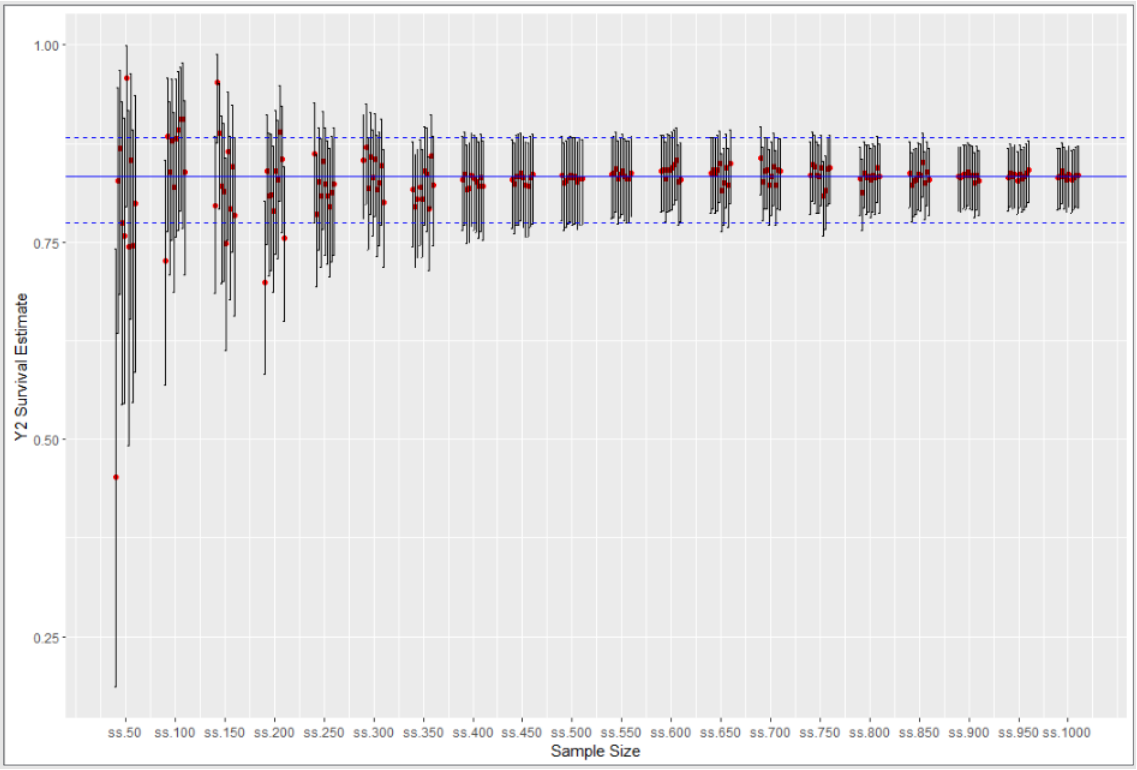

Figure A2.4c. Median (red dot) and 95% CI for each of 10 estimates of Y2 survival at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for survival using the full sample of 512 individuals.

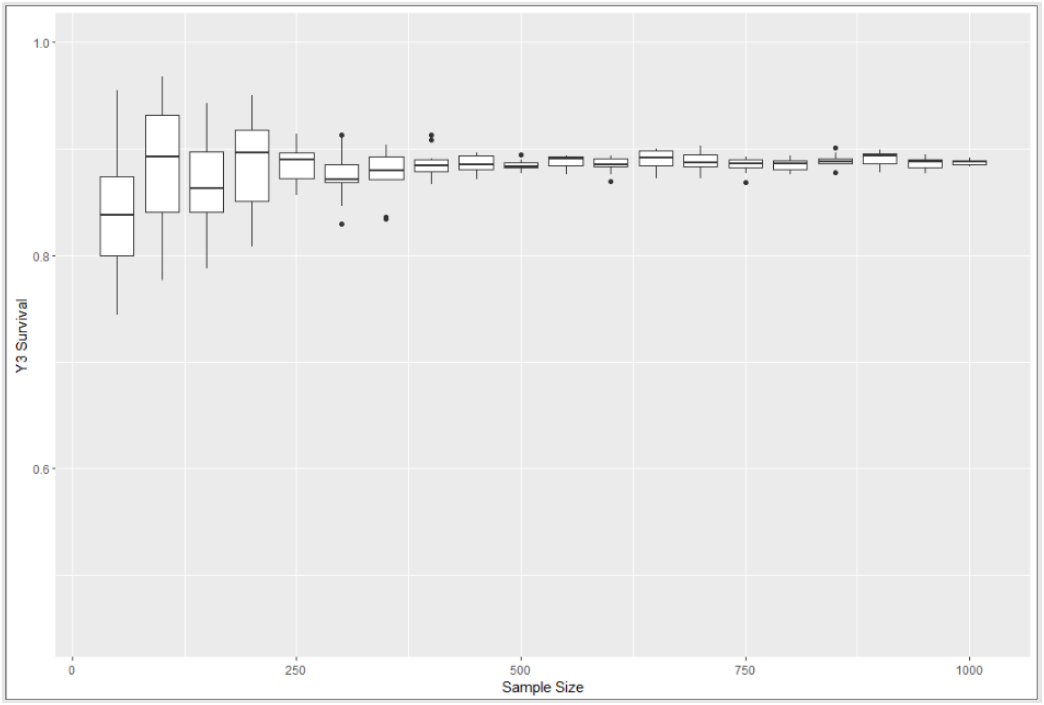

Figure A2.5a. Box plots showing quantiles for 10 runs of Y3 survival at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

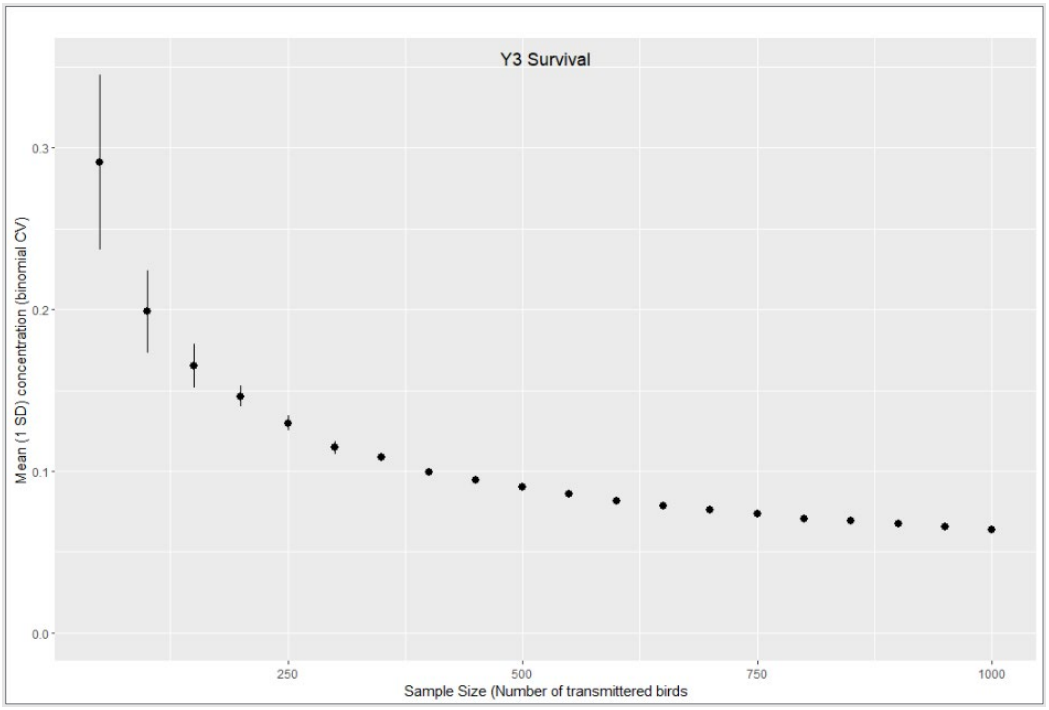

Figure A2.5b. Mean concentration (lines represent 1 SD) for 10 estimates of Y3 survival at each sample size.

