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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–HQ–ES–2021–0043; FF09E21000 FXES11180900000 212]

RIN 1018–BF35

Endangered and Threatened Wildlife and Plants; Threatened Species Status with Section 4(d) Rule for Emperor Penguin

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the emperor penguin (*Aptenodytes forsteri*), a flightless bird species from Antarctica, as a threatened species under the Endangered Species Act of 1973, as amended (Act). This proposal also serves as our 12-month finding on a petition to list the emperor penguin. After a review of the best available scientific and commercial information, we find that listing the species is warranted. Accordingly, we propose to list the emperor penguin as a threatened species with a rule issued under section 4(d) of the Act ("4(d) rule"). If we finalize this rule as proposed, it would add this species to the List of Endangered and Threatened Wildlife and extend the Act's protections to the species.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by [INSERT DATE 45 DAYS AFTER

DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–HQ–ES–2021–0043, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on "Comment."

(2) *By hard copy*: Submit by U.S. mail to: Public Comments Processing, Attn: FWS–HQ–ES–2021–0043, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see **Information Requested**, below, for more information).

Availability of supporting materials: Supporting documentation used to prepare this proposed rule, including the species status assessment (SSA) report, is available on the Internet at *http://www.regulations.gov* under Docket No. FWS–HQ–ES–2021–0043.

FOR FURTHER INFORMATION CONTACT: Elizabeth Maclin, Chief, Branch of Delisting and Foreign Species, Ecological Services Program, U.S. Fish and Wildlife Service, MS: ES, 5275 Leesburg Pike, Falls Church, VA 22041–3803 (telephone 703–358–2171). Persons who use a telecommunications device for the deaf may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species is an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register*. We will make a determination on our proposal within 1 year, unless we determine that there is substantial disagreement regarding the sufficiency and accuracy of the available data relevant to the proposed listing, in which case we may extend the final determination for not more than 6 months. Listing a species as an endangered or threatened species can only be completed by issuing a rule.

What this document does. We propose to list the emperor penguin as a threatened species with a 4(d) rule under the Act.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that the emperor penguin is likely to become endangered within the foreseeable future throughout a significant portion of its range, meeting the Act's definition of a threatened species. The emperor penguin is a sea-ice-obligate seabird distributed around the entire coastline of Antarctica. The global population is estimated at 270,000–280,000 breeding pairs. Given the influence that weather and climate have in affecting the extent and duration of sea ice and relatedly prey abundance around Antarctica, the effects of climate change present the most substantial threat facing the species.

We are also proposing a section 4(d) rule. When we list a species as threatened, section 4(d) of the Act (16 U.S.C. 1533(d)) allows us to issue regulations that are necessary and advisable to provide for the conservation of the species. Accordingly, we are proposing a 4(d) rule for the emperor penguin that would prohibit import, export, take, possession and other acts with unlawfully taken specimens, interstate or foreign commerce in the course of a commercial activity, or sale or offer for sale. It would also be unlawful to attempt to commit, to solicit another to commit, or to cause to be committed any such conduct. The proposed 4(d) rule would provide exceptions for certain activities with emperor penguins that are permitted under the Antarctic Conservation Act of 1978, as amended (16 U.S.C. 2401 et seq.) and its implementing regulations in title 45 of the Code of Federal Regulations (CFR) at part 670. An exception is also proposed for interstate commerce from public institutions to other public institutions, specifically museums, zoological parks, and scientific or educational institutions that meet the definition of "public" at 50 CFR 10.12. We may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened wildlife under certain circumstances, such as for scientific purposes, or the enhancement of propagation or survival of the species in the wild.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other governmental agencies, the scientific community, industry, or any other interested parties concerning this proposed rule.

We particularly seek comments concerning:

(1) The species' biology, range, and population trends, including:

(a) Population trends at breeding colonies;

(b) Genetics and taxonomy, particularly related to the four known metapopulations and the areas of Antarctica that have not yet been analyzed;

(c) Historical and current range, including redistribution patterns in relation to catastrophic events;

(d) Colony names and locations;

(e) Sea-ice conditions in Antarctica, and projected trends;

(f) Modeling efforts of sea-ice conditions using the Community Earth System Model Large Ensemble project and/or other models to simulate sea ice in Antarctica as it relates to emperor penguins; and

(g) Past and ongoing conservation measures for the species, its habitat, or both.

(2) Factors that may affect the continued existence of the species, which may include destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors.

(3) Biological, commercial trade, and relevant data concerning any threats (or lack thereof) to this species and existing regulations that may be addressing those threats.

(4) Information on regulations that are necessary and advisable to provide for the conservation of the emperor penguin and that the Service can consider in developing a 4(d) rule for the species. In particular, we seek information concerning the extent to which we should include the Act's section 9 prohibitions (16 U.S.C. 1538) in the 4(d) rule, or whether we should consider including any other prohibitions or exceptions in the 4(d) rule.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made "solely on the basis of the best scientific and commercial data available."

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov*.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*.

Because we will consider all substantive comments and information we receive during the comment period, our final determination may differ from this proposal. Based on the best available scientific and commercial information, we may conclude that the species is endangered instead of threatened, that the species is threatened throughout its range instead of in a significant portion of its range, or that the species does not warrant listing as either an endangered species or a threatened species. We may change the parameters of the prohibitions or the exceptions to those prohibitions in the 4(d) rule if we conclude it is appropriate in light of comments and new information we receive. For example, we may expand the prohibitions to include prohibiting additional activities if we conclude that those additional activities are not compatible with conservation of the species. Conversely, we may establish additional exceptions to the prohibitions in the final rule if we conclude that the activities would facilitate or are compatible with the conservation and recovery of the species.

Public Hearing

Section 4(b)(5) of the Act provides for a public hearing on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations, in the *Federal Register* at least 15 days before the hearing. For the immediate future, we will provide these public hearings using webinars that will be announced on the Service's website, in addition to the *Federal Register*. The use of these virtual public hearings is consistent with our regulations at 50 CFR 424.16(c)(3).

Previous Federal Actions

On December 5, 2011, we received a petition from the Center for Biological Diversity to list the emperor penguin as endangered or threatened under the Act. On January 22, 2014, we published a 90-day finding that the petition presented substantial scientific and commercial information indicating that the petitioned action may be warranted; that document also initiated a status review for the emperor penguin (79 FR 3559).

Supporting Documents

We prepared a species status assessment (SSA) for the emperor penguin, in consultation with species experts (Service 2021, entire). The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species. In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of six appropriate specialists regarding the SSA. The Service received six responses. We worked with scientists that have expertise with the species and its habitat, modeling sea ice in Antarctica, and projecting the response of emperor penguins under various climate change emissions scenarios.

I. Proposed Listing Determination

Background

A thorough review of the taxonomy, life history, and ecology of the emperor penguin is presented in the SSA report (Service 2021; available at *http://www.regulations.gov* under Docket No. FWS–HQ–ES–2021–0043).

Taxonomy

The emperor penguin (*Aptenodytes forsteri*) is a recognized species (ITIS 2020, unpaginated). In 1844, the head of the ornithology section of the British Museum in London (George Robert Gray) separated emperor penguins from king penguins (*A. patagonicus*), their closest relatives (Wienecke et al. 2013, p. 24; ITIS 2020, unpaginated).

The emperor penguin appeared to be panmictic—genetically homogeneous at the continent scale—which implies the entire species shares a common demographic history (Cristofari et al. 2016, p. 2). However, the most recent studies on the genetic differentiation of emperor penguins revealed at least four metapopulations (i.e., regional groups of connected populations of a species), with some degree of connectivity among the metapopulations, and very high connectivity between breeding colonies within each metapopulation (Younger et al. 2017, p. 3888). However, our understanding of gene flow for emperor penguins is incomplete, as not all colonies have been included in genetic analyses. For example, no colonies from West Antarctica have been sampled.

Physical Description

Penguins are flightless birds that are highly adapted for the marine environment. They are excellent swimmers and can dive to great depths (Australian Antarctic Division 2020, unpaginated). The emperor penguin is the tallest and heaviest of all living penguin species (Australian Antarctic Division 2020, unpaginated). Adults may weigh up to 40 kilograms (88 pounds) and are as tall as 114 centimeters (45 inches) (National Geographic 2020, unpaginated). Males and females are similar in plumage and size, although males are slightly larger than females. Emperor penguins have large reserves of energy-giving body fat, excellent insulation in the form of several layers of very dense scale-like feathers, and strong claws for gripping the ice (Australian Antarctic Division 2020, unpaginated).

Range and Distribution

The emperor penguin is endemic to Antarctica and has a pan-Antarctic distribution, meaning the species occurs around the entire continental coastline of Antarctica (see figure 1, below, for distribution of breeding colony locations). The species breeds mainly on fast ice, which is sea ice attached or "fastened" to the coast, between 66 °S and 78 °S latitude along the coast of Antarctica (Williams 1995, p. 153; Fretwell and Trathan 2020, p. 7). No gaps larger than 500 kilometers (311 miles) occur between colonies, except in front of large ice shelves that are probably unsuitable habitats because of the disturbance of iceberg calving (Fretwell and Trathan 2020, p. 10).

