governments, or on the distribution of power and responsibilities among the various levels of government or between the Federal Government and Indian tribes. Thus, the Agency has determined that Executive Order 13132, entitled Federalism (64 FR 43255, August 10, 1999) and Executive Order 13175, entitled *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249, November 9, 2000) do not apply to this proposed final rule. In addition, this proposed order does not impose any enforceable duty or contain any unfunded mandate as described under Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) (Pub. L. 104–4).

This action does not involve any technical standards that would require Agency consideration of voluntary consensus standards pursuant to section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104–113, section 12(d) (15 U.S.C. 272 note).

List of Subjects in 40 CFR Part 180

Environmental protection, Administrative practice and procedure, Agricultural commodities, difenzoquat, Pesticides and pests, Reporting and recordkeeping requirements.

Dated: June 22, 2012.

Michael Goodis,

Director, Pesticide Re-evaluation Division, Office of Pesticide Programs.

[FR Doc. 2012–16295 Filed 7–5–12; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R9–ES–2012–0013; 4500030115]

RIN 1018–AY38

Endangered and Threatened Wildlife and Plants; Listing the Hyacinth Macaw

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; 12-month finding.

SUMMARY: We, the U.S. Fish and Wildlife Service, propose to list as endangered the hyacinth macaw *(Anodorhynchus hyacinthinus)* under the Endangered Species Act of 1973, as amended (Act). We are taking this action in response to a petition to list this species as endangered or threatened under the Act. This document, which also serves as the completion of the status review and as the 12-month finding on the petition, announces our finding that listing is warranted for the hyacinth macaw. If we finalize this rule as proposed, it would extend the Act's protections to this species. We seek information from the public on this proposed rule and status review for this species.

DATES: *Comments:* We will consider comments and information received or postmarked on or before September 4, 2012.

Public hearing: We must receive requests for a public hearing by August 20, 2012 addressed to the contact specified in **FOR FURTHER INFORMATION CONTACT.**

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

- *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments on Docket No. FWS–R9–ES–2012–0013.
- *U.S. mail or hand-delivery:* Public Comments Processing, Attn: FWS–R9–ES–2012–0013, Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We will not accept comments by email or fax. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Information Requested section below for more information).

FOR FURTHER INFORMATION CONTACT: Janine Van Norman, Chief, Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, Room 420, Arlington, VA 22203; telephone 703–358–2171. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

We were petitioned to list the hyacinth macaw, and 13 other parrot species, under the Endangered Species Act of 1973 (Act). During our status review, we found threats operating in aggregation and contributing to the risk of extinction of the species. Therefore, in this 12-month finding, we announce that listing the hyacinth macaw is warranted and are publishing a proposed rule to list this species as endangered under the Act. We are undertaking this action pursuant to a settlement agreement, and publication of this 12-month finding and proposed rule will fulfill our obligations under that agreement.

This action is authorized by the Endangered Species Act of 1973, as amended. It affects Part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations. The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. These prohibitions make it illegal for any person subject to the jurisdiction of the United States to ''take'' (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or to attempt any of these) within the United States or upon the high seas; import or export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any endangered wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken in violation of the Act. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. With regard to endangered wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species and for incidental take in connection with otherwise lawful activities.

This regulatory action is not economically significant.

Background

Section 4(b)(3)(B) of the Endangered Species Act (Act) (16 U.S.C. 1533(b)(3)(B)) requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition (''12-month finding''). In this finding, we determine whether the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made to add qualified species to or remove species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though

resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**.

The U.S. Fish and Wildlife Service (Service) publishes an annual notice of resubmitted petition findings (annual notice) for all foreign species for which listings were previously found to be warranted but precluded.

In this document, we announce that listing the hyacinth macaw as endangered is warranted, and we are issuing a proposed rule to add that species as endangered under the Federal Lists of Endangered and Threatened Wildlife and Plants.

Prior to issuing a final rule on this proposed action, we will take into consideration all comments and any additional information we receive. Such information may lead to a final rule that differs from this proposal. All comments and recommendations, including names and addresses of commenters, will become part of the administrative record.

Previous Federal Actions

Petition History

On January 31, 2008, the Service received a petition dated January 29, 2008, from Friends of Animals, as represented by the Environmental Law Clinic, University of Denver, Sturm College of Law, requesting that we list 14 parrot species under the Act. The petition clearly identified itself as a petition and included the requisite information required in the Code of Federal Regulations (50 CFR 424.14(a)). On July 14, 2009 (74 FR 33957), we published a 90-day finding in which we determined that the petition presented substantial scientific and commercial information to indicate that listing may be warranted for 12 of the 14 parrot species. In our 90-day finding on this petition, we announced the initiation of a status review to list as threatened or endangered under the Endangered Species Act of 1973, as amended (Act), the following 12 parrot species: blue-headed macaw *(Primolius couloni),* crimson shining parrot *(Prosopeia splendens),* great green macaw *(Ara ambiguus),* grey-cheeked parakeet *(Brotogeris pyrrhoptera),* hyacinth macaw *(Anodorhynchus hyacinthinus),* military macaw *(Ara militaris),* Philippine cockatoo *(Cacatua haematuropygia),* red-crowned parrot *(Amazona viridigenalis),* scarlet macaw *(Ara macao),* white cockatoo *(C. alba),* yellow-billed parrot *(Amazona collaria),* and yellow-crested cockatoo *(C. sulphurea).* We initiated this status review to determine if listing each of the 12 species is warranted, and initiated a 60-day information collection period to allow all interested parties an opportunity to provide information on the status of these 12 species of parrots. The public comment period closed on September 14, 2009.

On October 24, 2009, and December 2, 2009, the Service received a 60-day notice of intent to sue from Friends of Animals and WildEarth Guardians, for failure to issue 12-month findings on the petition. On March 2, 2010, Friends of Animals and WildEarth Guardians filed suit against the Service for failure to make timely 12-month findings within the statutory deadline of the Act on the petition to list the 14 species *(Friends of Animals, et al* . v. *Salazar,* Case No. 10 CV 00357 D.D.C.).