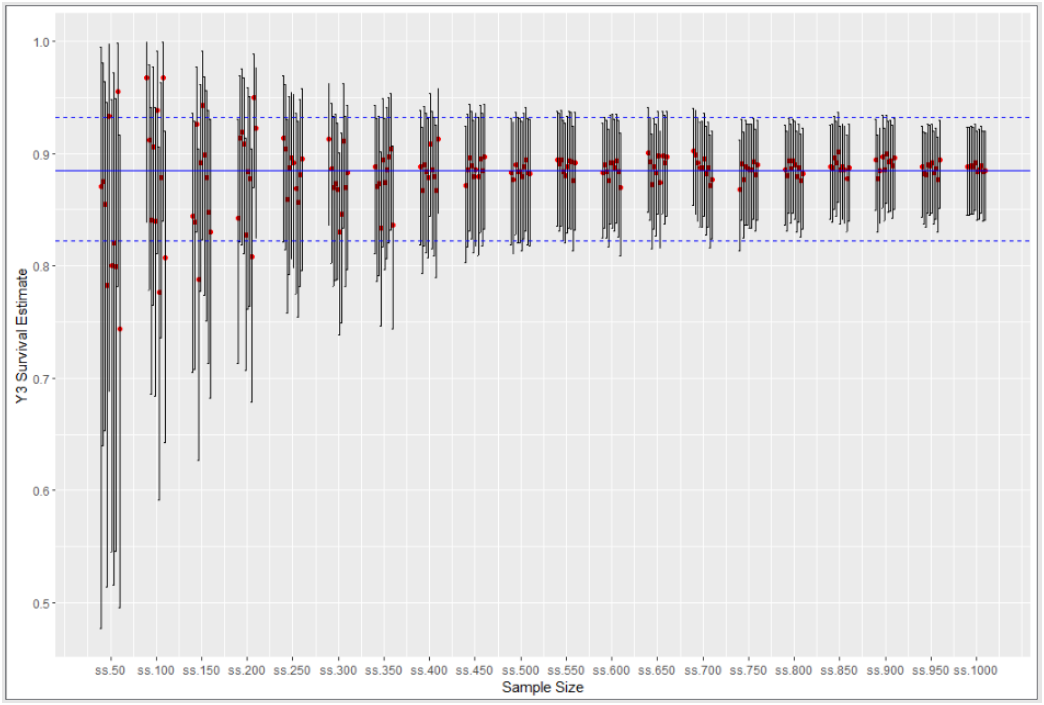

Figure A2.5c. Median (red dot) and 95% CI for each of 10 estimates of Y3 survival at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for survival using the full sample of 512 individuals.

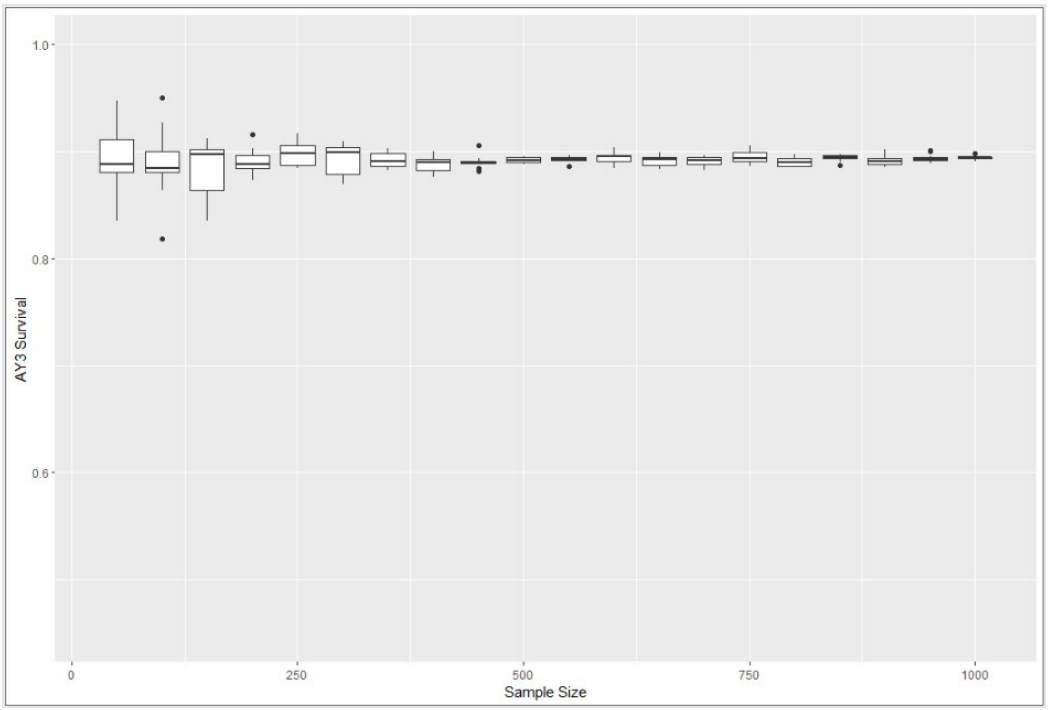

Figure A2.6a. Box plots showing quantiles for 10 runs of AY3 survival at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

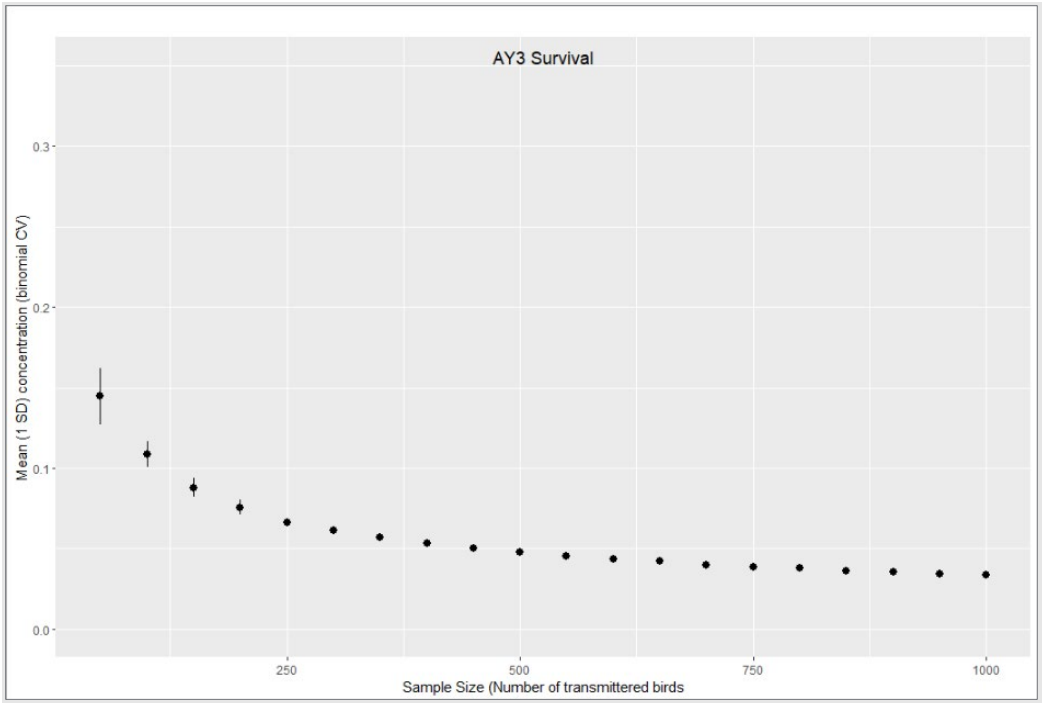

Figure A2.6b. Mean concentration (lines represent 1 SD) for 10 estimates of AY3 survival at each sample size.