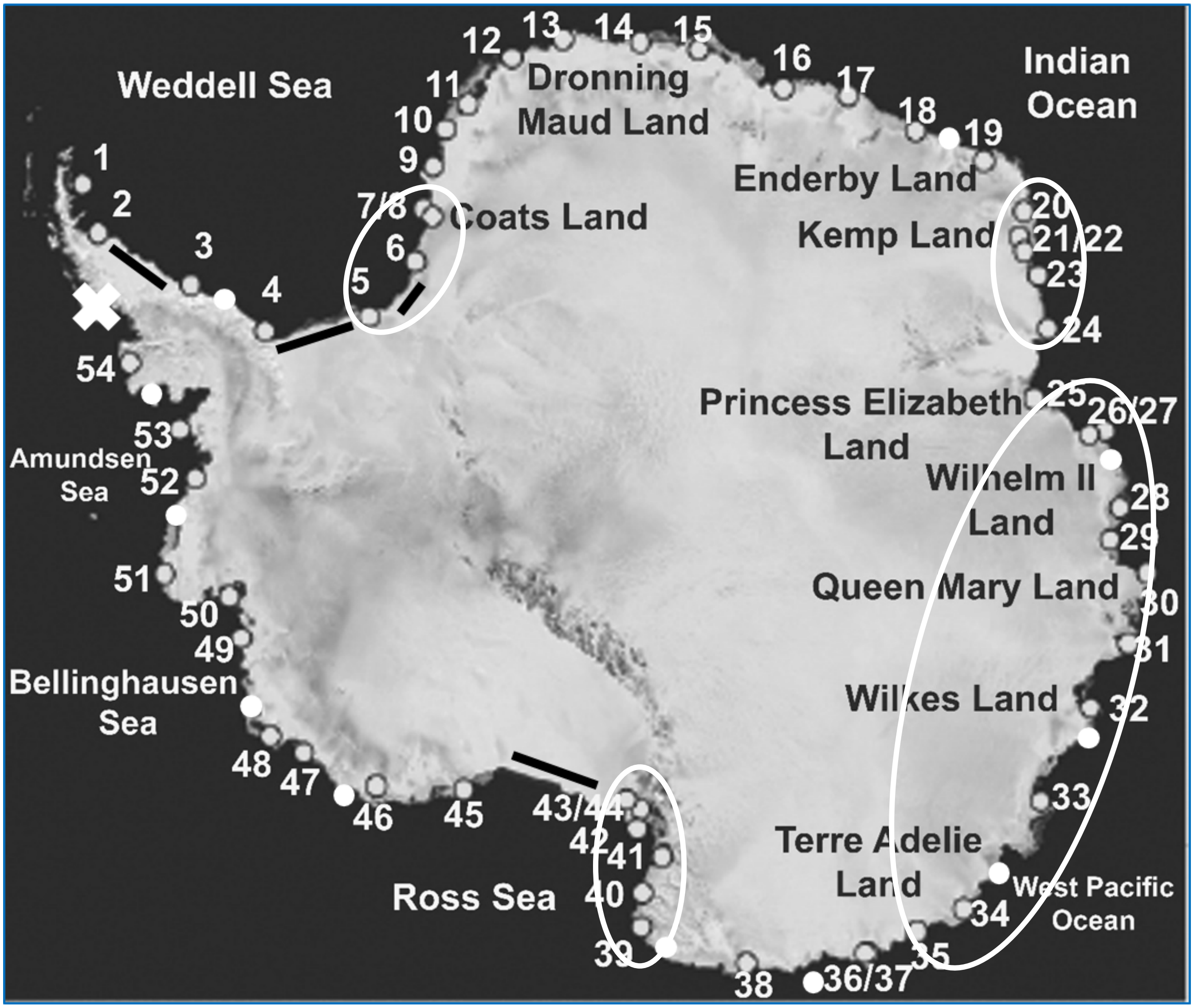

Figure 1. Distribution of known emperor penguin breeding colonies as of 2020 (numbered dots), including four colonies that were not extant in 2019 (7, 15, 18, 37) and the extirpated Dion Islets colony with approximate location on the peninsula (marked as X). The unnumbered white dots with approximate locations are 11 colonies that were discovered or rediscovered in 2019. Black lines are the fronts of large ice shelves and probably unsuitable habitat. Four white polygons approximately represent the four known metapopulations (Credit for data and figure: Fretwell and Trathan 2009; Fretwell et al. 2012, 2014; Fretwell and Trathan 2020; Wienecke 2011; Ancel et al. 2014; LaRue et al. 2015; Younger et al. 2017; Jenouvrier et al. 2020; also see figures 2.1 and 2.10 in Service 2021).

Life History

The emperor penguin has a long breeding cycle, approximately 8 to 9 months, commencing in the austral (southern) fall to complete the rearing of a single chick per pair within a year. It is the only warm-blooded Antarctic species that breeds during the austral winter and is uniquely adapted for doing so (Trathan et al. 2020, p. 3). The breeding cycle for the species is similar throughout its range, although the timing may vary slightly between colonies depending on the regional sea ice conditions, with some starting sooner and others later (Williams 1995, p. 20; Wienecke et al. 2013, in Trathan et al. 2020, p. 3). The Pointe Géologie colony in Terre Adélie, East Antarctica (colony #35 in figure 1, above) has been monitored annually for more than six decades. Most of our understanding of emperor penguin behavior patterns at breeding colonies is based on what has been learned from this site. Behavior patterns at this colony during the breeding season are well known, but much of the species' ecology at sea is poorly known. In the wild, the average life span is estimated up to 15 to 20 years (National Geographic 2020, unpaginated), although demographic models indicated the average life span is 10–12 years (Jenouvrier 2021, pers. comm). One generation is estimated at 16 years (Jenouvrier et al. 2014, p. 717). Age at first breeding is 5 years old (Mougin and Beveren 1979, in Williams 1995, p. 160; Jenouvrier et al. 2005, Appendix A).

Population Biology

Arrival at breeding colonies is synchronous with when annual sea ice begins to form in March/April. Emperor penguins are serially monogamous, but mate fidelity is low between breeding seasons (Williams 1995, p. 160). Females lay one egg. Males incubate the egg on their feet while females go to sea to forage. Once the egg hatches, males and females alternate between chick-rearing duties and foraging until the chick can thermoregulate independently, and then both adults forage simultaneously to provide enough food for their growing chick. It takes about 150 days from hatching to fledging before chicks depart from the colony (Stonehouse 1953, p. 28). Juveniles come back to a colony at approximately 4 years of age and breed for the first time at about 5 years of age (Jenouvrier et al. 2005, Appendix A). Yearlings and subadults can regularly occur at colonies, but they do not yet breed (Wienecke 2021, pers. comm.).

Breeding success varies from year to year in relation to both biotic factors (mainly food availability) and abiotic factors (e.g., ice conditions, heavy precipitation). In general, breeding success for *Aptenodytes* species is 0.6–0.8 chicks per pair while laying only a single-egg clutch (Williams 1995, p. 33). At the Point Géologie colony, breeding success for emperor penguin varied over six decades from 2 to 88 percent (Jenouvrier et al. 2005, entire; Jenouvrier et al. 2009, entire). In the same season, breeding success may vary among colonies (Robertson et al. 2014, p. 257). Approximately 80 percent of mature emperor penguins breed every year (Jenouvrier et al. 2005, p. 2900). The mean survival rate is estimated to be 95 percent for adults, and 40 percent for juveniles (Abadi et al. 2017, p. 1357; Mougin and Beveren 1979, in Williams 1995, p. 160). At Point Géologie, annual adult survival was 60–98 percent over six decades (Barbraud and Weimerskirch 2001, in Jenouvrier et al. 2012 appendices, p. 31). The population growth rate of long-lived species is mainly sensitive to changes in adult survival (Barbraud and Weimerskirch 2001, p. 184).

Population Size

As of 2020, 61 known emperor penguin breeding colonies are extant around Antarctica (Fretwell and Trathan 2020; Fretwell and Trathan 2009; Fretwell et al. 2012, 2014; Wienecke 2011; Ancel et al. 2014; LaRue et al. 2015). The global population size is estimated at approximately 270,000–280,000 breeding pairs or 625,000–650,000 individual birds (Trathan et al. 2020, p. 4; National Geographic 2020, unpaginated; Fretwell and Trathan 2020, p. 10). Sea ice surrounding Antarctica is described within five sectors (Weddell Sea, Indian Ocean, Western Pacific Ocean, Ross Sea, and Bellingshausen Sea-Amundsen Sea; see figure 2, below), which may approximately correspond to the known genetic variation among colonies and the Southern Ocean as a whole. The Ross Sea and Weddell Sea sectors contain the highest abundance of emperor penguins relative to the other three sectors.

Data sources include ground and aerial surveys, particularly satellite imagery. Most of the colonies have never been, and perhaps never will be, visited by humans because most breeding colonies are not practical to visit. They are too remote from occupied research stations, and the emperor penguin breeding season occurs during the austral winter, when ground visits to breeding colonies are not feasible with existing techniques (Jenouvrier et al. 2014a, p. 715; Ancel et al. 2014, p. 1). Satellite imaging makes it possible to monitor inaccessible colony locations and estimate colony sizes; although such estimates of colony sizes may be imprecise because colonies move with the wind (Trathan 2021, pers. comm.), they provide the best available information for inaccessible colonies.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species is an endangered species or a threatened species. The Act defines an endangered species as a species that is "in danger of extinction throughout all or a significant portion of its range," and a threatened species as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether any species is an endangered species or a threatened species because of any of the following factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term "threat" to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term "threat" includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term "threat" may either encompass— together or separately— the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, and then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an endangered species or a threatened species only after conducting this cumulative analysis and describing the expected effect on the species now and within the foreseeable future.

Foreseeable Future

The Act does not define the term “foreseeable future,” which appears in the statutory definition of “threatened species.” Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term foreseeable future extends only so far into the future as the Service can reasonably determine that both the future threats and the species’ responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. Reliable does not mean certain; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species’ likely responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species’ biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

When considering the future condition of emperor penguins, climate change is projected to be the most substantial threat to emperor penguins across the species’ range. Determining a future time horizon for assessing plausible climate change-driven impacts is complicated by the variation in magnitude of change in climate variables projected further into the future. Uncertainty in century-scale projections of Earth’s climate stems from a few main sources, in addition to model imperfections. In the near term, natural climate variability is the largest source of uncertainty in climate projections. Over multi-decadal timescales (approximately the next 30 to 50 years), uncertainties among climate model outputs tend to be most influenced by our imperfect scientific knowledge of the climate system. Over longer timescales (approximately the next 60 to 100 years), human actions and decisions affecting global greenhouse gas (GHG) emissions are considered to be the largest source of uncertainty in climate projections (Terando et al. 2020, pp. 14–15). Climate models used in national and global assessments simulate plausible and realistic representations of Earth's climate, but variations of initial conditions or model parameters and differences in how the models are developed and configured causes variation in model outputs, and ultimately affects the sensitivity of any given model to changes in atmospheric GHG concentrations (Terando et al. 2020, p. 14).

Atmospheric concentrations of GHG emissions in the near- and mid-term are determined primarily by current emissions and the average time it takes emitted molecules to break down chemically in the atmosphere. In the long term, human choices regarding economic development, changes in technology, and population trends will determine emission levels (Terando et al. 2020, p. 15).