On July 21, 2010, a settlement agreement was approved by the Court (CV–10–357, D. DC), in which the Service agreed to submit to the **Federal Register** by July 29, 2011, September 30, 2011, and November 30, 2011, determinations whether the petitioned action is warranted, not warranted, or warranted but precluded by other listing actions for no less than 4 of the petitioned species on each date. On August 9, 2011, the Service published in the **Federal Register** a 12-month status review finding and proposed rule for the following four parrot species: Crimson shining parrot, Philippine cockatoo, white cockatoo, and yellow-crested cockatoo (76 FR 49202). On October 6, 2011, a 12-month status review finding was published for the red-crowned parrot (76 FR 62016). On October 11, 2011, a 12-month status review and proposed rule was published for the yellow-billed parrot (76 FR 62740), and on October 12, 2011, a 12-month status review was published for the blue-headed macaw and grey-cheeked parakeet (76 FR 63480).

On September 16, 2011, an extension to the settlement agreement was approved by the Court (CV–10–357, D. DC), in which the Service agreed to submit a determination for the remaining four petitioned species to the **Federal Register** by June 30, 2012.

In this status review we make a determination whether the petitioned action is warranted, not warranted, or warranted but precluded by other listing actions for one of the remaining species, the hyacinth macaw. This **Federal Register** document complies, in part, with the last deadline in the court-ordered settlement agreement.

Information Requested

We intend that any final actions resulting from this proposed rule will be based on the best scientific and commercial data available. Therefore, we request comments or information from other concerned governmental agencies, the scientific community, or any other interested parties concerning this proposed rule. We particularly seek clarifying information concerning:

(1) Information on taxonomy, distribution, habitat selection and trends (especially breeding and foraging habitats), diet, and population abundance and trends (especially current recruitment data) of this species.

(2) Information on the effects of habitat loss and changing land uses on the distribution and abundance of this species.

(3) Information on the effects of other potential threat factors, including live capture and hunting, domestic and international trade, predation by other animals, and any diseases that are known to affect this species or its principal food sources.

(4) Information on management programs for parrot conservation, including mitigation measures related to conservation programs, and any other private, nongovernmental, or governmental conservation programs that benefit this species.

(5) The potential effects of climate change on this species and its habitat.

Please include sufficient information with your submission (such as full references) to allow us to verify any scientific or commercial information you include. 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. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

Public Hearing

At this time, we do not have a public hearing scheduled for this proposed rule. The main purpose of most public hearings is to obtain public testimony or comment. In most cases, it is sufficient to submit comments through the Federal eRulemaking Portal, described above in the **ADDRESSES** section. If you would like to request a public hearing for this proposed rule, you must submit your request, in writing, to the person listed in the **FOR FURTHER INFORMATION CONTACT** section by the date specified in **DATES**.

Species Information and Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following 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.

In considering whether a species may warrant listing under any of the five factors, we look beyond the species' exposure to a potential threat or aggregation of threats under any of the factors, and evaluate whether the species responds to those potential threats in a way that causes actual impact to the species. The identification of threats that might impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence indicating that the threats are operative and, either singly or in aggregation, affect the status of the species. Threats are significant if they drive, or contribute to, the risk of extinction of the species, such that the species warrants listing as endangered or threatened, as those terms are defined in the Act.

Species Description

The hyacinth macaw is the largest bird of the parrot family, Family Psittacidae, (Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 405). It measures approximately 100 centimeters (cm) (3.3 feet (ft)) in length. Average female and male wing lengths measure approximately 400 to 407.5 millimeters (mm) (1.3 ft), respectively. Average tail lengths for females and males are 492.4 mm (1.6 ft) and 509.4 mm (1.7 ft), respectively (Forshaw 1973, p. 364). Hyacinth macaws are characterized by a predominately cobalt-blue plumage, black underside of wing and tail, and unlike other macaws, have feathered faces and lores (areas of a bird's face from the base of the bill to the front of the eyes). In addition, they have bare yellow eye rings, bare yellow patches surrounding the base of their lower mandibles, large and hooked grey-black bills, dark-brown irises, and dark-grey legs. However, older adults have lighter grey or white legs, which are short and sturdy to allow the bird to hang sideways or upside down while foraging. Immature birds are similar to adults but with shorter tails and paler yellow bare facial skin (Juniper and Parr 1998, pp. 416–417; Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 405; Forshaw 1973, p. 364).

At one time, hyacinth macaws were widely distributed throughout Brazil, Bolivia, and Paraguay (Pinho and Nogueira 2003, p. 30; Whittingham *et al.* 1998, p. 66; Guedes and Harper 1995, p. 395). Today, the species is limited to three separate areas, almost exclusively within Brazil, that have experienced less pressure from trapping, hunting, and agriculture: Eastern Amazonia in Pará, Brazil, south of the Amazon River along the Tocantins, Xingu, and Tapajós rivers; the Gerais region of northeastern Brazil, including the states of Maranhão, Piauí, Goiás, Tocantins, Bahia, and Minas Gerais; and the Pantanal of Mato Grosso and Mato Grosso do Sul, Brazil and marginally in Bolivia and Paraguay (Snyder *et al.* 2000, p. 119; Juniper and Parr 1998, p. 416; Abramson *et al.* 1995, p. 14; Munn *et al.* 1989, p. 407).

The hyacinth macaw exploits a variety of habitats in the Pará, Gerais, and Pantanal regions, although the climate within these three regions features a dry season that prevents the growth of extensive closed-canopy tropical forests. In Pará, the species prefers palm-rich várzea (flooded forests), seasonally moist forests with clearings, and savannas. In the Gerais region, it is located within the Cerrado biome, where it inhabits dry open forests in rocky, steep-sided valleys and plateaus, gallery forests (a stretch of forest along a river in an area of otherwise open country), and *Mauritia* palm swamps. In the Pantanal region, hyacinth macaws frequent gallery forest and palm groves with wet grassy areas (Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 407).

Although there is evidence that suggests this species was abundant before the mid-1980's (Collar *et al.* 1992, p. 4), a very rapid population decline is suspected to have taken place over the last 45 years (three generations) based on large-scale illegal trade, habitat loss, and hunting (BLI 2011, unpaginated). In 1986, Munn *et al.* (1989, p. 413) estimated the total population of hyacinth macaws to be 3,000, with a range between 2,500 and 5,000 individuals; 750 occurred in Pará, 1,000 in Gerais, and 1,500 in Pantanal (Collar *et al.* 1992, p. 4). In 2003, the population was estimated at 6,500 individuals; 5,000 of which were located in the Pantanal region (BLI 2011, unpaginated; Brouwer 2004, unpaginated). This population is the stronghold for the species and has shown signs of recovery since 1990, most likely as a response to conservation projects (BLI 2011, unpaginated; Antas *et al.* 2006, p. 128; Pinho and Nogueira 2003, p. 30).