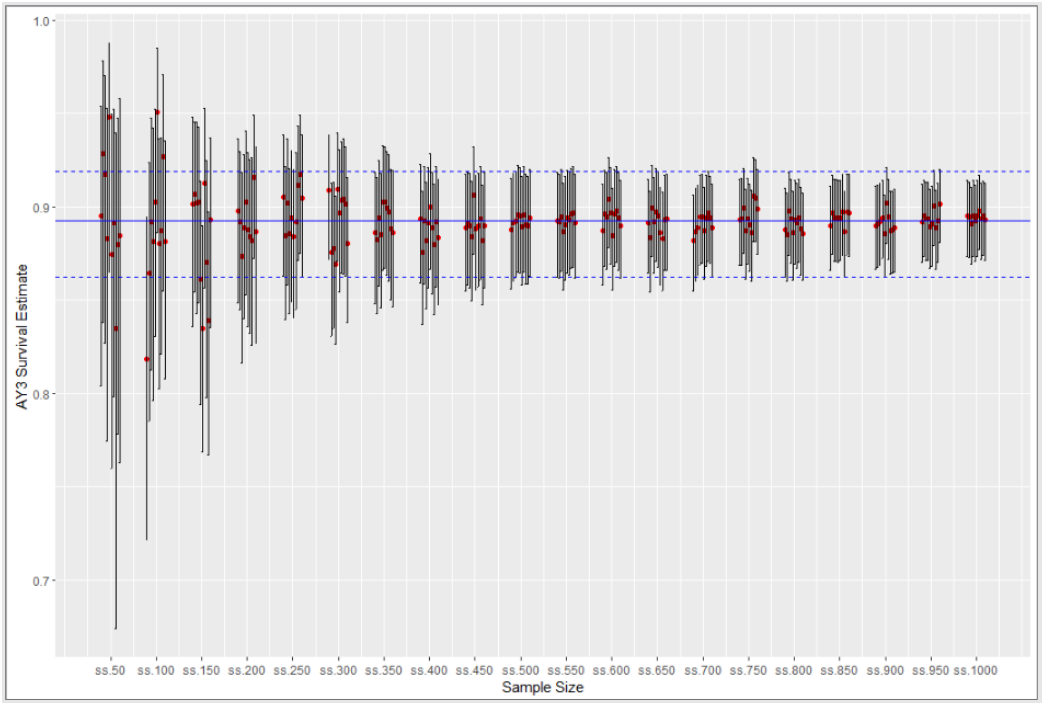

Figure A2.6c. Median (red dot) and 95% CI for each of 10 estimates of AY3 survival at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for survival using the full sample of 512 individuals.

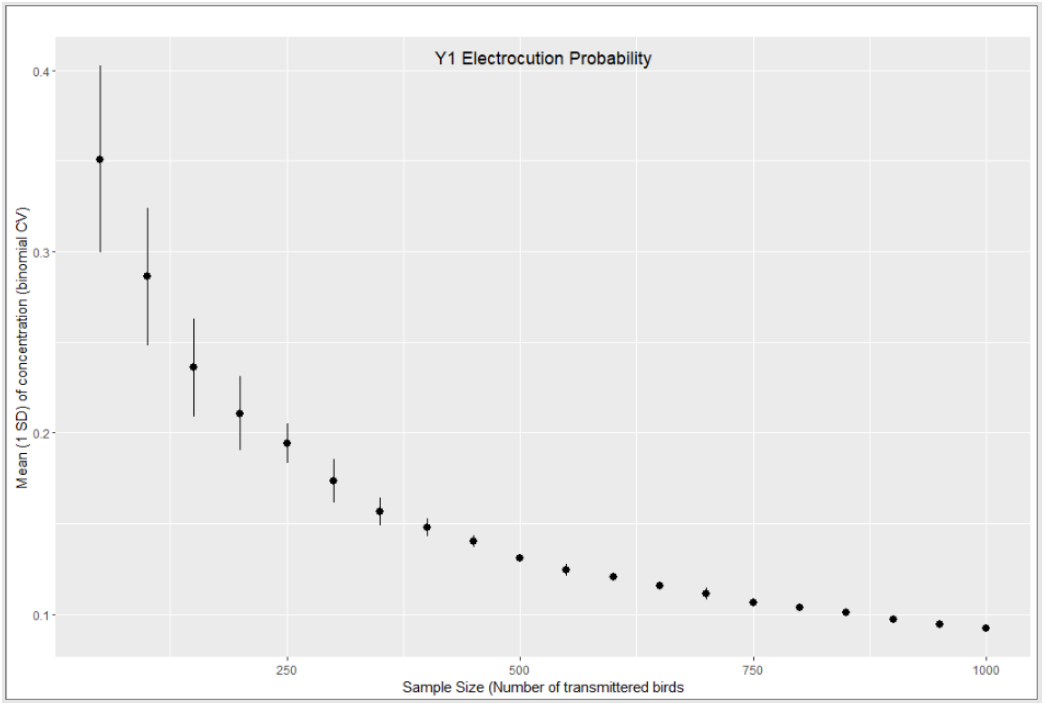

Figure A2.7a. Box plots showing quantiles for 10 runs of Y1 electrocution probability at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

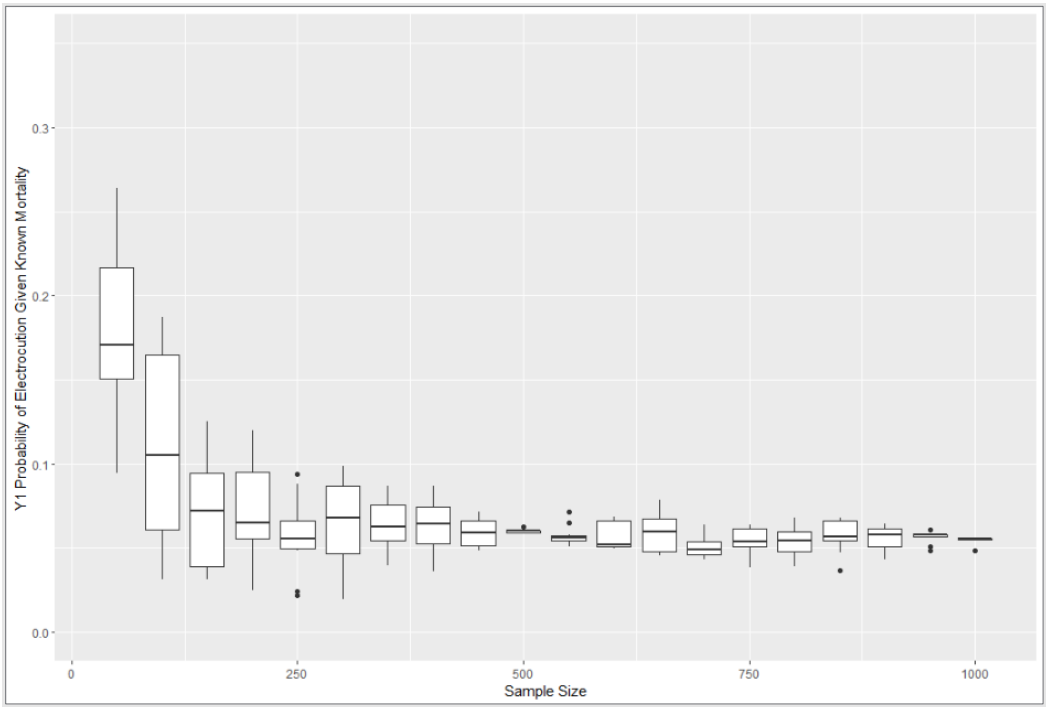

Figure A2.7b. Mean concentration (lines represent 1 SD) for 10 estimates of Y1 electrocution probability at each sample size.