The reliability of modeled projections of sea ice in the Southern Ocean using Global Circulation Models (GCMs) from the Coupled Model Intercomparison Project (CMIP) is an important issue (Trathan et al. 2020, p. 5; Roach 2020, entire). The amount of sea ice has exhibited minimal positive trends from 1979 to 2018; however, nearly all individual models simulate declining sea ice over this period (Roach 2020, entire). The existing models often do not capture the regional and, in some cases, opposing trends observed by satellites, and no single model matches the historical conditions at all colonies in all seasons. Thus, there is lower confidence in projections of Antarctic sea ice because of the wide range of outputs, and models not being able to replicate historical satellite observations, as well as multiple factors and complex interactions between the ocean and atmosphere that affect the Antarctic ice sheet (Meredith et al. 2019, pp. 205, 223). However, models continue to improve their ability to represent historical sea-ice conditions in Antarctica.

The key statutory difference between a threatened species and an endangered species is the timing of when a species may be in danger of extinction, either now (endangered species) or within the foreseeable future (threatened species). In the emperor penguin SSA, we considered time horizons at mid-century, late-century, and end-of-century (2050, 2080, 2100) for analyzing the future condition of emperor penguins. The population projections of emperor penguins are based on Intergovernmental Panel on Climate Change (IPCC) climate-change-model projections following available IPCC scenarios, using GCMs from (CMIP) phase 3 (CMIP3) and phase 5 (CMIP5).

When applying the information in the SSA to a listing context in considering what is the foreseeable future for emperor penguins, the projections of the global emperor penguin population begin to diverge around 2050. At 2050, population projections from all scenarios are within 50,000 pairs of each other (see figure A2 in the SSA report (Service 2021, p. 83). The differences in population estimates grows to approximately 150,000 breeding pairs by 2100, with scenario based on Representative Concentration Pathway (RCP) 8.5 predicting near extinction while the scenarios based on the Paris Accord commitments predict gradual declines that do not fall under 135,000 breeding pairs. Thus, after 2050, the variation in population size results in too much uncertainty for the Service to make reliable predictions on whether the emperor penguin's response to the threat of climate change will result in the species being in danger of extinction or not.

Climate change is the most substantial threat to emperor penguins in the future because of an increase in air and sea temperatures that negatively affects sea ice habitat and, relatedly, prey abundance in Antarctica. Most of the difference between the present climate and the climate at the end of the century and beyond will be determined by decisions made by policymakers today and during the next few decades (Terando et al. 2020, p. 15). At this time, we have little clarity on what decisions will be made by policymakers in the next few decades. Thus, we determined the projections of sea-ice conditions and the response of emperor penguins at the late-century and end-of-century (2080 and 2100) time horizons to be too uncertain to make reliable predictions. The 2050 time horizon extends only so far into the future as the Service can reasonably determine that both the future threats and the species' response to those threats are likely. Therefore, in this evaluation, we identified mid-century (2050) as the foreseeable future for the threat of climate change because that is the period over which we can make reliable predictions as to sea ice and the future condition of emperor penguins.

Analytical Framework

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent a decision by the Service on whether the emperor penguin should be proposed for listing as an endangered or threatened species under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket No. FWS–HQ–ES–2021–0043 on *http://www.regulations.gov*.

To assess the emperor penguin's viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability.

We used the SSA framework to evaluate the current biological status of emperor penguins at mid-century, late-century, and end-of-century (years 2050, 2080, and 2100). Because of the uncertainty about the magnitude of climate change at late-century (2080) and end-of-century (2100) time horizons, we were unable to make reliable predictions about the emperor penguin's response for the latter half of the century. Although the SSA report contains information on modeling results out to 2100, this proposed rule focuses on the threat of climate change and the emperor penguin's response to that threat at mid-century. Therefore, we focus on the 2050 timeframe as the foreseeable future for this proposed rule (see *Foreseeable Future*, above, for more information on how we determined the foreseeable future).

Species Needs/Ecological Requirements

The SSA contains a detailed discussion of the emperor penguin's individual and population requirements (Service 2021, pp. 14–27); we provide a summary here.

Emperor penguins rely on annual, stable fast ice to form breeding colonies; pack ice (belt of sea ice comprising ice floes of varying sizes that drifts in response to winds, currents, or other forces) and polynyas to forage; sufficient prey resources year round; and areas of sea ice to haul out, molt, rest, and avoid predation (Williams 1995, pp. 157–159; Ainley et al. 2010, p. 51; Trathan et al. 2020, p. 3). Polynyas are regions of biologically productive open water surrounded by ice and provide prime foraging habitat for emperor penguins because they often provide the closest open water to a colony (Labrousse et al. 2019, p. 2; NSIDC 2020, unpaginated).

Emperor penguins are meso-predators near the top of the Southern Ocean's food web (Cherel and Kooyman 2008, p. 2). They hunt opportunistically and shift foraging strategies relative to prey abundance and distribution (Trathan et al. 2020, p. 3; Williams 1995, p. 155). The life histories of emperor penguins and their primary prey species (e.g., Antarctic silverfish (*Pleurogramma antarctica*) and Antarctic krill (*Euphausia superba*)) are tied to sea-ice extent and duration, and reproductive success of emperor penguins is highly dependent on foraging success. Thus, the interaction of demographic processes of reproduction and survival drives the population dynamics of emperor penguins, which are all related to the sea-ice environment.

Factors Influencing Viability of Emperor Penguins

Based on emperor penguin's life history and habitat needs, and in consultation with species' experts, we identified the stressors likely to affect the species' current and future condition and overall viability, as well as the sources of the stressors, and the existing conservation and regulatory measures that address certain stressors. For a full description of our evaluation of the effects of these stressors, refer to the SSA report (Service 2021, pp. 27–45).

Climate Change

Climate change presents the most substantial threat facing emperor penguins. Other stressors on the species include tourism and research, contaminants and pollution, and commercial Antarctic krill fisheries, but these stressors are minor and not considered to be driving factors of the emperor penguin’s viability now or in the future. See the SSA report for a review of the minor threats (Service 2021, pp. 40–45).

Climate change is a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, which refers to an agent outside the climate system causing a change in the climate system, such as modulations of the solar cycles or volcanic eruptions, or to persistent anthropogenic changes in the composition of the atmosphere (e.g., GHG emissions) or in land use (IPCC 2014a, pp. 120, 123).

Earth’s climate has changed throughout history, and substantial regional variation exists in observations and projections of climate change impacts (IPCC 2014b, p. 1137). The current global warming trend is significant and most of it is extremely likely to be the result of humans adding heat trapping greenhouse gases to the atmosphere (IPCC 2014a, pp. 4–5; NASA 2020, unpaginated). Anthropogenic GHG emissions have increased since the pre-industrial era, largely because of technology and economic and population growth. This increase has led to atmospheric concentrations of carbon dioxide, methane, and nitrous oxide that are unprecedented in at least the last 800,000 years (IPCC 2014a, p. 4). The planet’s average surface temperature has risen about 0.9

degrees Celsius (°C) (1.62 degrees Fahrenheit (°F)) since the late 19th century, with most of the warming occurring in the past 35 years and with the 6 warmest years on record taking place since 2014 (NASA 2020, unpaginated).

The Antarctic continent has seen less uniform temperature changes over the past 30–50 years, compared to the Arctic, and most of Antarctica has yet to see dramatic warming (Meredith et al. 2019, p. 212). The Antarctic Peninsula juts out into warmer waters north of Antarctica and is one of the fastest warming places on Earth, warming 2.5 °C (4.5 °F) since 1950 (Meredith et al. 2019, p. 212). However, warming has slowed on the peninsula since the late-1990s; this variability is within the bounds of large natural decadal-scale regional climate variability (Turner et al. 2016, p. 7; Stroeve 2021, pers. comm.). In East Antarctica, no clear trend has emerged, although locations where some research stations occur appear to be cooling slightly (NSIDC 2020, unpaginated).

The magnitude of climate change into the future depends in part on the amount of heat-trapping gases emitted globally and how sensitive Earth's climate is to those emissions, as well as any human responses to climate change by developing adaptation and mitigation policies (NASA 2020, unpaginated; IPCC 2014a, p. 17).

Sea ice is sensitive to both the atmosphere and ocean; thus, it is an important indicator of polar climate changes (Hobbs et al. 2016, p. 1543). Given the influence that weather and climate have in affecting the extent and duration of sea ice and, relatedly, prey abundance around Antarctica, climate change is a substantial potential threat facing emperor penguins. Changes in sea-ice extent and duration, due to climate change, is projected to affect the emperor penguin's long-term viability at breeding colonies throughout the species' range. Different aspects of atmospheric circulation influence the annual sea-ice extent around Antarctica (Turner et al. 2015, pp. 5–8). Thus, climate change is not projected to have a uniform effect on the sea ice around the continent (Ainley et al. 2010, p. 56; Jenouvrier et al. 2014a, entire). Because sea ice in some regions of Antarctica are projected to be more affected than in other regions, emperor penguins and their breeding habitat around the continent will be affected at different magnitudes and temporal scales.

Unique to Antarctica is calving of huge, tabular icebergs, a process that can take a decade or longer by which pieces of ice break away from the terminus of a glacier (NSIDC 2020, unpaginated). On a stable ice shelf, iceberg calving is a near-cyclical, repetitive process producing large icebergs every few decades. These events are part of the natural system and not a good indicator of warming or climate change (NSIDC 2020, unpaginated). However, warmer temperatures can destabilize this system. Rapid ice-shelf collapse is attributed to warmer air and water temperatures, as well as increased melt on the ice surface (NSIDC 2020, unpaginated). Rapid collapse of ice shelves or calving of icebergs can affect emperor penguins, which mostly breed on fast ice at continental margins. Generally, catastrophic ice-shelf collapse or iceberg calving could cause mortality of chicks and adults, destroy a breeding colony resulting in total breeding failure, and prevent adult penguins from reaching their feeding ground affecting survival and reproductive success. For example, in March 2000, an iceberg from the Ross Ice Shelf calved and lodged near the Cape Crozier and Beaufort Island colonies in the Ross Sea, which caused habitat destruction, mortality of adults and chicks, and blocked access to foraging areas (Kooyman et al. 2007, p.31). The effect would depend on the time of year (season) and the breeding colony's proximity to a collapsing ice shelf or calving iceberg (Fretwell and Trathan 2019, pp. 3–6; Kooyman et al. 2007, pp. 36–37). If a catastrophic event occurs, emperor penguins have been known to try to return to that same breeding location or relocate to another nearby site. However, this results in a loss of at least one breeding season for those birds because they may not find an alternate site that season.