The hyacinth macaw has a specialized diet consisting of the fruits of various palm species which are inside an extremely hard nut that only the hyacinth macaw can easily break (Guedes and Harper 1995, p. 400; Collar *et al.* 1992, p. 5). In each of the three regions where it occurs, this species utilizes only a few specific palm species. In Pará, hyacinth macaws (hyacinths) have been reported to feed on *Maximiliana regia* (inajá), *Orbignya martiana* (babassu), *Orbignya phalerata* (babacú) and *Astrocaryum sp.* (tucumán). In the Gerais region, hyacinths feed on *Attalea funifera* (piacava), *Syagrus coronata* (catolé), and *Mauritia vinifera* (buriti). In the Pantanal region, hyacinths feed exclusively on *Scheelea phalerata* (acuri) and *Acrocromia totai* (bocaiúva) (Antas *et al.* 2006, p. 128; Schneider *et al.* 2006, p. 74; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 401; Collar *et al.* 1992, p. 5; Munn *et al.* 1987, pp. 407–408). Although the hyacinth macaw prefers bocaiúva palm nuts over acuri, bocaiúva is only readily available from September to December, which coincides with the peak of chick hatching; however, the acuri is available throughout the year and constitutes the majority of this species' diet in the Pantanal (Guedes and Harper 1995, p. 400).

Hyacinths forage for palm nuts and water on the ground. They feed on the large quantities of nuts eliminated by cattle in the fields and have been observed in close proximity to cattle ranches where waste piles are concentrated. They may also forage directly from the palm tree and drink fluid from unripe palm fruits (Juniper and Parr 1998, p. 417; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, pp. 5, 7). Birds often occur in small family groups except at feeding and roosting sites when large flocks of 10–100 have been observed (Abramson *et al.* 1995, p. 2). Single birds rotate responsibility for serving as a lookout. Birds are most active during the cooler parts of the day, foraging in the morning and late afternoon. Foraging generally lasts about 30 minutes followed by a 10–20 minute break before feeding

again. Foraging may be within a few meters to several kilometers from the roost or nest tree (Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, p. 5).

Hyacinths nest from July to December in tree cavities and, in some parts of its range, cliff cavities. As a secondary tree nester, hyacinth macaws require large, preexisting tree holes for nesting (Pizo *et al.* 2008, p. 792; Abramson *et al.* 1995, p. 2). In Pará, the species nests in holes of *Bertholettia excelsa* (Brazil nut). In the Gerais region, nesting may occur in large dead *Mauritia vinifera* (buriti), but is most commonly found in natural rock crevices. In studies conducted in the Pantanal region, the species was found to nest almost exclusively (94 percent of nests) in *Sterculia striata* (manduvi); although nesting has been reported in *Pithecellobium edwalii* (angio branco), *Enterolobium contortisiliquum* (ximbuva), and *Vitex sp.* (tarumá) (Kuniy *et al.* 2006, p. 381; Pinho and Nogueira 2003, p. 30; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 402; Collar *et al.* 1992, pp. 5–6; Munn *et al.* 1987, p. 408).

Hyacinth pairs will defend a nest using loud vocalizations and flights around the nest tree when a potential threat, such as humans, dogs, some birds, and mammals, approach. Often one or two other pairs will join in these nest defense behaviors. However, when displacing other macaw species, hyacinths engage in silent behaviors; the male and female will cover the nest opening using their bodies, hook their bill on the upper rim of the nest opening, and extend their wings. The male may fly to displace the intruding bird while the female remains at the nest opening (Guedes and Harper 1995, p. 405).

In captivity, hyacinths reach reproductive maturity between 4 and 5 years old (Abramson *et al.* 1995, p. 2). The hyacinth macaw lays two smooth, white eggs approximately 48.4 mm (1.9 inches (in)) long and 36.4 mm (1.4 in) wide. Eggs are usually found in the nest from August until December (Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 406). The female alone incubates the eggs for approximately 28–30 days. The male remains near the nest to protect it from invaders, but may leave 4–6 times a day to forage and collect food for the female (Schneider *et al.* 2006, pp. 72, 79; Guedes and Harper 1995, p. 406). Chicks are mostly naked with sparse white down feathers at hatching. Young are fed regurgitated, chopped palm nuts (Munn *et al.* 1989, p. 405). Most chicks fledge at 105–110 days old; however, separation is a slow process. Fledglings will continue to be fed by the parents for 6 months, when they begin to break hard palm nuts themselves, and may remain with the adults for 16 months, after which they will join groups of other young birds (Schneider *et al.* 2006, pp. 71–72; Guedes and Harper 1995, pp. 407–411). Although hyacinths lay two eggs, observers have reported that they rarely fledge more than one bird (Munn *et al.* 1989, p. 409). Given the long period of chick dependence, hyacinths may not breed every year (Schneider *et al.* 2006, pp. 71–72; Guedes and Harper 1995, pp. 407–411).

Conservation Status

In 1989, the hyacinth macaw was listed as a species at risk for extinction by the Brazilian Institute of Environment and Natural Resources (IBAMA), the government agency that controls the country's natural resources (Lunardi *et al.* 2003, p. 283). It is also listed as ''critically endangered'' by the State of Minas Gerais and ''vulnerable'' by the State of Pará (Garcia and Marini 2006, p. 153). This species is also currently classified as ''endangered'' by the International Union for the Conservation of Nature and is listed as Appendix I on the Convention on International Trade in Endangered Species (CITES) list. Species included in CITES Appendix I are the most endangered CITES-listed species. They are considered threatened with extinction, and international trade is permitted only under exceptional circumstances, which generally precludes commercial trade.

Summary of Factors Affecting the Hyacinth Macaw

This status review focuses primarily on the hyacinth macaw populations in Brazil. The species occurs only marginally within Bolivia and Paraguay as extensions from the Brazilian Pantanal population, and there is little information on the species in those countries. Most of the information on the hyacinth macaw is from the Pantanal region, as this is the largest and most studied population. We found little information on the status of the Pará and Gerais populations; therefore, we evaluated factors for these populations by a broader region (e.g., the Amazon biome for Pará and the Cerrado biome for Gerais). For particular areas in which we lack information about the species, we request additional information from the public during the proposed rule comment period.