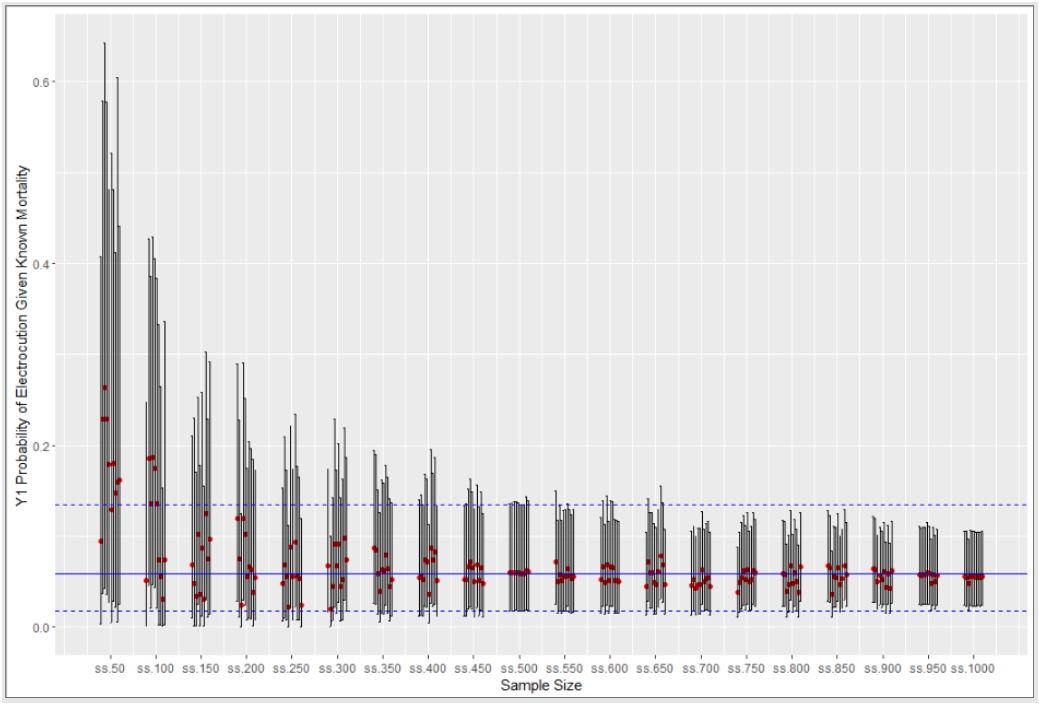

Figure A2.7c. Median (red dot) and 95% CI for each of 10 estimates of Y1 electrocution probability at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for electrocution using the full sample of 512 individuals.

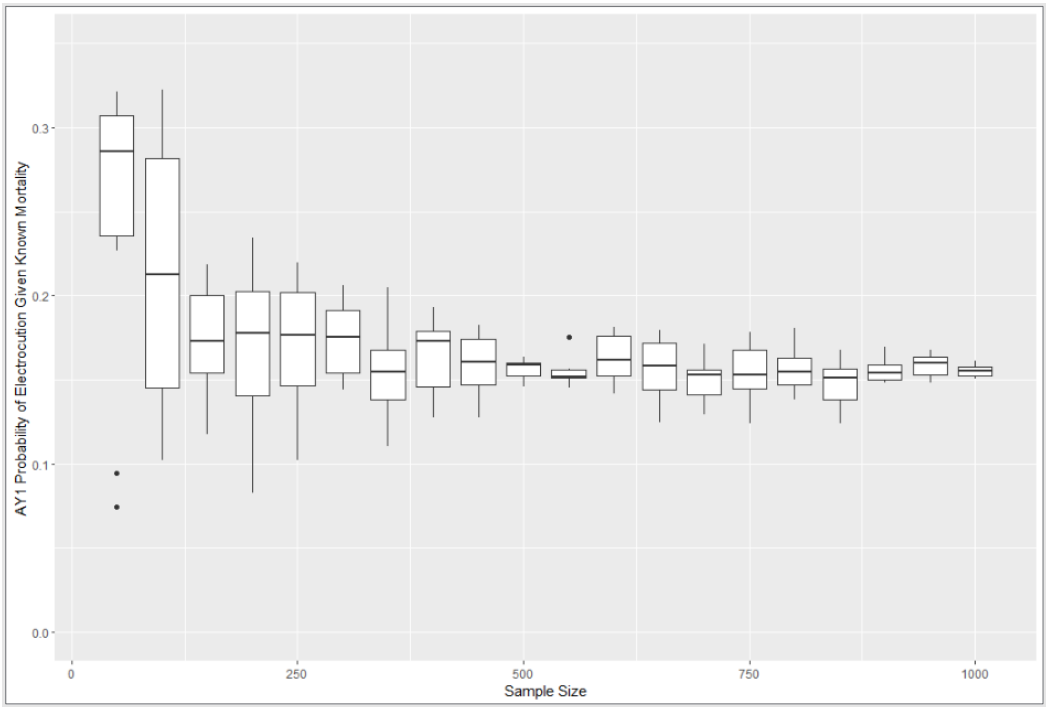

Figure A2.8a. Box plots showing quantiles for 10 runs of AY1 electrocution probability at each sample size. Vertical line shows median, and the upper and lower edges of the boxes are the 75th and 25th quantiles. Whiskers extend up to 1.5 times the mid-point of median and box boundary. Dots represent outliers beyond whisker range.