The effect of climate change on prey abundance, relative to changes in sea ice, for emperor penguin and other marine life in the Southern Ocean could be substantial. However, the effect of climate change on Southern Ocean pelagic primary production is difficult to determine given that the time series data are insufficient (less than 30 years) to attribute a climate-change signature and effects may be due to a combination of climate change and natural variability (Meredith et al. 2019, p. 230; Ainley et al. 2010, p. 63). Nevertheless, the emperor penguin's primary prey species are positively tied to local sea-ice conditions and the penguin's breeding success is highly dependent on its foraging success. Therefore, subsequent distresses to the food web because of changes in sea ice increase the risk to emperor penguins over the long term.

Conservation Efforts and Regulatory Mechanisms

Antarctica is designated as a natural reserve devoted to peace and science under the Protocol on Environmental Protection to the Antarctic Treaty (Protocol) that was signed in 1991 and entered into force in 1998 (Secretariat of the Antarctic Treaty 2020, unpaginated). The Protocol includes annexes with measures to minimize effects to the Antarctic environment from conduct related to activities in Antarctica such as national program operations, scientific research, tourism, and other non-governmental activities. The Antarctic Treaty System (see United States Treaties and Other International Agreements (UST): 12 UST 794; Treaties and Other International Acts Series (TIAS): TIAS 4780; and the United Nations Treaty Series (UNTS): 402 UNTS 71), first signed in 1959 by 12 nations, regulates international relations with respect to Antarctica. Fifty-four countries have acceded to the Treaty, and 29 of them participate in decision making as Consultative Parties. Protection of the Antarctic environment has been a central theme in the cooperation among Parties (Secretariat of the Antarctic Treaty 2020, unpaginated).

Under the Protocol, certain protected areas have been established to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific research. Additionally, marine-protected-area boundaries may include ice shelves, adjacent fast ice and pack ice, and potentially afford more complete protection for emperor penguins at their breeding site and while feeding or molting at sea than protected areas that are land based (Trathan et al. 2020, p. 7). To date, seven active breeding sites are protected within protected areas and seven are protected by the Ross Sea region marine protected area, including three colonies that are also in protected areas (Trathan et al. 2020, p. 8) The management plans for these areas explain specific concerns about emperor penguins (Secretariat of the Antarctic Treaty 2020, unpaginated).

In the United States, the Antarctic Conservation Act of 1978 (16 U.S.C. 2401 et seq.) (ACA) also provides for the conservation and protection of the fauna and flora of Antarctica (defined to mean the area south of 60 °S latitude (16 USC 2402)), and of the ecosystem upon which those fauna and flora depend, consistent with the Antarctic Treaty and the Protocol. The ACA’s implementing regulations (45 CFR part 670) include provisions relating to the conservation of Antarctic animals, including native birds such as emperor penguins.

Additionally, the Convention on the Conservation of Antarctic Marine Living Resources (Convention) (33 UST 3476; TIAS 10240), which establishes the Commission for the Conservation of Antarctic Marine Living Resources (Commission), provides for the conservation and rational use of marine living resources in the Convention area. The Commission was established in 1982, with the objective of conserving Antarctic marine life, in response to increasing commercial interest in Antarctic krill resources and a history of over-exploitation of several other marine resources in the Southern Ocean (Commission 2020, unpaginated). Twenty-five countries plus the European Union are party to the Convention, with another 10 countries also having acceded (Commission 2020, unpaginated). The United States implemented the Commission through the

Antarctic Marine Living Resources Convention Act of 1984 (16 U.S.C. 2431 et seq.) (AMLRCA). Under the AMLRCA, among other prohibitions, it is unlawful to: (1) Engage in harvesting or other associated activities in violation of the provisions of the Convention or in violation of a conservation measure in force with respect to the United States; and (2) ship, transport, offer for sale, sell, purchase, import, export, or have custody, control or possession of, any Antarctic marine living resource (or part or product thereof) harvested in violation of a conservation measure in force with respect to the United States (16 U.S.C. 2435).

The regulatory mechanisms and conservation efforts focus on the native marine and terrestrial resources of Antarctica. The existing mechanisms minimize environmental impacts to emperor penguins from national program operations, scientific research, tourism, and other non-governmental activities in Antarctica. None of the existing regulatory mechanisms addresses the primary and unique nature of the threat of climate change on emperor penguins; however, we recognize the value these regulatory mechanisms and conservation efforts play in helping to conserve the species.

Current Condition

The current condition of emperor penguin is based on population abundance (i.e., number of breeding pairs) at each colony and the global abundance distributed throughout the species' range. The resiliency of each emperor penguin colony is tied to local sea-ice conditions because the species depends on sea ice that offers a breeding platform to complete its annual breeding cycle and promotes primary production. As sea ice melts in the summer, it releases algae and nutrients into the water that stimulate phytoplankton blooms, which play a key role in the Southern Ocean food web (Hempel 1985, in Flores et al. 2012, p. 4). Therefore, the estimates of sea-ice condition and the emperor penguin population are directly related, and sea ice serves as a proxy measure of all important habitat factors for the species. Sea ice surrounding Antarctica is described within five sectors (Weddell Sea, Indian Ocean, Western Pacific Ocean, Ross Sea, and Bellingshausen Sea-Amundsen Sea) (figure 2), which may approximately correspond to the known genetic variation among colonies and the Southern Ocean as a whole.

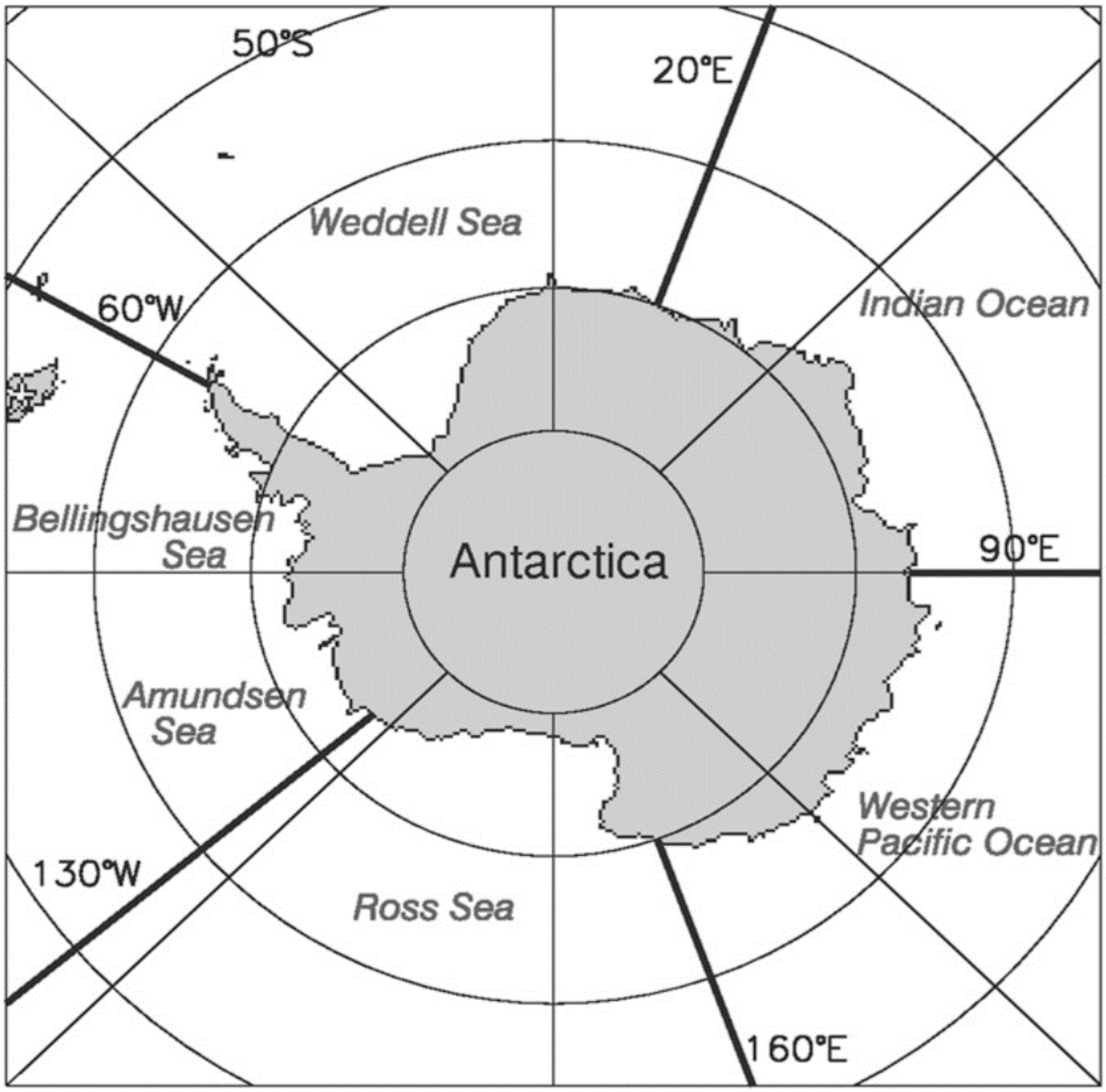

Figure 2. Image showing the five sectors of Antarctica: Weddell Sea (60 °W–20 °E), Indian Ocean sector of the Southern Ocean (20 °E–90 °E), Western Pacific Ocean sector of the Southern Ocean (90 °E–160 °E), Ross Sea (160 °E–130 °W), and the Bellingshausen Sea-Amundsen Sea (130 °W–60 °W).

As of 2020, 61 emperor penguin breeding colonies are extant. Of the 66 total known colonies, four were not extant or not visible in the 2019 satellite imaging, 1 colony is extirpated, and 11 of the colonies were newly discovered or rediscovered in 2019. The global population comprises approximately 270,000–280,000 breeding pairs or

625,000–650,000 individual birds. The Ross Sea and Weddell Sea sectors contain the highest abundance of birds relative to the other three sectors.