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Natural ecosystems across Latin America are being transformed due to economic development, international market demands, and government policies. In Brazil, demand for soybean oil and meal has increased, causing cultivations to significantly increase (Barona *et al.* 2010, pp. 1–2). Brazil has also risen to become the world's largest exporter of beef. Over the past decade, more than 10 million hectares (ha) (24.7 million acres (ac)) were cleared for cattle ranching, and the government is aiming to double the country's share of the beef export market to 60 percent by 2018 (Mongabay 2009, unpaginated). Much of the recent surge in cropland area expansion is taking place in the Brazilian Amazon and Cerrado regions (Nepstad *et al.* 2008, p. 1738). However, in all of the regions where the hyacinth macaw occurs, the natural vegetation, including food and nesting resources, is threatened by expansion of agriculture and cattle ranching.

Pará

Pará is one of the Brazilian states that constitute the Amazon biome (Greenpeace 2009, p. 2). This biome contains more than just the well-known tropical rainforests; it also encompasses other ecosystems, including floodplain forests and savannas. Pará has long been known as the epicenter of illegal deforestation in the Brazilian Amazon (Dias and Ramos 2012, unpaginated). Here, the most important cause of deforestation is the conversion of floodplain forests to cattle-ranching, which has expanded significantly over the last 15 years (da Silva 2009, p. 3; Lucas 2009, p. 1; Collar *et al.* 1992a, p. 7). Although the hyacinth macaw's food and nesting habitat are reasonably intact, the continuing rapid expansion of cattle ranching may affect nesting trees and food resources (Munn *et al.* 1989, p. 415).

Cattle ranching has been present in the várzea (floodplain forests) of the Amazon for centuries (Arima and Uhl, 1997, p. 433). However, state subsidies and massive infrastructure development have facilitated large-scale forest conversion and colonization for cattle ranching (Barona *et al.* 2010, p. 1). Additionally, certain factors have led to a significant expansion of this land use. The climate of the Brazilian Amazon is favorable for cattle ranching; frosts do not occur like in the south of Brazil and rainfall is more evenly distributed throughout the year, increasing pasture productivity and reducing the risk of

fire. In Pará, there is a lower incidence of disease, such as hoof-and-mouth disease, brucellosis, and ectoparasites than in central and south Brazil. Additionally, the price of land in Pará has been lower than in central and south Brazil, resulting in ranchers selling farms, establishing larger farms in Pará, and competing in the national market (Arima and Uhl, 1997, p. 446).

In the Brazilian North region, including Pará, cattle occupy 84 percent of the total area under agricultural and livestock uses. This area, on average, has expanded 9 percent per year over the last 10 years causing 70–80 percent of deforestation (Nepstad *et al.* 2008, p. 1739). Pará itself contains two-thirds of the Brazilian Amazonia cattle herd (Arima and Uhl 1997, p. 343). For 7 months of the year, cattle are grazed in the várzea, but are moved to the upper terra firme the other 5 months (Arima and Uhl, 1997, p. 440). Intense livestock activity can affect seedling recruitment via trampling and grazing. Cattle also compact the soil such that regeneration of forest species is severely reduced (Lucas 2009, pp. 1–2). This type of repeated disturbance can lead to an ecosystem dominated by invasive trees, grasses, bamboo, and ferns (Nepstad *et al.* 2008, p. 1740).

Although the immediate cause of deforestation in the Amazon was predominantly the expansion of pasture during the period 2000–2006 (Barona *et al.* 2010, p. 8), the underlying cause may be the expansion of soy cultivation in other areas, leading to a displacement of pastures further north into parts of Pará causing additional deforestation (Barona *et al.* 2010, pp. 6, 8). Pará has one of the highest deforestation rates in the Brazilian Amazon (Portal Brasil 2010, unpaginated). During 1988–2009, the state lost 123,527 km² (47,694 mi²), with annual rates varying between 3,780–8,870 km² (1,460–3,424 mi²) (Butler 2010, unpaginated). Modeled future deforestation is concentrated in eastern Amazonia. If current trends in agricultural expansion continue, the southeastern tributaries of the Amazon River (Tapajós and Xingu) will lose at least two-thirds of their forest cover by 2050 (Soares-Filho *et al.* 2006, p. 522).

Cerrado

The Cerrado is a 2 million km² (772,204 mi²) biome consisting of plateaus and depressions with vegetation that varies from dense grasslands with sparse shrubs and small trees to an almost closed woodland (Pinto *et al.* 2007, p. 14; da Silva 1997, p. 437; Ratter *et al.* 1997, p. 223). In the Cerrado, hyacinths now mostly nest in rock crevices, most likely a response to the destruction of nesting trees (Collar *et al.* 1992, p. 5). These crevices will likely remain constant and are not a limiting factor. However, deforestation for agriculture, primarily soy crops, and cattle ranching threaten the remaining native cerrado vegetation, including palm species the hyacinth macaw relies on as a food resource.

Settlement of the Cerrado region by nonindigenous people began in the 18th Century with the quest for gold and precious stones. Later, cattle ranching became the dominant activity until the 1950's (WWF–UK 2011b, p. 2). However, during this time the Cerrado was sparsely populated and inhabitants practiced little more than subsistence agriculture (Pinto *et al.* 2007, p. 14; Ratter *et al.* 1997, p. 227). Most of the settlement and drastic anthropogenic modification to the Cerrado region began in the 1950's with the mechanization of agriculture, new fertilization techniques, and the low cost of land (Pinto *et al.* 2007, p. 14; WWF 2001, unpaginated; da Silva 1997, p. 446). With the construction of the new Brazilian capital, Brasília, in 1960, several highways and railways were built, and during the 1970's and 1980's, investment programs along with generous government subsidies, tax incentives, and low-interest loans transformed the region to a new agricultural frontier (WWF–UK 2011b, p. 2; WWF 2001, unpaginated; Ratter *et al.* 1997, pp. 227–228).