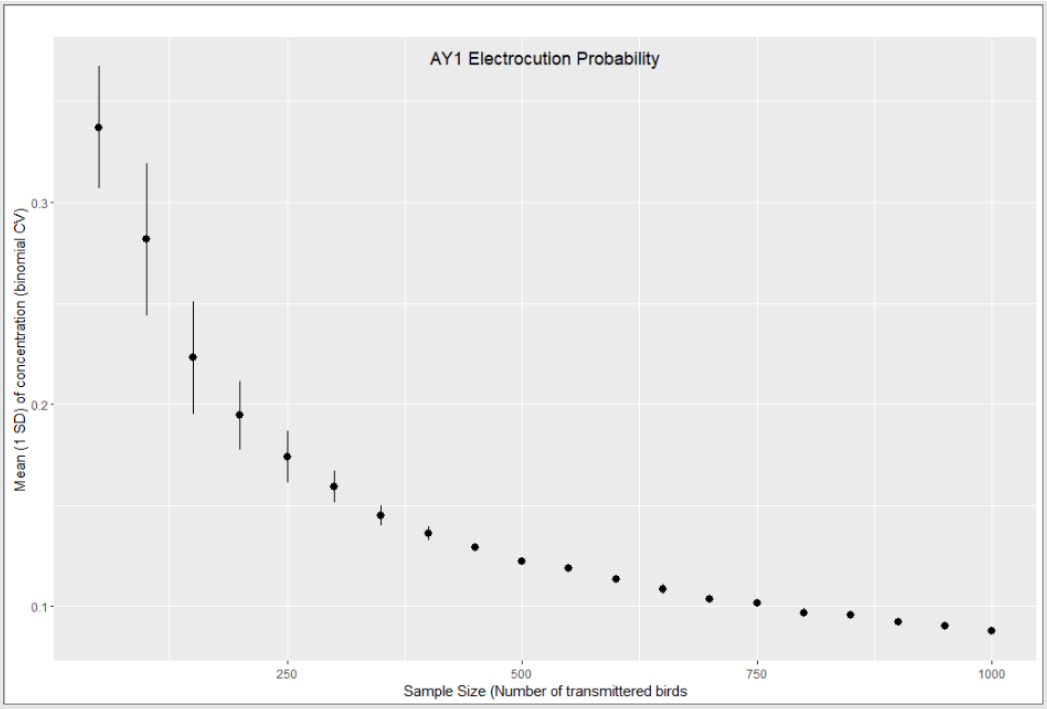

Figure A2.8b. Mean concentration (lines represent 1 SD) for 10 estimates of AY1 electrocution probability at each sample size.

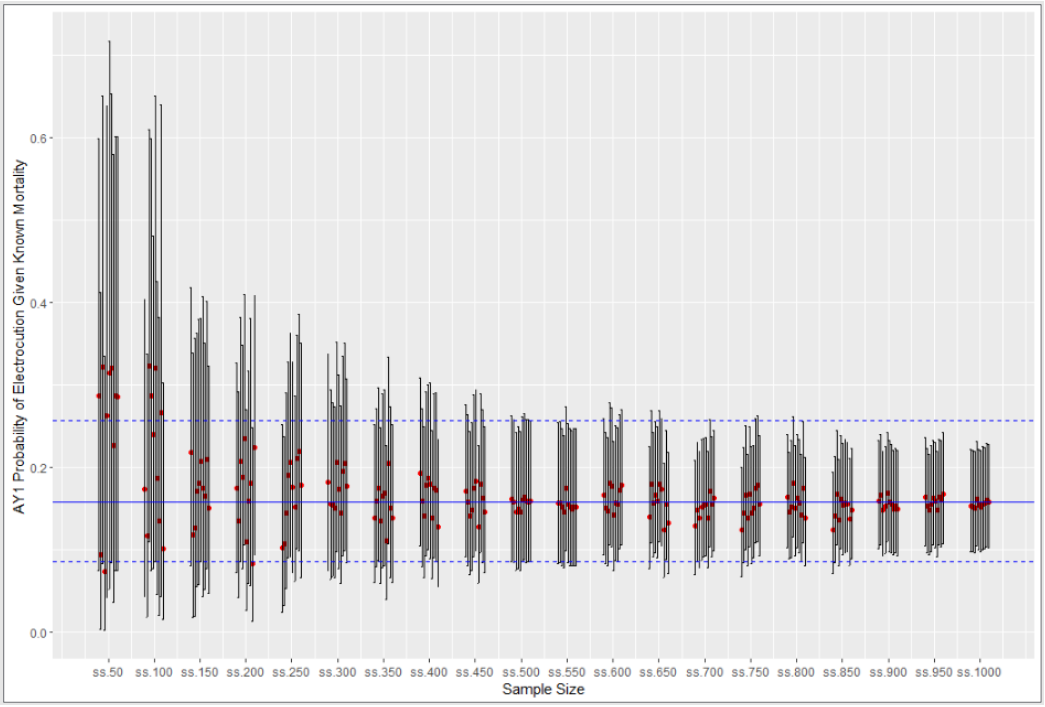

Figure A2.8c. Median (red dot) and 95% CI for each of 10 estimates of AY1 electrocution probability at each sample size. Blue lines represent the median (solid line) and 95% CI (dotted lines) for electrocution using the full sample of 512 individuals.

Annual effort, total sample size, and cost

GOEA population growth rates are, by far, most sensitive to AY3 survival (Millsap et al. 2022), so we assumed that obtaining reliable estimates of that parameter would be the priority for estimating sample sizes. We observed that at a sample size of 150 transmitters, concentration for the survival parameter dropped below 10% (Figure A2.9b). Given the importance of this demographic parameter in driving populations trends, and concerns over energy development influencing this demographic rate directly, we suggest a design that yields a sample size of ~ 150 transmittered AY3 GOEA per year. Such a sample could enable us to precisely estimate annual survival rates to detect potential declines in AY3 survival and explore potential factors that correlate with changes in survival (e.g., mitigation efforts, climate, density).

We incorporated our best estimates of survival and transmitter failure from the GOEA IPM to estimate expected sample sizes of PTT-transmittered eagles under a consistent annual banding effort. Estimated transmitter failure rate from the IPM was 0.128 (SD = 0.010) annually. Therefore, if a transmitter was fitted on an eagle, we assumed that the probability that the transmitter would still be working after 5 years was (1-0.128)^5. We assumed that transmitters from most (95%) birds that died could be recovered and redeployed on a new bird. We used the estimate and SD for transmitter failure and age-specific survival (Table A2.1) to incorporate uncertainty in sample size estimates from these variables. We found that a design where 50 new PTT transmitters are deployed on Y1 birds for 5 years, followed by operational efforts to deploy 35 new PTT transmitters on Y1 birds; along with re-deploying recovered and refurbished transmitters from birds that died, achieved our desired sample size (Figure A2.10). We estimate that the annual cost for hiring crews and climbers, purchasing equipment, travel, cost of new PTT tags, and cost of satellite service fees would increase from approximately $320,000 to approximately $450,000 dollars from year 1 to year 5 and then level off at approximately $445,000 from year 6 onward (Table A2.3).

Table A2.3. Estimated annual costs for an operational PTT monitoring program targeting an annual sample 150 after third year (AY3) golden eagles for estimating survival and cause of death.

Year	Coordinator	Crew (non USFWS)	Crew (non USFWS)	Crew (USFWS)	GPS Tags - New	Argos satellite service	Total
1	$64,800 (1)	$34,250 (2)	$4,500 (1)	$4,500 (1)	$175,000 (50)	$36,000 (50, 12mo)	$319,050
2	$64,800 (1)	$34,250 (2)	$4,500 (1)	$4,500 (1)	$175,000 (50)	$77,760 (108, 12mo)	$360,810
3	$64,800 (1)	$34,250 (2)	$4,500 (1)	$4,500 (1)	$175,000 (50)	$111,600 (155, 12mo)	$394,650
4	$64,800 (1)	$34,250 (2)	$4,500 (1)	$4,500 (1)	$175,000 (50)	$141,840 (197, 12mo)	$424,890
5	$64,800 (1)	$34,250 (2)	$4,500 (1)	$4,500 (1)	$175,000 (50)	$169,200 (235, 12mo)	$452,250
6+	$64,800 (1)	$17,125 (1)		$4,500 (1)	$122,500 (35)	$237,600 (200, 12mo)	$446,525

Although the PTT monitoring is targeting precise and annual estimate of AY3 survival, we note that sample sizes of 150 PTT also resulted in unbiased estimates of collision risk (Figure A2.8a). The PTT data will also provide a wealth of additional information including age at first breeding and probability of breeding, which are important gaps in information useful for estimating allowable take and population status; migration and movement patterns, which will help ensure that our operational population survey is occurring in the right areas and optimal times; and habitat use. The annual overall sample sizes (Figure A2.9) and cumulative total number of birds tracked over time (Figure A2.10) generated from this monitoring design will provide a strong data set for improved monitoring of GOEA take and population monitoring to inform conservation.