In the Southern Ocean, sea-ice extent undergoes considerable inter-annual variability, although with much greater inter-annual variability regionally than for the Southern Ocean as a whole (Parkinson 2019, p. 14414). Sea-ice extent in the Southern Ocean is currently within its natural range of variability. Over the 40 years from 1979 to 2018, the yearly sea-ice extent in the Southern Ocean has a small, but statistically insignificant, positive trend. However, this overall increase masks larger and sometimes opposing regional differences in trends (Turner et al. 2015, pp. 1–2; Parkinson 2019, p. 14419). The greatest increase in sea ice extent has been in the Ross Sea sector, with smaller increases in the Weddell Sea and along the coast of East Antarctica, and a decrease in the Bellingshausen Sea and Amundsen Sea in West Antarctica (Turner et al. 2015, p. 9; Holland 2014, in Meredith et al. 2019, p. 214; Parkinson 2019, entire). The satellite record reveals that the gradual, decades-long overall increase in Antarctic sea-ice extent reversed in 2014, with subsequent rates of decrease in 2014–2018. All sectors, except the Ross Sea, have experienced at least one period since 1999 when the yearly average sea-ice extent decreased for 3 or more consecutive years only to rebound again, and eventually reach levels exceeding the sea-ice extent preceding the 3 years of decreases. Therefore, recent decreases in sea ice may not indicate a long-term negative trend (Parkinson 2019, p. 14420).

Emperor penguins may have difficulties finding food in years of low sea ice, which may increase adult mortality and reduce breeding success. Currently, prey abundance appears not to be a limiting factor for emperor penguins.

The emperor penguin currently has high resiliency, redundancy, and representation. Sixty-one breeding colonies are distributed around the coastline of Antarctica with no indication that their distribution has decreased or is presently decreasing. The number of known breeding colonies has increased over time, because the use of satellite imagery has improved the ability to locate colonies and roughly estimate population sizes at colonies. Catastrophic events may include iceberg calving, ice-shelf disintegration, and storm events. However, if a catastrophic event occurs, it only affects a small proportion of the total breeding colonies at any one time, and the displaced penguins try to return to that same breeding location or relocate to another nearby colony. Breeding colonies within the four known metapopulations have some degree of connectivity among metapopulations and very high connectivity between breeding colonies within each of the metapopulations. Two of the four metapopulations are in East Antarctica (Mawson Coast and Amanda Bay/Point Géologie metapopulations) while the other two are the Weddell Sea metapopulation and the Ross Sea metapopulation (Younger et al. 2017, p. 3892). There has been no loss of the known metapopulations.

Future Condition

The interaction of demographic processes of reproduction and survival drives the population dynamics of the emperor penguin, which are all related to the sea-ice environment. Therefore, to project the long-term viability of emperor penguin, the sea-ice extent and/or concentration and how it relates to the emperor penguin's long-term demographics has been modeled under different climate change scenarios (Ainley et al. 2010, entire; Jenouvrier et al. 2009, 2012, 2014, 2017, 2020). The research into emperor penguin populations and their habitat conditions uses an ensemble of climate models based on changes in sea ice into the future that is founded on standard climate modeling efforts (e.g., Ainley et al. 2010; Jenouvrier et al. 2009, 2012, 2014, 2017, 2020; Melillo et al. 2014).

The future scenarios for population projections of emperor penguins are based on climate change model projections following available IPCC scenarios using Global

Circulation Models driven by Special Report on Emissions Scenarios (SRES) and by Representative Concentration Pathways (RCP) scenarios (Hayhoe et al. 2017, p. 142).

Modeling efforts projected sea-ice conditions and the emperor penguin's response under low-, moderate-, and high-emissions scenarios. The Paris Agreement set a goal to limit global warming to below 2 °C and preferably to 1.5 °C, compared to pre-industrial levels (United Nations 2021, unpaginated). The Paris Agreement goals (low-emissions scenario) do not represent or equate to any RCP scenario; they are uniquely designed to meet the global temperature change targets set in the Paris Agreement (Sanderson and Knutti 2016, in Jenouvrier et al. 2020, p. 1; Sanderson et al. 2017, p. 828). The global temperature is likely to increase 0.3–1.7 °C under RCP 2.6, and 1.0–2.6 °C under RCP 4.5 (IPCCb 2019, p. 46). Therefore, based strictly on the projected increase in global temperature, the Paris Agreement goals would fall within the projected range of RCP 2.6 and RCP 4.5 projections. Thus, we view the two projections aligned with the Paris goals collectively as one low-emissions scenario. We also evaluated two moderate-emissions scenarios: one in which the global temperature is projected to increase up to 2.6 °C under RCP 4.5, and a second in which the global temperature is projected to increase up to 3.2 °C by the end of the century (SRES A1B). Finally, we used a high-emissions scenario (RCP 8.5) with the greatest warming where global temperature is projected to increase up to 4.8 °C (IPCC 2019b, p. 46).

Given the complexities of Global Circulation Models and advancements in technology, models typically build upon previous modeling efforts. The modeling for the global population of emperor penguins and sea-ice conditions was initially run under scenario SRES A1B in CMIP3 using the best available information of the population and demographics at the time. SRES A1B in CMIP3 is consistent with RCP 6.0 in CMIP5 (Melillo et al. 2014, p. 755). As newer models were developed, and experts learned more about emperor penguin dispersal capabilities and behavior and discovered more colonies that increased the global population size, the modeling efforts were refined to account for additional colonies and inter-colony dispersal behaviors. Additionally, the most recent projections for the emperor penguin include simulations that account for extreme or catastrophic events occurring in Antarctica (Jenouvrier et al. 2021, in litt.).

The Community Earth System Model Large Ensemble project was used in the most recent modeling efforts to simulate the sea-ice conditions, building upon the initial efforts of the moderate-emissions scenario SRES A1B, which used models that contributed to CMIP3. The Community Earth System Model contributed to CMIP5 and was included in the IPCC fifth assessment report (Jenouvrier et al. 2020, pp. 3–4). The largest differences between the Community Earth System Model compared to historical sea-ice conditions occur in the nonbreeding season, which has a small influence on emperor penguin population growth rates. Sea-ice conditions during the laying season have the greatest effect on the population growth rates, and those conditions are well addressed in this model (Jenouvrier et al. 2020, p. 7). The sea-ice models relied on for the SSA report represent the best available scientific information.

The demographic parameters for emperor penguin used for all colonies are based on, and extrapolated from, the population at Pointe Géologie in Terre Adélie (see figure 1, colony #35) because the vast majority of colonies have not been visited or subject to long-term studies. Sea ice-condition is projected to decrease in Antarctica and emperor penguins will likely need to disperse or attempt to disperse as colonies are disrupted or lost due to sea-ice instability. The simulations in the latest unpublished models include emperor penguin dispersal behaviors and extreme or catastrophic events, and we find including these additional demographic factors is an improvement because they represent natural and observed parts of the emperor penguin's relationship to the sea-ice environment. See the SSA report for a more thorough discussion of the demographic uncertainties in century-scale projections of climate change as they relate to emperor penguins (Service 2021, pp. 56–57, 80–82).

Low-Emissions Scenario

Under the low-emissions scenario, the median global population of emperor penguins is projected to decline by 26 percent under Paris 1.5, and by 27 percent under Paris 2.0 by 2050. At that point, approximately 185,000 breeding pairs would remain. However, the declines would not occur equally around the continent. Colonies in the Ross Sea and Weddell Sea are likely to experience more stable conditions. Colonies in the Ross Sea are projected to increase from their current size by 2050, as penguins from other areas with less suitable habitat migrate to the Ross Sea. Colonies in the Weddell Sea are projected to increase initially; however, by 2050, the population is projected to be slightly smaller than the current population size in this sector. Colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors are projected to decline the most. By 2050, colonies within these three sectors are projected to decline by at least 50 percent, but the vast majority are projected to decline by more than 90 percent.

Moderate-Emissions Scenarios

For simulations under one of the moderate-emissions scenarios, SRES A1B in CMIP3, the population growth rate is projected to be slightly positive until 2050, while the median global population is projected to decline by 19 to 33 percent by 2100 (Jenouvrier et al. 2014a, p. 716; Jenouvrier et al. 2014b, p. 28). We note this projection is at 2100 and we do not have an estimate of the global population or population size within each sector at 2050. Under the other moderate-emissions scenario, RCP 4.5, the global population is projected to decline by 33 percent by 2050 (to approximately 167,000 breeding pairs; Jenouvrier et al. 2021, in litt.). Similar to the projections under the low-emissions scenario, the declines are not equal around the continent. The Ross Sea and

Weddell Sea experience the smallest decrease in breeding pairs. However, even high-latitude colonies in the Ross Sea and Weddell Sea are not immune to changes in sea-ice condition under this scenario (Jenouvrier et al. 2014, entire; Schmidt and Ballard 2020, pp. 183–184). The vast majority, and possibly all, colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors are projected to decline by more than 90 percent. Two important differences in the results of the two moderate-emissions scenarios are noteworthy: the projections under SRES A1B were modeled using a different model and method than all the other scenarios, and the projections under RCP 4.5 include demographic factors of dispersal and extreme events while SRES A1B projections do not. Dispersal behaviors may accelerate, slow down, or reverse the anticipated rate of population decline of emperor penguins, compared to the population projection without dispersal considered, but does not change the overall conclusion that the global population will decline. Extreme events are projected to increase the magnitude of decline throughout the species' range.

High-Emissions Scenario

Under the high-emissions scenario, RCP 8.5, the global population of emperor penguin is projected to decline 47 percent by 2050 (to approximately 132,500 breeding pairs; Jenouvrier et al. 2021, in litt.). Similar to the low- and moderate-emissions scenarios, the declines are not equal around the continent. However, the population decline is greater in magnitude under the high-emissions scenario. The few colonies that are projected to remain occur in the Ross Sea and Weddell Sea. The breeding colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors are projected to decline by more than 90 percent.