In the last 15 years, soy production has doubled due to an increasing demand related to an increase in the consumption of meat (soy is used in the manufacturing of livestock feed), use in food, and biofuel (WWF 2011, unpaginated). In 1980, cattle in the Cerrado region numbered 48 million, and have certainly grown since then. In 1994, 3.9 million ha (9.6 million ac) of soy were planted, and far more were planted with exotic grasses for pasture (Ratter *et al.* 1997, p. 228). Today, the Cerrado produces 70 percent of Brazil's farm output and constitutes 40 percent of the national cattle herd (Pearce 2011, unpaginated; WWF–UK 2011b, p. 2). The remaining Cerrado continues to be pressured by conversion for soy plantations and extensive cattle ranching. Additionally, the conversion to biofuel production is imminent, creating a market for the expansion and establishment of new areas for soy, caster beans, other oil-bearing plants, and sugar cane (WWF–UK 2011a, unpaginated; Carvalho *et al.* 2009, p. 1393; BLI 2008, unpaginated).

Fire is frequently used to clear land or stimulate new growth in pastures. Farmers often burn at the end of the dry season when fuel is high and humidity low, resulting in extremely hot fires (Klink and Machado 2005, p. 708). Cerrado vegetation is resistant to fires, but frequent burnings cause destruction, affecting tree and shrub establishment, and resulting in a more herbaceous landscape (Klink and Machado 2005, pp. 709–710; Ratter *et al.* 1997, p. 224). It was estimated that in 2000, 67 percent of the area burned in Brazil occurred within the Cerrado (Klink and Machado 2005, p. 709). From May to September 2010, there were 60,000 fire outbreaks, a 350 percent increase over the same time period in 2009. Although some of this increase is likely due to the drought at that time, more can be attributed to deliberate burning to create farmland, aggravated by a legislative challenge to Brazil's Forest Code (See Factor D) (WWF 2010, unpaginated).

More than 50 percent of the original Cerrado vegetation has been lost due to conversion to agriculture and pasture, although estimates range up to 80 percent, and the area currently continues to suffer high rates of habitat loss (Pearce 2011, unpaginated; WWF–UK 2011b, pp. 1–2; Carvalho *et al.* 2009, p. 1393; BLI 2008, unpaginated; Pinto *et al.* 2007, p. 14; Klink and Machado 2005, p. 708; Marini and Garcia 2005, p. 667; WWF 2001, unpaginated; da Silva 1997, p. 446, da Silva 1995, p. 298). During 2002–2008, the demand for land to be put into production resulted in an annual deforestation rate of more than 14,200 km² (5,483 mi²) (WWF–UK 2011b, p. 2). At this rate, the vegetation of the Cerrado region is disappearing faster than the Amazon rainforest (Pearce 2011, unpaginated; WWF–UK 2001, unpaginated; Klink and Machado 2005, p. 708; Ratter *et al.* 1997, p. 228). If current rates continue, the remaining native habitat may be lost by 2030 (Marini and Garcia 2005, p. 667).

Pantanal

The Pantanal is a 140,000-km² (54,054-mi²) seasonally flooded wetland interspersed with higher areas, not subject to inundation, covered with cerrado or seasonal forests (Júnior 2008, p. 133; Júnior *et al.* 2007, p. 127; Harris *et al.* 2005, p. 715; Mittermeier *et al.* 1990, p. 103). Since the 1700's, the Pantanal region has been subject to various economic activities, including mining, sugar plantations, agriculture, and cattle ranching (Harris *et al.* 2006, p. 165). Although cattle ranching has occurred in this region for more than a century, transitions during the 1990's to more intense ranching methods led to the conversion of more forests to pasture and the introduction of nonnative grasses. Today, cattle ranching is the

predominant economic activity in this region and is the greatest threat to habitat loss in the Pantanal (Pizo *et al.* 2008, p. 793; Harris *et al.* 2006, pp. 165, 175–176; Harris *et al.* 2005, pp. 715–716, 718; Pinho and Nogueira 2003, p. 30; Seidl *et al.* 2001, p. 414; Guedes and Harper 1995, p. 396; Mettermeier 1990, pp. 103, 107–108).

Eighty percent of the land in the Pantanal is owned by large-ranch owners, some whose tracts exceed 1,000 km^2 (386 mi^2) (Seidl *et al.* 2001, p. 414; Mettermeier *et al.* 1990, p. 103). Cattle ranchers use naturally occurring grasslands for grazing cattle, but these areas are subject to seasonal flooding. During the flooding season (January to June), the upland forests experience increased pressure from cattle. These upland forests are often removed and converted to cultivated pastures (Júnior *et al.* 2007, p. 127; Harris *et al.* 2006, p. 165; Pinho and Nogueira 2003, p. 30; Seidl *et al.* 2001, p. 414; Johnson *et al.* 1997, p. 186). Clearing land to establish pasture is perceived as the economically optimal land use while land not producing beef is often perceived as unproductive (Seidl *et al.* 2001, pp. 414–415). Little of the vegetation in this region remains undisturbed due to cattle ranching and the associated burning of pastures for maintenance (Mittermeier *et al.* 1990, p. 103). Between 1990 and 2000, the annual deforestation rate was estimated at 0.46 percent. During the period 2000–2004, the rate increased to 2.3 percent per year, an increase of five times compared to the previous 10-year period. If this rate is maintained, the original vegetation area of the Pantanal, including nesting trees for the hyacinth macaw, will be completely destroyed by approximately 2050 (Harris *et al.* 2006, pp. 169, 177).

When clearing land for pastures, palm trees are often left as the cattle will feed on the palm nuts (Pinho and Nogueira 2003, p. 36). In fact, hyacinth macaws are known to occur near cattle ranches and feed off the palm nuts eliminated by the cattle (Juniper and Parr 1998, p. 417; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, pp. 5, 7). However, other trees, including potential nesting trees, are often removed (Snyder *et al.* 2000, p. 119). In addition to the direct removal of trees, other activities associated with cattle ranching, such as the introduction of exotic foraging grasses, grazing, and burning, are serious threats to the nesting trees of the hyacinth macaw (Júnior *et al.* 2007, p. 128; Harris *et al.* 2006, p. 175; Snyder *et al.* 2000, p. 119).