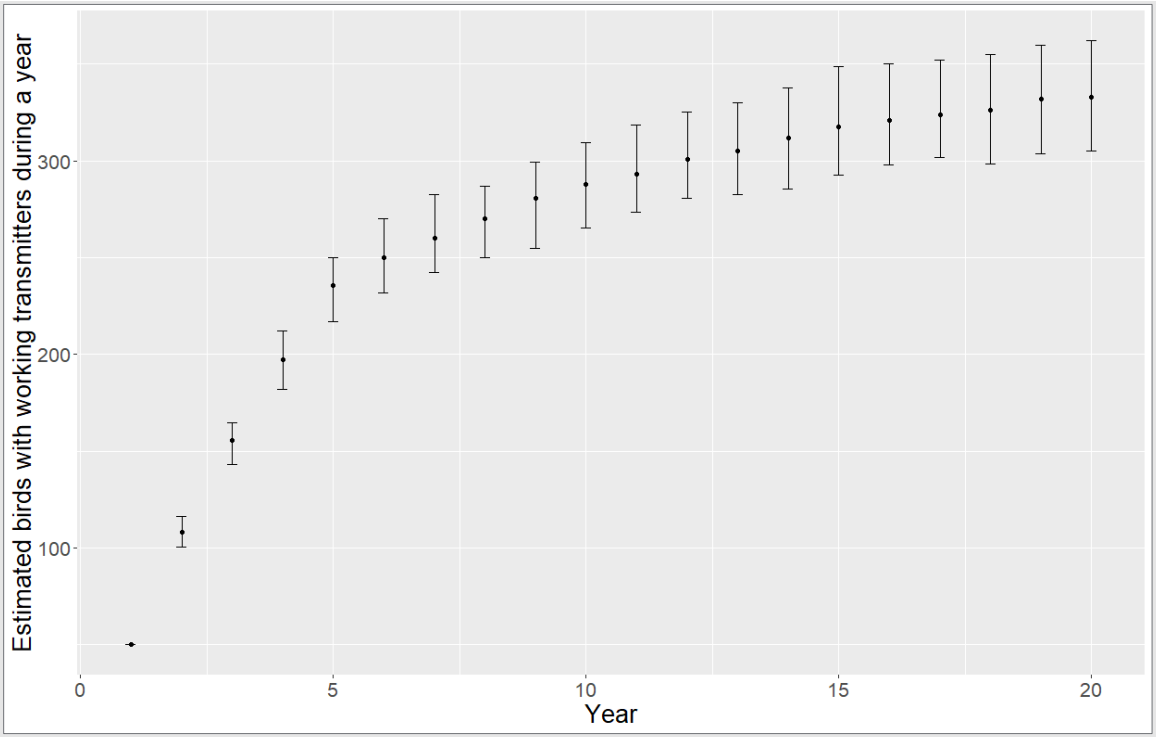

Figure A2.9. Expected annual sample size of transmittered GOEA providing data assuming 50 new transmitters were deployed the first five years, and 35 per year from year 6 to year 20. In addition, we assumed that 95% of transmitters from birds that died were recovered and re-deployed on new birds.

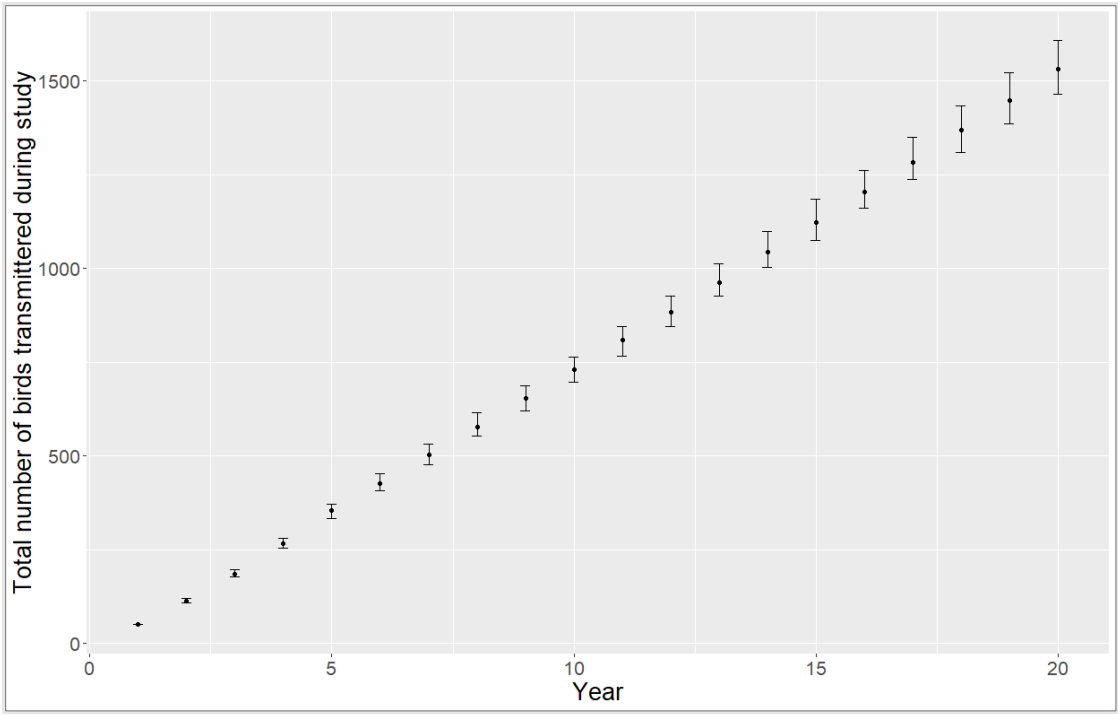

Figure A2.10. Cumulative increase in the total number of individual GOEA transmittered over time assuming 50 new transmitters were deployed the first five years, and 35 per year from year 6 to year 20. In addition, we assumed that 95% of transmitters from birds that died were recovered and re-deployed on new birds.

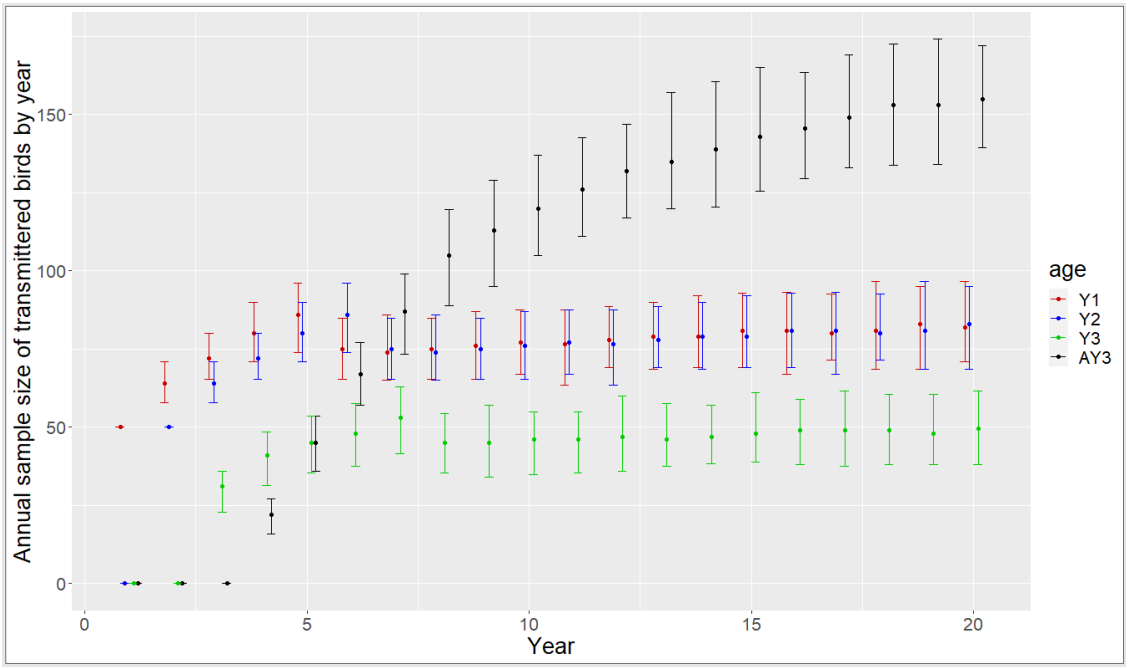

Figure A2.11. Distribution of transmitters among 4 age classes of GOEA over time for a PTT study where 50 new transmitters are deployed for 5 years, followed by operational annual deployment of 35 new PTT transmitters on Y1 GOEA. We assumed the approximately 95% of recovered transmitters from eagles that died each year were refurbished and re-deployed in addition to the new PTTs.