Resiliency, Redundancy, and Representation

The two most resilient sectors of Antarctica are first the Ross Sea and then the Weddell Sea under every emissions scenario. The breeding colonies in these sectors are projected to have the highest resiliency because these areas are likely to have the most stable long-term sea-ice conditions. The breeding colonies in the Indian Ocean sector are projected to be the least resilient, and experience the largest population declines and sea-ice decrease and variability under every scenario. The Bellingshausen Sea-Amundsen Sea sector is also projected to have low resiliency. Projected declines in the Western Pacific Ocean sector are more complex and vary according to emissions scenario; however, the colonies in this sector also markedly decline. Under the high-emissions scenario RCP 8.5, the vast majority of breeding colonies throughout the range decline significantly by 2050, resulting in the Ross Sea and Weddell Sea serving as the last refuges for the species.

Redundancy is higher under the low-emissions scenario than under the moderate- and high-emissions scenarios because more colonies remain extant under the low-emissions scenario. Under the high-emissions scenario, the colonies in the three least resilient sectors (Indian Ocean, Bellingshausen Sea-Amundsen Sea, and the Western Pacific Ocean) are predicted to decline substantially, if not disappear entirely, whereas under the other emissions scenarios some colonies are predicted to decline less appreciably in East Antarctica and in West Antarctica depending on the scenario. Including extreme events into the simulations increases the magnitude of declines at breeding colonies throughout the range under every scenario.

Representation is similar to redundancy in that it decreases as the distribution of the species declines. The emperor penguin is predicted to lose genetic diversity under every scenario because the overall population abundance is projected to decline. Under the low-emissions scenario with projections that do not include dispersal or extreme events, no known metapopulations are lost, although colonies that make up the two metapopulations in East Antarctica are projected to decline. However, when including dispersal and extreme events, both of the metapopulations in East Antarctica along with many other colonies in East Antarctica and in the Bellingshausen Sea-Amundsen Sea sector for which genetics have not been analyzed are projected to decline by more than 90 percent by 2050.

Projections under the moderate-emissions scenarios show a similar pattern with an increase in magnitude of decline, which would also likely result in the loss of the two metapopulations in East Antarctica. Emperor penguins may migrate to the Ross Sea or Weddell Sea where some habitat is projected to remain suitable as habitat quality declines in the other sectors. However, the colonies that remain will likely reach carrying capacity, and some colonies provide little potential for population expansion (Jenouvrier et al. 2014, p. 716).

Under the high-emissions scenario, the emperor penguin would increasingly lose genetic diversity, because of declines in the Weddell Sea and Ross Sea, which account for the other two known metapopulations. Colonies within these two metapopulations would decrease in redundancy over time, thus reducing the genetic variation within the two metapopulations. The Ross Sea may be the last stronghold for the species, but even the number of breeding colonies in the Ross Sea have the potential to decline under the high-emissions scenario. Therefore, the genetic diversity of emperor penguins will substantially decrease under the high-emissions scenario because the vast majority of all colonies are likely to decline by more than 90 percent, or disappear entirely.

Summary

The emperor penguin is currently in high condition because the species has high resiliency, redundancy, and representation. Sixty-one breeding colonies are distributed around the coastline of Antarctica with no indication that there has been a decrease in their range or distribution. Colony size naturally fluctuates, and reproductive success varies from year to year at breeding colonies in relation to both biotic and abiotic factors. However, emperor penguins have high survival rates and reproductive success. Genetic analysis has identified four known metapopulations of emperor penguins, with many areas of Antarctica not yet analyzed.

Sea-ice extent in the Southern Ocean is currently within its natural range of variability. The yearly sea ice extent in the Southern Ocean has a small positive but statistically insignificant trend over the 40 years from 1979 to 2018, although the overall increase masks larger, opposing regional differences in trends. The emperor penguin's main prey resources are directly related to the extent and duration of sea ice. Currently, prey abundance appears not to be a limiting factor for emperor penguins.

The Antarctic continent has seen less uniform temperature changes over the past 30 to 50 years, compared to the Arctic, and most of Antarctica has yet to see dramatic warming. Weather and climate are projected to affect the extent and duration of sea ice and, relatedly, prey abundance in Antarctica. Therefore, climate change presents the most substantial threat facing emperor penguins in the future. Antarctica will be profoundly different in the future compared with today, but the degree of that difference will depend strongly on the magnitude of global climate change. The magnitude of climate change into the future depends in part on the amount of heat-trapping gases emitted globally and how sensitive the Earth's climate is to those emissions, as well as any human responses to climate change by developing adaptation and mitigation policies.

Under all scenarios, sea-ice extent and the global population of emperor penguins are projected to decline in the future; however, the degree and speed of the decline varies substantially by scenario. Accordingly, the resiliency, redundancy, and representation of the emperor penguin will also decrease across all scenarios. The rate and magnitude of decline of the sea-ice conditions and the number of breeding pairs and colonies of emperor penguins varies between scenarios, temporally and spatially. Breeding colonies in the Ross Sea and Weddell Sea sectors, the current strongholds for the species, are projected to retain the most resiliency and have the most stable sea-ice conditions into the future, relative to the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors. The projected decline in the global population of emperor penguins is much less under the low-emissions scenario (i.e., the scenarios that model the Paris Accord) than under the high-emissions scenario (i.e., RCP 8.5). Similarly, redundancy and representation are higher under the low-emissions scenarios compared to the high-emissions scenario because more colonies are projected to be extant. Redundancy and representation decline at a faster rate than resiliency because the Ross Sea and Weddell Sea sectors contain at least half the global population, have a greater initial population abundance compared to the other three sectors, and are projected to have higher-quality sea-ice habitat over a longer time period. These two sectors, and particularly the Ross Sea, are strongholds for the species under every scenario, as the other sectors markedly decline because sea-ice conditions deteriorate.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. To assess the current and future condition of the species, we undertake an iterative analysis that encompasses and incorporates the threats individually and then accumulates and evaluates the effects of all the factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative-effects analysis.

Determination of Emperor Penguin's Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of an “endangered species” or a “threatened species.” The Act defines an “endangered species” as a species in danger of extinction throughout all or a significant portion of its range, and a “threatened species” as a species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether a species meets the definition of an endangered species or a threatened species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we found that climate change presents the most substantial threat to emperor penguin’s viability. While other activities such as tourism and commercial fisheries occur on and near Antarctica, international regulatory measures are in place that adequately regulate conduct related to these activities in Antarctica. Thus, no other stressors are drivers of the species’ viability.

The emperor penguin is currently in high condition because the species has high resiliency, redundancy, and representation. Emperor penguin breeding colonies are distributed around the continent (see figure 1, above) with no indication that their distribution or genetic or ecological diversity is presently decreasing. Sixty-one breeding colonies are extant. The global population comprises approximately 270,000–280,000 breeding pairs or 625,000–650,000 individual birds, with the greatest abundance in the Ross Sea and Weddell Sea sectors. Emperor penguins have high survival and reproductive success, and genetic analysis has identified four known metapopulations of emperor penguins.

The sea-ice conditions in Antarctica are described within five sectors (Weddell Sea, Indian Ocean, Western Pacific Ocean, Ross Sea, and Bellingshausen Sea-Amundsen Sea), and colonies within these sectors may approximately correspond to the genetic variation of the four known metapopulations (see figures 1 and 2, above). Sea-ice extent in the Southern Ocean serves as a proxy measure of all important habitat factors for emperor penguins. Sea-ice extent is currently within its natural range of variability. The yearly sea-ice extent in the Southern Ocean has a small positive, but statistically insignificant trend over the 40 years from 1979 to 2018, although the overall increase masks larger, and sometimes opposing regional differences in trends. The emperor penguin's main prey resources (Antarctic silverfish and Antarctic krill) are directly related to the extent and duration of sea ice. Currently, foraging success and prey availability appear not to be limiting factors for emperor penguins throughout their range.

Thus, after assessing the best available information, we determined that the emperor penguin is not currently in danger of extinction throughout all of its range. We then turned our attention to determining whether the emperor penguin is in danger of extinction throughout all of its range within the foreseeable future.

At 2050, roughly 50,000 breeding pairs constitute the difference between global population projections for the low- and high-emissions scenarios. Starting at approximately 250,000 breeding pairs, under Paris 1.5, the median number of breeding pairs declines to approximately 185,000, and under RCP 8.5, the median number of breeding pairs declines to approximately 132,500.

The Ross Sea and Weddell Sea sectors currently contain the greatest abundance of emperor penguin breeding pairs and are projected to be the most resilient sectors within the foreseeable future, relative to the Indian Ocean, Western Pacific Ocean, and Bellingshausen Sea-Amundsen Sea sectors. Redundancy and representation decline at a faster rate than resiliency because the Weddell Sea, and particularly the Ross Sea, are the strongholds for the species as the colonies in the other sectors markedly decline because sea-ice conditions are projected to deteriorate. Assessing the results of the projections for all scenarios shows that the majority of the remaining global population would be in the Weddell Sea and Ross Sea sectors. These two sectors contain two of the four known metapopulations (Weddell Sea and Ross Sea metapopulations) and are the two most resilient sectors.

The global population at 2050 is projected to decline between 26 percent (to approximately 185,000 breeding pairs) and 47 percent (to approximately 132,500 breeding pairs) under the low- and high-emissions scenarios, respectively. The global population would be large enough and retain sufficient viability so that the species is not in danger of extinction by 2050, because the breeding pairs remaining include at least 50 percent of the global breeding pairs, even under the high-emissions scenario. That said, the distribution of the species will be reduced by 2050 because most, and possibly all, colonies and breeding pairs will be limited to the Weddell Sea and Ross Sea sectors; almost the entire decline of breeding pairs is because of the loss of breeding colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors. However, enough breeding colonies would be extant in the Weddell Sea and Ross Sea to withstand localized stochastic and catastrophic events. The genetic and ecological diversity of emperor penguins will be reduced because the decrease in distribution of breeding colonies results in the loss of the colonies that make up the two metapopulations in East Antarctica (Mawson Coast and Amanda Bay/Point Géologie metapopulations), and many other colonies in East Antarctica and in the Bellingshausen Sea-Amundsen Sea sector for which breeding colony genetics have not been analyzed. The Weddell Sea and Ross Sea sectors contain the other two metapopulations that maintain genetic and ecological diversity, are the strongholds for the species, and are projected to contain the vast majority, and possibly all, the remaining breeding colonies at 2050. The emperor penguin will decrease in resiliency, representation, and redundancy compared to current conditions. However, the global population size at 2050 will be large, and enough colonies will be extant in the Weddell Sea and Ross Sea, such that the species as a whole will not likely to be in danger of extinction.