As stated above, hyacinths in the Pantanal nest almost exclusively in cavities of the manduvi tree, as it is one of the few tree species that grow large enough to supply cavities that can accommodate the hyacinth's large size. Manduvis occur in forest patches and corridors that cover only 6 percent of the vegetative area of the Pantanal (Pizo *et al.* 2008, p. 793). Much of these patches and corridors are surrounded by seasonally flooded grasslands used as rangeland for cattle (Johnson *et al.* 1997, p. 186). When forests are cleared, the natural vegetation is replaced with exotic grasses (Júnior 2008, p. 136; Harris *et al.* 2005, p. 716). More than 40 percent of the forests and savanna habitats have already been altered by the introduction of exotic grasses (Harris *et al.* 2005, p. 716; Johnson *et al.* 1997, p. 187). Fire is a common method for renewing pastures, controlling weeds, and controlling pests (e.g., ticks); however, fires frequently become uncontrolled and are known to enter the patches and corridors of manduvi trees during the dry season (Harris *et al.* 2005, p. 716; Johnson *et al.* 1997, p. 186). Although fire can promote cavity formation in manduvi trees, frequent fires can also prevent trees from surviving to a size capable of providing suitable cavities and can cause a high rate of nesting tree loss (Guedes 1993 in Johnson *et al.* 1997, p. 187). Guedes (1995 in Júnior *et al.* 2006, p. 185) noted that 5 percent of hyacinth macaw nests are lost each year to deforestation, fire, and storms.

In addition to the direct removal of trees and the impact of fire on recruitment of manduvi trees, cattle themselves have impacted the density of manduvi seedlings in the Pantanal. Cattle forage on and trample manduvi seedlings, affecting the recruitment of this species to a size large enough to accommodate hyacinths (Pizo *et al.* 2008, p. 793; Johnson *et al.* 1997, p. 187; Mettermeier *et al.* 1990, p. 107). Only those manduvi trees 60 years old or older are capable of providing these cavities (Pizo *et al.* 2008, p. 792; Júnior *et al.* 2006, p. 185). The minimum diameter at breast height (DBH) for trees to potentially contain a cavity suitable for hyacinth macaws is 50 cm (20 in), while all manduvi trees greater than 100 cm (39 in) DBH contain suitable nest cavities. Data indicate a low recruitment in classes greater than 5 cm (2 in) DBH, a strong reduction in the occurrence of individuals greater than 50 cm (20 in) DBH, and very few individuals greater than 110 cm (43 in) DBH (Júnior *et al.* 2007, p. 128). Only 5 percent of the existing adult manduvi trees in south-central Pantanal contain suitable cavities for hyacinth macaws (Guedes 1993 in Johnson *et al.* 1997, p. 186). This suggests that potential nesting sites are rare and will become increasingly rare in the future (Júnior *et al.* 2007, p. 128).

Effects of Deforestation on the Hyacinth Macaw

The hyacinth macaw is highly specialized in its diet and nest sites (Faria *et al.* 2008, p. 766; Guedes and Harper 1995, p. 400; Collar *et al.* 1992, p. 5). The loss of these tree species may pose a threat by creating a shortage of suitable nesting sites and increasing competition, and result in lowered recruitment and a reduction in population size (Lee 2010, pp. 2, 12; Júnior *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188).

The hyacinth macaw has an extremely strong and chiseled beak which allows it to feed on extremely hard palm nuts that few, if any, other species can eat (Guedes and Harper 1995, p. 400; Collar *et al.* 1992, p. 5). Loss of these palm species, especially in Pará and the Cerrado region where food sources are threatened, could lead to reduced fitness, reduced reproduction, and extinction. For example, one of the major factors thought to have contributed to the critically endangered status of the Lear's macaw *(Anodorhynchus leari)* is the loss of its food source, licuri palm stands *(Syagrus),* to cattle grazing (Collar *et al.* 1992, p. 257).

Lack of breeding cavities can be a limiting factor for cavity-nesting parrot species (Pinho and Noguiera 2003, p. 30). Hyacinths can tolerate a certain degree of human disturbance at their breeding sites (Pinho and Noguiera 2003, p. 36); however, the number of usable cavities increases with the age of the trees in the forest (Newton 1994, p. 266), and clearing land for agriculture and cattle ranching, cattle trampling and foraging, and burning of forest habitat result in the loss of mature trees with natural cavities of sufficient size and a reduction in recruitment of native species, which could eventually provide nesting cavities. A shortage of nest sites can threaten the persistence of the hyacinth macaw by constraining breeding density, resulting in lower recruitment and a gradual reduction in population size (Júnior *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188; Guedes and Harper 1995, p. 405; Newton 1994, p. 265). This may lead to long-term effects on the viability of the hyacinth macaw population, especially in Pará and the Pantanal where persistence of nesting trees is threatened (Júnior *et al.* 2007, p. 128; Júnior *et al.* 2006, p. 181).

Habitat and feeding specializations are good predictors of the risk of

extinction of birds. The hyacinth macaw scores high in both feeding and nest site specialization (Pizo *et al.* 2008, pp. 794–795). Although a species may withstand the initial shock of deforestation, factors such as the lack of food resources and breeding sites may reduce the viability of the population and make them vulnerable to extinction (Sodhi *et al.* 2009, p. 517). Given the land-use trends across the range of the hyacinth macaw, the continued existence of food and nesting resources is a great concern.

Conservation Actions

Brazil announced in 2009 a plan to cut deforestation rates by 80 percent by 2020 with the help of international funding; Brazil's plan calls on foreign countries to find $20 billion U.S. dollars (USD) (Marengo *et al.* 2011, p. 8; Moukaddem 2011, unpaginated; Painter 2008, unpaginated). If Brazil's plan is implemented and the goal is met, deforestation in Brazil would be significantly reduced. Despite obstacles to overcome to reach this goal, including annual funding, deforestation fell by 80 percent in the past 6 years due to police raids and other tactics used to crack down on illegal deforesters (Barrionuevo 2012, unpaginated). However, the Brazilian Senate is currently debating reform to Brazil's Forest Code. We do not know the current status of the bill, but if the reform is passed, it would reduce the percentage of land a private landowner would be required to maintain as forest (See Factor D). The expectation of the bill being passed has already resulted in a spike in deforestation. If the bill is passed, it would undermine Brazil's commitment to reduce deforestation (Moukaddem 2011, unpaginated; WWF–UK 2011a, unpaginated).