Attachment 3: Nest Failure Rates of Bald Eagles Exposed to Anthropogenic Activities in the United States

Introduction

Populations of bald eagles (*Haliaeetus leucocephalus*) have experienced two periods of severe decline from anthropogenic sources (Gerrard and Bortolotti 1988). The first was from persecution by humans during the first half of the 20th century and the second occurred in the mid-20th century, a result of widespread use of organochlorine pesticides (in particular dichlorodiphenyltrichloroethane [DDT]), which caused significant reductions in productivity or reproductive failure (Grier 1982; Buehler 2000; Dykstra et al. 2001). Following protection for bald eagles through the Bald and Golden Eagle Protection Act of 1940, an amendment of the Migratory Bird Treaty Act and a nationwide ban on DDT in 1972, and their listing under the Endangered Species Act in 1978, bald eagle populations were able to recover sufficiently for the species to be delisted by 2007. Furthermore, it is estimated that the bald eagle population in the United States experienced a more than 4-fold increase from 2009 to 2018 (Zimmerman et al. 2022). Consequently, the U.S. Fish and Wildlife Service (Service) implemented regulations allowing for permits for incidental take of bald eagles in association with otherwise lawful activities, provided the take is consistent with the goals of maintaining a stable or increasing population (U.S. Fish and Wildlife Service 2016). This includes issuing permits authorizing activities that may cause incidental disturbance of breeding bald eagles (nest disturbance), as long as the activities comply with maintaining a sustainable population (U. S. Fish and Wildlife Service 2016).

Furthering our understanding of the impact of nest disturbance on bald eagle populations requires assessing the demographic response to these activities. Several studies have demonstrated human activity negatively impacting bald eagle nest success or productivity (Bangs et al. 1982; Anthony and Isaacs 1989; Steidl 1994). However, there is a growing body of evidence suggesting that breeding bald eagle populations may be much more resilient to human disturbance than previously thought. For example, some studies found that anthropogenic activities were not adversely affecting reproductive rates (e.g., Fraser et al. 1985; Anthony et al. 1994; Millsap et al. 2004; Goulet et al. 2021). Clearly, the response of breeding bald eagles to human disturbance is highly variable and may depend on the type of anthropogenic activity (e.g., recreation, construction, resource extraction) and/or the environment in which the nest is located. Our objective was to examine the failure rate of used bald eagle nests that are listed in incidental take permits issued by the Service and estimate the probability of a nest under a permit failing to produce young. Results will inform bald eagle management and will be used to update the take (i.e., due to loss of productivity of a bald eagle nest) that the Service debits from bald eagle management unit take limits and local area population thresholds for each used nest under a nest disturbance permit.

Methods

In 2007, the Service published the National Bald Eagle Management Guidelines (NBEMG; U.S. Fish and Wildlife Service 2007) following delisting of the bald eagle and in anticipation of publication of nest disturbance permitting regulations. The NBEMG recommend various combinations of distance buffers, breeding season timing restrictions, and visual barriers according to the type of human activity. The assumption at the time was that activities not conforming to NBEMG would result in nest failure due to disturbance, and therefore require a disturbance permit. The Service based these recommendations on expert opinion and best available science at the time. Our aim was to assess and potentially update these recommendations based on our analyses of failure rates of bald eagle nests listed in the Service's incidental take permits. Therefore, we compiled data from bald eagle incidental take permits issued by the Service from 2009 to 2021 authorizing activities that could potentially disturb bald eagle nests, where the authorized activity did not adhere to NBEMG, with or without required avoidance and minimization measures. We examined bald eagle nest failure; therefore, we only included data, (1) for nests that were in use (i.e., a nest that contains eggs, young, or an incubating bird, or has a pair of birds on or near it, or has been recently repaired or decorated [see Steenhof et al. 2017]) during any phase of nesting behavior during the period(s) of the permitted activity for which sufficient monitoring and reporting was conducted to reliably determine nest failure, (2) from permits that were not combined with any other authorization, and authorized activity was for one nesting pair only (i.e., this could mean one nest or several nests presumed to be in the same territory), (3) where a single permit was issued to a single applicant for an activity (i.e., we did not include permits where an additional permittee was authorized for an activity for the same nest in the same nesting season unless the nest did not fail in any nesting seasons that were monitored during activity), and (4) from permits that were not amended once the first period of permitted activity commenced. We only address bald eagle nests that could be "disturbed" according to the following regulatory definition (50 CFR 22.6) for disturbance created by the Service (i.e., we exclude intentional or unintentional removal or destruction of bald eagle nests or nest trees): 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.

We gathered data on the geographic location of bald eagle nests, including latitude, longitude, and state. We used information from the permits to determine whether the authorized activity adhered to NBEMG, and if so, should not be included in the data. This included minimum distance (m) between the nest and the edge of the activity area (buffer) and degree of visibility of the activity from the nest (i.e., visible, partially visible, or not visible). For example, NBEMG recommend a buffer of 100 m if the activity is not visible from the nest and 200 m if it is visible, and this depends on the type of activity (see NBEMG [U.S. Fish and Wildlife Service 2007] pp. 11–14). For our purposes, when determining inclusion of data in our analyses, we treated *partially visible* the same as *visible*. When available, we also recorded data on nest failure for up to three nesting seasons prior to and following the years when the authorized activity occurred.

We ran generalized linear logistic regression models in R 3.6.2 (R Core Team 2019) in a Bayesian framework using NIMBLE 0.12.1 (de Valpine et al. 2017) to estimate the probability of bald eagle nest failure. The binary response variable was nest fail or success, with a nest considered failed if the breeding pair did not fledge any young. We used a Bernoulli model and the data were modeled on a logit scale as

$$y_i \sim \text{Bernoulli}(\rho_i^{fail})$$

$$\text{logit}(\rho_i^{fail}) = \beta_0 ,$$

where, for the i^{th} nest-season (i.e., a nesting season during authorized activity in which nest outcome was determined), y_i was nest failure (0 = success, 1 = fail), ρ_i^{fail} was the probability of nest failure, and β_0 was the model intercept, which was assigned an uninformative normal (μ = 0, τ = 0.0001) prior. Models were run for 100,000 MCMC iterations with the initial 20,000 MCMC samples discarded as burn-in.