Thus, after assessing the best available information, we conclude that the emperor penguin is not likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so within the foreseeable future throughout all or a significant portion of its range. Having determined that the emperor penguin is not in danger of extinction or likely to become so within the foreseeable future throughout all of its range, we now consider whether the emperor penguin is in danger of extinction or likely to become so within the foreseeable future in a significant portion of its range—that is, whether there is any portion of the species' range for which it is true that both (1) the portion is significant; and (2) the species, in that portion, is in danger of extinction or likely to become so within the foreseeable future. Depending on the case, it might be more efficient for us to address the "significance" question or the "status" question first. We can choose to address either question first. Regardless of which question we choose to address first, if we reach a negative answer with respect to the first question, we do not need to evaluate the other question for that portion of the species' range.

For the emperor penguin, sea-ice conditions in Antarctica are described in five sectors, which also may approximately correspond to the known genetic variation among breeding colonies. Emperor penguins are distributed around the entire coastline of Antarctica, and we assessed the status of the species in relation to the five sectors.

Therefore, to assess the significance and status questions, we consider emperor penguins to occur within five sectors.

We chose to first address the status question—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered or threatened. We considered whether the threat of climate change is geographically concentrated in any portion of the species' range at a biologically meaningful scale. Climate change is not projected to have a uniform effect around the entire continent of Antarctica; the rate and magnitude of decline of sea-ice conditions and breeding colonies vary temporally and spatially. It is in this context that we considered the concentration of threats of climate change to the emperor penguin.

We found that climate change is projected to substantially affect the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors under every modeled emissions scenario within the foreseeable future. The Ross Sea and Weddell Sea sectors are considered strongholds for the species now and into the foreseeable future because they have the most stable long-term sea-ice condition. However, projections under low-, moderate-, and high-emissions scenarios result in a substantial decline of the breeding colonies and sea-ice condition in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors. By 2050, the colonies within these three sectors decline rather quickly and are projected to decline by at least 50 percent, with the vast majority projected to decline by more than 90 percent under every scenario.

Currently, breeding colonies are distributed along the entire coastline of Antarctica with no gaps larger than 500 kilometers (311 miles) between colonies, except in front of large ice shelves (see figure 1, above). By 2050, the global population of emperor penguins is projected to decline between 26 percent (to approximately 185,000 breeding pairs) and 47 percent (to approximately 132,500 breeding pairs); however, almost the entire decline of global breeding pairs is because of the loss of breeding colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors. This results in a substantial decline of the population and distribution of breeding colonies in these three sectors. Therefore, because climate change is projected to affect the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors of the species' range more than the Ross Sea and Weddell Sea sectors, resulting in a substantial decline of the breeding colonies in these three sectors, the species may be in danger of extinction or likely to become so within the foreseeable future in this portion of its range.

We first considered whether the species was endangered in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean portion of the species' range. The emperor penguin is currently in high condition throughout its range (see *Status Throughout All of Its Range*, above). Therefore, the emperor penguin within these three sectors of its range is also currently in high condition, and the best scientific and commercial data available indicates that this portion of its range currently has sufficient resiliency, redundancy, and representation to be secure in its current state. Therefore, the emperor penguin is not currently in danger of extinction (endangered) in that portion of its range.

However, while the divergence in global population projections between the scenarios becomes more evident around 2050, under every scenario the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors are projected to substantially decline within the foreseeable future. The decline in the global population is almost entirely attributed to the decline of sea-ice conditions and loss of breeding colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors. By 2050, breeding colonies within these three sectors decline by at least

50 percent, with the vast majority projected to decline by more than 90 percent. Therefore, the emperor penguin in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors will have minimal to no resiliency, distribution of breeding colonies, or genetic and ecological diversity because very few colonies and breeding pairs are projected to remain in this portion of the species' range by 2050. Thus, the species is likely to become in danger of extinction within the foreseeable future in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors.

We then proceeded to ask the question whether the portion of the range including the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors is significant. We assessed whether this portion of the species' range is biologically significant by considering it in terms of the portion's contribution to resiliency, redundancy, or representation of the species as a whole.

The Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors account for 40 to 50 percent of the global population, approximately 60 percent of the species' range and total number of known breeding colonies, and 50 percent of the known genetic diversity. Ecological diversity between breeding colonies in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors include breeding location (sea ice vs. ice shelf), distance to open water, exposure to katabatic winds (cold dense air flowing out from interior Antarctica to the coast), and amount of snowfall. Breeding colonies within the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors provide connectivity between colonies within the metapopulations and among the metapopulations in different sectors. Currently, it is likely that all breeding colonies are connected because the average distance between colonies throughout the species' range (500 kilometers (311 miles)) is well within the distance that emperor penguins can travel/disperse. The fact that emperor penguins travel widely as juveniles, move among breeding colonies, and share molting locations indicates that dispersal between breeding colonies provides gene flow among colonies (Thiebot et al. 2013, entire; Younger et al. 2017, p. 3894). If there were minimal to no breeding colonies (as projected) in the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors, the distance between colonies would substantially increase and reduce the probability that all colonies are connected and provide gene flow among colonies. Additionally, the diversity of the species and its habitat would substantially decrease because the vast majority of colonies that would remain (as projected) would only be in the Ross Sea and Weddell Sea sectors. The Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors contribute significantly to the emperor penguin's global population size (resiliency), global distribution around the entire coastline of Antarctica (redundancy), and genetic and ecological diversity (representation) of the species as a whole, and the conservation of the species would suffer the loss of these significant contributions if these sectors were lost.

Therefore, having determined that the Indian Ocean, Bellingshausen Sea-Amundsen Sea, and Western Pacific Ocean sectors (or portion of the species' range) do indeed meet both of the significant portion of the range prongs ((1) the portion is significant; and (2) the species is, in that portion, likely to become in danger of extinction within the foreseeable future), the emperor penguin is in danger of extinction within the foreseeable future within a significant portion of its range. This is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity* v. *Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

Determination of Status

Our review of the best available scientific and commercial information indicates that the emperor penguin meets the definition of a threatened species. Therefore, we propose to list the emperor penguin as a threatened species in accordance with sections 3(20) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, foreign governments, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

An “action” that is subject to the consultation provisions of section 7(a)(2) is defined in our implementing regulations at 50 CFR 402.02 as “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." With respect to the emperor penguin, there are no "actions" known to require consultation under section 7(a)(2) of the Act, and it is therefore unlikely to be the subject of section 7 consultations. Additionally, no critical habitat will be designated for this species because, under 50 CFR 424.12(g), we will not designate critical habitat within foreign countries or in other areas outside of the jurisdiction of the United States.

Section 8(a) of the Act (16 U.S.C. 1537(a)) authorizes the provision of limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered or threatened species in foreign countries. Sections 8(b) and 8(c) of the Act (16 U.S.C. 1537(b) and (c)) authorize the Secretary to encourage conservation programs for foreign listed species, and to provide assistance for such programs, in the form of personnel and the training of personnel.

As explained below, the proposed 4(d) rule for the emperor penguin would, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export; deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any emperor penguins. It would also be illegal to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or to attempt any of these) within the United States or on the high seas; or to possess, sell, deliver, carry, transport, or ship, by any means whatsoever any emperor penguins that have been taken in violation of the Act. It would also be unlawful to attempt to commit, to solicit another to commit or to cause to be committed, any of these acts. Certain exceptions apply to agents of the Service and State conservation agencies. Additional exceptions are also provided in the proposed 4(d) rule for activities permitted under the Antarctic Conservation Act of 1978, as amended (16 U.S.C. 2401 et seq.), and its implementing regulations (45 CFR part 670), including for take and possession of emperor penguins within Antarctica, and for import and export of emperor penguins between the United States and Antarctica. An exception is also proposed for interstate commerce from public institutions to other public institutions, specifically museums, zoological parks, and scientific or educational institutions that meet the definition of "public" at 50 CFR 10.12.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits for threatened species are codified at 50 CFR 17.32, and general Service permitting regulations are codified at 50 CFR part 13. With regard to threatened wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. The Service may also register persons subject to the jurisdiction of the United States through its captive-bred-wildlife (CBW) program if certain established requirements are met under the CBW regulations (50 CFR 17.21(g)). Through a CBW registration, the Service may allow a registrant to conduct the following otherwise prohibited activities under certain circumstances to enhance the propagation or survival of the affected species: take; export or re-import; deliver, receive, carry, transport, or ship in interstate or foreign commerce, in the course of a commercial activity; or sell or offer for sale in interstate or foreign commerce. A CBW registration may authorize interstate purchase and sale only between entities that both hold a registration for the taxon concerned. The CBW program is available for species having a natural geographic distribution not including any part of the United States and other species that the Service Director has determined to be eligible by regulation. The individual specimens must have been born in captivity in the United States. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the *Federal Register* on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. The discussion below regarding protective regulations under section 4(d) of the Act complies with our policy.

II. Proposed Rule Issued Under Section 4(d) of the Act

Background

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary shall issue such regulations as he or she deems necessary and advisable to provide for the conservation of species listed as threatened. The U.S. Supreme Court has noted that statutory language like necessary and advisable demonstrates a large degree of deference to the agency (see *Webster* v. *Doe*, 486 U.S. 592 (1988)). Conservation is defined in the Act to mean the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, the second sentence of section 4(d) of the Act states that the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with broad discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife, or include a limited taking prohibition (see *Alsea Valley Alliance* v. *Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council* v. *National Marine Fisheries Service*, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana* v. *Verity*, 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, "once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him [or her] with regard to the permitted activities for those species. He [or she] may, for example, permit taking, but not importation of such species, or he [or she] may choose to forbid both taking and importation but allow the transportation of such species" (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising this authority under section 4(d), we have developed a proposed rule that is designed to address the emperor penguin's specific threats and conservation needs. Although the statute does not require us to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9, we find that this proposed rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the emperor penguin.