In Brazil, the Ministry of Environment and The Nature Conservancy have worked together to implement the Farmland Environmental Registry to curb illegal deforestation in the Amazon. Once all of the country's rural properties are registered in the system, Brazil will be able to more easily identify and track illegal deforestation through satellite monitoring and develop land use plans to create alternatives for farmers and ranchers, guaranteeing the protection of Amazon land. This plan helped Paragominas, a municipality in Pará, be the first in Brazil to come off the government's blacklist of top Amazon deforesters. After 1 year, 92 percent of rural properties in Paragominas had been entered into the registry, and deforestation was cut by 90 percent. In response to this success, Pará launched its Green Municipalities Program in 2010. The purpose of this project is to eliminate illegal deforestation by 2014 across more than 77 municipalities. The program aims to show how it is possible to develop a new model for an activity identified as a major cause of deforestation (Dias and Ramos 2012, unpaginated; Vale 2010, unpaginated). If these two programs continue to be implemented and show success like that experienced in Paragominas, it would contribute significantly to the reduction of deforestation not only in the Amazon, but throughout Brazil.

Awareness of the urgency in protecting the biodiversity of the Cerrado biome is increasing (Klink and Machado 2005, p. 710). The Brazilian Ministry of the Environment's National Biodiversity Program and other government-financed institutes such as the Brazilian Environmental Institute, Center for Agriculture Research in the Cerrado, and the National Center for Genetic Resources and Biotechnology, are working together. Additionally, nongovernmental organizations such as Fundaço Pró-Natureza, Instituto Sociedade População e Natureza, and World Wildlife Fund have provided valuable assessments and are pioneering work in establishing extractive reserves (Ratter *et al.* 1997, pp. 228–229). Other organizations are working to increase the area of Federal Conservation Units; currently they represent only 1.5 percent of the biome (Ratter *et al.* 1997, p. 229). Teams from the University of Brasilia, Center for Agriculture Research in the Cerrado, and the Royal Botanic Garden Edinburgh have combined to form the Conservation and Management of the Biodiversity of the Cerrado Biome initiative. The aim is to survey floristic patterns to determine representative and biodiversity hot spots (Ratter *et al.* 1997, p. 229).

A network of nongovernmental organizations, Rede Cerrado, has been established to promote local sustainable-use practices for natural resources (Klink and Machado 2005, p. 710). Rede Cerrado provided the Brazilian Ministry of the Environment recommendations for urgent actions for the conservation of the Cerrado. As a result, a conservation program, Program Cerrado Sustentavel, was established to integrate actions for conservation in regions where agropastoral activities were especially intense and damaging (Klink and Machado 2005, p. 710). Conservation International, The Nature Conservancy, and World Wildlife Fund have worked to promote alternative economic activities, such as ecotourism, sustainable use of fauna and flora, and medicinal plants, to support the livelihoods of local communities (Klink and Machado 2005, p. 710). Although these programs demonstrate an urgency and effort in protecting the Cerrado, we have no details on the specific work or accomplishments of these programs, or how they would affect, or have affected, the hyacinth macaw and its habitat.

The Brazilian Government, under its Action Plan for the Prevention and Control of Deforestation and Burning in the Cerrado—Conservation and Development (2010), committed to recuperating at least 8 million ha (20 million ac) of degraded pasture by the year 2010. It also plans to expand the areas under protection in the Cerrado to 2.1 million ha (5 million ac) (WWF–UK 2011b, p. 4). However, we do not have details on the success of the action plan or the progress on expanding protected areas.

In 1990, the Hyacinth Macaw Project (Projecto Arara Azul) began with support from the University for the Development of the State (Mato Grosso do Sul) and the Pantanal Region (Brouwer 2004, unpaginated; Guedes 2004, p. 28; Pittman 1999, p. 39). This program works with local landowners, communities, and tourists to monitor the hyacinth macaw, study the biology of this species, manage the population, and promote its conservation and ensure their protection in the Pantanal (Júnior 2008, p. 135; Harris *et al.* 2005, p. 719; Brouwer 2004, unpaginated; Guedes 2004, p. 281). Studies have addressed feeding, reproduction, competition, habitat survival, chick mortality, behavior, nests, predation, movement, and threats contributing to the reduction in the wild population (Guedes 2004, p. 281). Because there are not enough natural nesting sites in this region, the Hyacinth Macaw Project began installing artificial nest boxes; more than 180 have been installed (Guedes 2004, p. 281). Additionally, wood boards are used to make cavity openings too small for predators, while still allowing hyacinths to enter (Brouwer 2004, unpaginated).

In nests with a history of unsuccessful breeding, the Hyacinth Macaw Project has also implemented chick management, with the approval of the Committee for Hyacinth Macaw Conservation coordinated by IBAMA. Hyacinth macaw eggs are replaced with chicken eggs and the hyacinth eggs are incubated in a field laboratory. After hatching, chicks are fed for a few days, and then reintroduced to the original nest or to another nest with a chick of the same age. This began to increase the number of chicks that survived and fledged each year (Brouwer 2004, unpaginated; Guedes 2004, p. 281). Awareness has also been raised with

local cattle ranchers. Attitudes have begun to shift, and ranchers are proud of having macaw nests on the property. Local inhabitants also served as project collaborators (Guedes 2004, p. 282). This shift in attitude has also diminished the threat of illegal trade in the Hyacinth Macaw Project area (See Factor B) (Brouwer 2004, unpaginated).

The activities of the Hyacinth Macaw Project have certainly contributed to the increase of the hyacinth population in the Pantanal since the 1990's (Harris *et al.* 2005, p. 719). Nest boxes can have a marked effect on breeding numbers of many species on a local scale (Newton 1994, p. 274), and having local cattle ranchers appreciate the presence of the hyacinth macaw on their land helps diminish the effects of habitat destruction and illegal trade. However, the Hyacinth Macaw Project area does not encompass the entire Pantanal region. Although active management (installation of artificial nest boxes and chick management) has contributed to the increase in the hyacinth population, and farmers have begun to protect hyacinth macaws on their property, the Pantanal is still threatened with the expansion of cattle-ranching. The recruitment (entry of new trees into a population) of the manduvi tree is severely reduced and is expected to become increasingly rare in the future, due to ongoing damage caused by grazing and trampling of cattle as well as the burning of pastures for maintenance. If this continues, the hyacinth's preferred natural cavities will be severely limited and the species will completely rely on the installation of artificial nest boxes, which is currently limited to the Hyacinth Macaw Project area.