Results

The Service's regional staff submitted data from 273 bald eagle incidental take permits issued by the Service (2009–2021), of which 68 permits met our criteria for inclusion in analyses, for a total of 103 nest-seasons. Data included bald eagle nests in 18 states in the coterminous U.S. distributed primarily across the north-central Midwest, northeast, southeast, and Pacific northwest regions (Figure A3.1). Gaps in the geographic distribution of the nests are due to spatial variation in frequency of anthropogenic activities coinciding with bald eagle nests, willingness of project proponents to apply for permits, variability among the Service's regions in conditions imposed on permits, regional-scale abundance of breeding bald eagles, and regional Service staff access to historic permit and annual report documents.

Overall mean (± SD) probability of failure of bald eagle nests listed in incidental take permits issued by the Service (2009–2021) across nest-seasons was 0.162 ± 0.567 (80th quantile estimate 0.195; *n* = 103 nest-seasons) (Table A3.1; Figure A3.2). Estimated probabilities of bald eagle nest failure by permit characteristics are provided in Table 1 and their posterior density distribution plots are provided in Figure A3.2.

Bald eagle nests listed in incidental take permits that were monitored in years prior to authorized activity (*n* = 23 nest-seasons) had a mean failure probability of 0.250 (95% credible interval: 0.097–0.476), and in those same nests during authorized activity 0.250 (0.107–0.454; *n* = 19 nest-seasons) (Table 2). Bald eagle nests listed in incidental take permits that were monitored in years following authorized activity (*n* = 25 nest-seasons) had a mean failure probability of 0.064 (0.010–0.211), and in those same nests during authorized activity 0.085 (0.014–0.273; *n* = 19 nest-seasons) (Table A3.2). There were four bald eagle nests that were monitored both in years prior to and following authorized activity, and for those nests, mean probability of failure prior to activity was 0.303 (0.053–0.717; *n* = 6 nest-seasons), during activity 0.111 (0.005–0.523; *n* = 6), and following activity 0.492 (0–1; *n* = 9 nest-seasons) (Table A3.2). Note that the uncertainty was high in the estimates from nests that were monitored both prior to and following activity due to very small sample sizes. These comparisons of nest failure before, during, and after years of authorized activity suggest that, generally, there was no apparent impact of anthropogenic activity on bald eagle nest failure.

Figure A3.1. Map of bald eagle nests included in analyses (red dots) where anthropogenic activities were authorized during nesting season under permits issued by the Service (2009–2021). Note that although we included 68 permits in our dataset, only 66 nests are shown; one permit did not include geographic location of the nest and one nest was covered by two permits.

Table A3.1. Estimates of mean and median bald eagle nest failure probabilities, standard deviation (SD), 95% credible intervals (CrI), and estimates at the 80th quantile (Q80) for nests listed in bald eagle incidental take permits issued by the Service in the U.S. (2009–2021) by nest-seasons and permit characteristics.

		Nest Failure Probability				
Dataset	*n*	Mean	SD	95% CrI	Median	Q80
Nest-seasons	103	0.162	0.567	0.100–0.242	0.0163	0.195
All permits*	68	0.172	0.580	0.096–0.275	0.173	0.214
Single-year permits	32	0.081	0.658	0.020–0.214	0.245	0.309
Multi-year permits*	36	0.243	0.597	0.124–0.401	0.245	0.309

*For a permit, if there was ≥ 1 year where a nest was unsuccessful, that permit was coded as a nest failure.

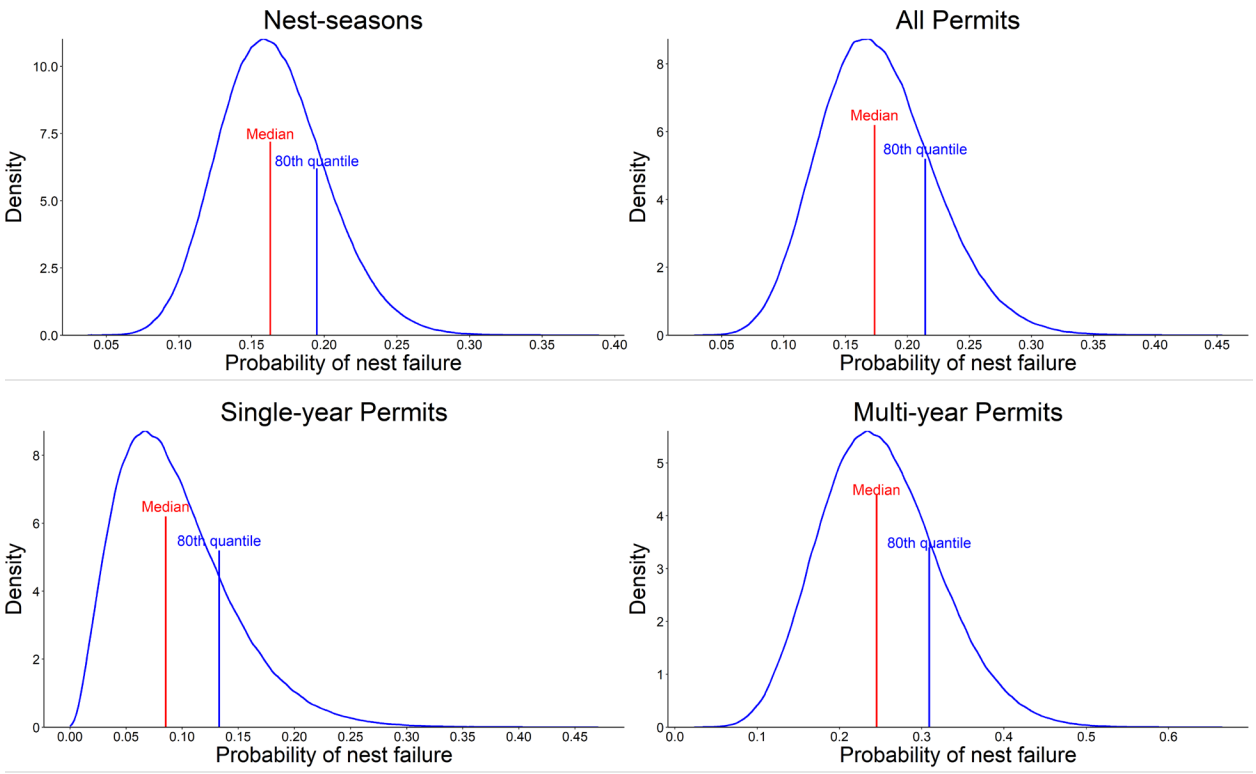

Figure A3.2. Posterior density distributions for probability of bald eagle nest failure for nests listed in bald eagle incidental take permits issued by the Service in the U.S. (2009–2021) by nest-seasons and permit characteristics. For a permit, if there was ≥ 1 year where a nest failed, that permit was coded as a nest failure.

Table A3.2. Estimates of mean bald eagle nest failure probabilities, standard deviation (SD), and 95% credible intervals (CrI) for nests listed in bald eagle incidental take permits issued by the Service in the U.S. (2009–2021) that were monitored in years prior to (Pre-monitor) and following (Post-monitor) years of authorized activity (Permit Years). Probabilities across rows are estimated from the same permits.

	Nest Failure Probability								
	Pre-monitor Years			Permit Years			Post-monitor Years		
Dataset	*n*	Mean (95% CrI)	SD	*n*	Mean (95% CrI)	SD	*n*	Mean (95% CrI)	SD
Pre-monitor	23	0.250 (0.097–0.476)	0.633	19	0.250 (0.1070.454)	0.621			
Post-monitor				19	0.085 (0.014–0.273)	0.698	25	0.064 (0.010–0.211)	0.696
Pre/Post-monitor	6	0.303 (0.053–0.717)	0.724	6	0.111 (0.005–0.523)	0.797	9	0.070 (0.003–0.370)	0.791

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