As discussed above under **Summary of Biological Status and Threats,** and **Determination of Emperor Penguin's Status**, we have concluded that the emperor penguin is likely to become in danger of extinction within the foreseeable future primarily due to climate change. Under this proposed 4(d) rule, certain prohibitions and provisions that apply to endangered wildlife under the Act's section 9(a)(1) prohibitions would help minimize threats that could cause further declines in the species' status. The provisions of this proposed 4(d) rule would promote conservation of emperor penguins by ensuring that activities undertaken with the species by any person under the jurisdiction of the United States are also supportive of the conservation efforts undertaken for the species in Antarctica. The provisions of this proposed rule are one of many tools that we would use to promote the conservation of emperor penguins. This proposed 4(d) rule would apply only if and when we make final the proposed listing of the emperor penguin as a threatened species.

Provisions of the Proposed 4(d) Rule

In the SSA report and this proposed rule, we identified the factor of climate change as the greatest threat to the species. However, other activities of tourism, research, commercial krill fisheries, and activities that could lead to marine pollution also may affect emperor penguins. Except for climate change, these other factors all have minor effects on emperor penguins. Although this proposed 4(d) rule addresses the threats that have minor effects on emperor penguins, regulating these activities could help conserve emperor penguins and decrease synergistic, negative effects from the threat of climate change. Thus, the proposed 4(d) rule would provide for the conservation of the species by regulating and prohibiting the following activities, except as otherwise authorized or permitted: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce. Under the Act, “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulations at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Prohibiting take applies to take within the United States, within the territorial sea of the United States, or upon the high seas.

As noted previously, in the United States, the Antarctic Conservation Act of 1978 (ACA; 16 U.S.C. 2401 et seq.) provides for the conservation and protection of the fauna and flora of Antarctica, and of the ecosystem upon which such fauna and flora depend, consistent with the Antarctic Treaty and the Protocol. The ACA's implementing regulations (45 CFR part 670) include provisions relating to the conservation of Antarctic animals, including native birds such as emperor penguins. The National Science Foundation is the lead agency that manages the U.S. Antarctic Program and administers the ACA and its implementing regulations (45 CFR part 670).

Under the ACA, certain activities are prohibited related to flora and fauna in Antarctica. Of particular relevance to emperor penguins, the ACA prohibits take of any native bird within Antarctica without a permit. The term "native bird" under the ACA means any member, at any stage of its life cycle (including eggs), of any species of the class Aves which is indigenous to Antarctica or occurs there seasonally through natural migrations, and includes any part of such member (16 U.S.C. 2402(9); 45 CFR 670.3). Emperor penguins are designated as native birds under the ACA (45 CFR 670.20). To "take" under the ACA means to kill, injure, capture, handle, or molest a native mammal or bird, or to remove or damage such quantities of native plants that their local distribution or abundance would be significantly affected or to attempt to engage in such conduct (16 U.S.C. 2402(20); 45 CFR 670.3). The ACA also makes it unlawful for any person, unless authorized by a permit, to receive, acquire, transport, offer for sale, sell, purchase, import, export, or have custody, control, or possession of, any native bird, native mammal, or native plant which the person knows, or in the exercise of due care should have known, was taken in violation of the ACA (16 U.S.C. 2403(b)(5)).

A permit system managed by the National Science Foundation, in coordination with appropriate agencies, issues permits under the ACA for certain, otherwise prohibited activities such as take, import, and export. Permits authorizing take of emperor penguins under the ACA may be issued only: (1) For the purpose of providing specimens for scientific study or scientific information; (2) for the purpose of providing specimens for museums, zoological gardens, or other educational or cultural institutions or uses; or (3) for unavoidable consequences of scientific activities or the construction and operation of scientific support facilities. Additionally, ACA permits shall ensure, as far as possible, that (1) no more native mammals, birds, or plants are taken than are necessary to meet the purposes set forth above; (2) no more native mammals or native birds are taken in any year than can normally be replaced by net natural reproduction in the following breeding season; (3) the variety of species and the balance of the natural ecological systems within Antarctica are maintained; and (4) the authorized taking, transporting, carrying, or shipping of any native mammal or bird is carried out in a humane manner (16 U.S.C. 2404(e); 45 CFR part 670, subparts C and D). Specific requirements also apply to permits for proposed imports and exports of emperor penguins (see 45 CFR part 670, subpart G). While we have found above that these current efforts alone will be inadequate to prevent the species from likely becoming in danger of extinction within the foreseeable future due to the unique nature of the threat of climate change, we also recognize the value these management efforts play in helping to conserve the species.

The ACA applies to the area south of 60 °S latitude, which encompasses Antarctica and the entire distribution of emperor penguins. Many provisions under the ACA are comparable to similar provisions in the Act, including with regard to take; prohibitions on activities with unlawfully taken specimens; and prohibitions on import and export. As discussed above, for decades, the ACA has provided significant conservation benefits and protections to the emperor penguin through its regulation of these activities with emperor penguin. Accordingly, we propose to provide exceptions from permitting requirements under the Act for certain otherwise prohibited activities with emperor penguins that are authorized by permit or regulation by the National

Science Foundation under the ACA. Specifically, we propose to provide exceptions for take in Antarctica, import to the United States from Antarctica, and export from the United States to Antarctica when these activities are authorized under an ACA permit issued by the National Science Foundation. These exceptions would not apply where there is a violation of the ACA, and thus a violation of the ACA would also be a violation of the Act under the proposed 4(d) rule. For example, for import to the United States from Antarctica where the ACA requires an import permit, the import of an emperor penguin without an ACA permit would fail to meet the proposed regulatory exception, and therefore the import would be prohibited by both the ACA and the Act under the proposed 4(d) rule. A permit under the Act would be required for the import and export of any emperor penguins for any other purpose (e.g., import from or export to another country, or import or export of a captive-bred emperor penguin). Accordingly, all imports and exports of emperor penguins would be prohibited unless authorized by an ACA permit, a permit under the Act, or for law enforcement purposes. Exceptions are also proposed to apply to take of emperor penguins, if the activity meets the ACA regulatory exceptions for emergency circumstances (45 CFR 670.5(a) and (c)), to aid or salvage a specimen (45 CFR 670.5(b) and (c)), or for law enforcement purposes (including the import or export of emperor penguins for law enforcement purposes; 45 CFR 670.9).

The proposed 4(d) rule also provides an exception for interstate commerce from public institutions to other public institutions, specifically museums, zoological parks, and scientific or educational institutions, meeting the definition of "public" at 50 CFR 10.12. The majority of records of import of emperor penguins into the United States have been for this very purpose. Demand for emperor penguins held at or captive-bred by these types of public institutions in the United States is not substantial nor is it likely to pose a significant threat to the wild population in Antarctica. As defined in our regulations, "public" museums, zoological parks, and scientific or educational institutions are those that are open to the general public and are either established, maintained, and operated as a governmental service or are privately endowed and organized but not operated for profit.

We may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. As noted above, we may also authorize certain activities associated with conservation breeding under CBW registrations. We recognize that captive breeding of wildlife can support conservation, for example by producing animals that could be used for reintroductions into Antarctica, if permitted under the ACA. We are not aware of any captive breeding programs for emperor penguins for this purpose. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act. This proposed 4(d) rule, if finalized, would apply to all live and dead emperor penguin parts and products, and support conservation management efforts for emperor penguins in the wild.

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the proposed rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Branch of Delisting and Foreign Species (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Branch of Delisting and Foreign Species.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

AUTHORITY: 16 U.S.C. 1361-1407; 1531-1544; and 4201-4245, unless otherwise noted.

2. Amend § 17.11(h) by adding an entry for "Penguin, emperor" to the List of Endangered and Threatened Wildlife in alphabetical order under BIRDS to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * * * *				
BIRDS				
* * * * * * *				
Penguin, emperor	*Aptenodytes forsteri*	Wherever found	T	[*Federal Register* citation when published as a final rule]; 50 CFR 17.41(k).[4d]
* * * * * * *				

3. Amend § 17.41 by adding a paragraph (k) to read as set forth below:

§ 17.41 Special rules—birds.

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(k) Emperor penguin (*Aptenodytes forsteri*). (1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to the emperor penguin. Except as provided under paragraph (k)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to this species:

(i) Import or export, as set forth for endangered wildlife at § 17.21(b).

(ii) Take, as set forth for endangered wildlife at § 17.21(c)(1).

(iii) Possession and other acts with unlawfully taken specimens, as set forth for endangered wildlife at § 17.21(d)(1).

(iv) Interstate or foreign commerce in the course of commercial activity, as set forth for endangered wildlife at § 17.21(e).

(v) Sale or offer for sale in foreign commerce, as set forth for endangered wildlife at § 17.21(f).

(vi) Sale or offer for sale in interstate commerce, as set forth for endangered wildlife at § 17.21(f).

(2) *Exceptions from prohibitions.* In regard to the emperor penguin, you may:

(i) Sell, offer for sale, deliver, receive, carry, transport, or ship in interstate commerce live emperor penguins from one public institution to another public institution. For the purposes of this paragraph, "public institution" means a museum, zoological park, and scientific or educational institution that meets the definition of "public" at 50 CFR 10.12.

(ii) Take emperor penguins within Antarctica as authorized under implementing regulations for the Antarctic Conservation Act of 1978 (16 U.S.C. 2401 et seq.), either in accordance with the provisions set forth at 45 CFR 670.5 or 670.9, or as authorized by a permit under 45 CFR part 670.

(iii) Import emperor penguins into the United States from Antarctica or export emperor penguins from the United States to Antarctica as authorized under implementing regulations for the Antarctic Conservation Act of 1978 (16 U.S.C. 2401 et seq.), either in accordance with the provisions set forth at 45 CFR 670.9, or as authorized by a permit under 45 CFR part 670.

(iv) Conduct activities as authorized by a permit under § 17.32.

(v) Take, as set forth at § 17.21(c)(2) through (c)(4) for endangered wildlife.

(vi) Possess and engage in other acts with unlawfully taken wildlife, as set forth at § 17.21(d)(2) for endangered wildlife.

(vii) Conduct activities as authorized by a captive-bred wildlife registration under § 17.21(g) for endangered wildlife.

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Martha Williams,
Principal Deputy Director,
Exercising the Delegated Authority of the Director,
U.S. Fish and Wildlife Service.

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