Summary of Factor A

Although the hyacinth macaw is found is three different biomes of Brazil, they are all threatened with the expansion of agriculture, mainly soy and cattle ranching. Pará has long been known as the epicenter of illegal deforestation and has one of the highest deforestation rates of the Amazon. Rapid expansion of cattle ranching is leading to the conversion of floodplain forests, threatening the food and nesting resources of the hyacinth macaw. If current trends in agricultural expansion continue, the southeastern tributaries of the Amazon River (Tapajós and Xingu) will lose at least two-thirds of their forest cover by 2050. The Cerrado region is disappearing faster than the Amazon forest due to soy cultivation and cattle ranching. If current rates continue, the remaining native vegetation could be lost by 2030. Although the hyacinth mainly nests in rock crevices in this region, the palm species the hyacinth macaw utilizes as food sources are threatened by direct clearing of land and the reduced recruitment of native forests by the grazing and trampling of cattle and the burning of pastures for maintenance.

The greatest threat to the habitat of the Pantanal is the expansion of cattle ranching. If current rates of deforestation continue, the original vegetation could be lost by approximately 2050. In this region, the palm species that the hyacinths utilize as food sources are usually left as cattle also feed on the palm nuts. However, the manduvi trees, which contain the majority of hyacinth nests, are already limited. Cattle affect the recruitment of native seedlings through grazing and trampling. Fire, for pasture maintenance or clearing, has been known to enter stands of manduvi trees during the dry season. Five percent of hyacinth macaw nests are lost each year to deforestation, fire, and storms, and there is evidence of severely reduced recruitment of manduvi trees, suggesting that not only are these nesting trees scarce now, but they are likely to become increasingly scarce in the future.

As discussed above, the regions where the hyacinth macaw occurs have suffered high rates of deforestation. The growing demand for soy and Brazil's plan to increase their export of beef suggest that the current trends are likely to continue and may even increase. There are conservation programs that aim to curb the deforestation rate. If these programs are implemented and goals are reached, deforestation in Brazil could be significantly reduced; however, the effects of these programs are yet to be seen. The Hyacinth Macaw Project has contributed much to the knowledge of the biology of the hyacinth macaw. Management, such as the installation of artificial nests and chick management have contributed to the increased hyacinth population in the Pantanal. However, the Pantanal population, as well as the Pará and Cerrado populations, continues to be threatened by the loss of essential food and nesting resources. Given the specialized nature of the hyacinth macaw, the loss of these resources could have a particularly devastating effect on the viability of the population. Therefore, based on the best available scientific and commercial information, we find that the present or threatened destruction, modification, or curtailment of habitat or range is a threat to the hyacinth macaw now and in the future.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

For centuries, parrots and macaws have been trapped for the pet bird trade and captured for use of their feathers in local handicrafts (Guedes 2004, p. 279; Snyder *et al.* 2000, pp. 98–99). Additionally, hunting of parrots is widespread and large species of macaws have been known to be targeted by hunters as a food source (Tobias or Brightsmith 2007, p. 134). It is likely that hunting and habitat destruction were the main causes of the hyacinth macaw's decline until the 1960's and early 1970's. At that time, a major increase in international trade in live macaws may have had a greater effect on the decline of the species than either habitat loss or hunting (Munn *et al.* 1989, p. 412).

Trade can have a particularly devastating effect on parrot species given their long life span, low reproductive rate, and slow recovery from harvesting pressures (Lee 2010, p. 3; Thiollay 2005, p. 1121; Wright *et al.* 2001, p. 711; Munn *et al.* 1989, p. 410). Because of the difficulty in keeping young birds alive, adults are often the main target for trade; as this practice removes reproductive individuals, the population is depleted more rapidly (Collar *et al.* 1992a, p. 6). Certain trapping methods can also lead to rapid extirpation of extremely site-faithful species, like the hyacinth macaw (Collar *et al.* 1992a, p. 7). Additionally, once a species becomes rare in the wild, demand and price often increase, creating a greater demand for the species and increasing harvesting pressure (Herrera and Hennessey 2009, p. 234; Wright *et al.* 2001, p. 717). Species priced above $500 USD are more likely to be imported illegally, and higher prices often drive poaching rates (Wright *et al.* 2001, p. 718). The hyacinth macaw is a larger and more expensive species; prices may reach over $12,000 USD (Basile 2009, p. 4). Harvesting pressure can cause smaller populations than habitat degradation where some level of reproduction could be supported (Wright *et al.* 2001, p. 718).

In 1981, the hyacinth macaw was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments to ensure that the international trade of CITES-listed plant and animal species does not threaten species' survival in the wild. There are currently 175 CITES Parties (member countries or signatories

to the Convention). Under this treaty, CITES Parties regulate the import, export, and reexport of specimens, parts, and products of CITES-listed plant and animal species. Trade must be authorized through a system of permits and certificates that are provided by the designated CITES Scientific and Management Authorities of each CITES Party.

In October 1987, the hyacinth macaw was uplisted to Appendix I of CITES. An Appendix-I listing includes species threatened with extinction whose trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The import of an Appendix-I species generally requires the issuance of both an import and export permit. Import permits for Appendix-I species are issued only if findings are made that the import would be for purposes that are not detrimental to the survival of the species in the wild and that the specimen will not be used for primarily commercial purposes (CITES Article III(3)). Export permits for Appendix-I species are issued only if findings are made that the specimen was legally acquired and trade is not detrimental to the survival of the species in the wild, and if the issuing authority is satisfied that an import permit has been granted for the specimen (CITES Article III(2)).

Based on CITES trade data obtained from United Nations Environment Programme—World Conservation Monitoring Center (UNEP–WCMC) CITES Trade Database, from October 1987 through 2010, the time the hyacinth macaw was uplisted to CITES Appendix I, 2,092 specimens of this species were reported in international trade: 1,887 live birds, 116 feathers, 82 scientific specimens, 2 bodies, 1 skin piece, and 4 unspecified specimens, plus an additional 124 milliliters, 2 grams, and 49 flasks of scientific specimens. In analyzing these reported data, several records appear to be overcounts due to slight differences in the manner in which the importing and exporting countries reported their trade, and it is likely that the actual number of specimens of hyacinth macaws reported in international trade to UNEP–WCMC from 1987 through 2010 was 1,873, including 1,669 live birds, 115 feathers, 82 scientific specimens, 2 bodies, 1 skin piece, and 4 unspecified specimens, plus an additional 124 milliliters, 2 grams, and 49 flasks of scientific specimens. Of these specimens, 86 (4.6 percent) were exported from Bolivia, Brazil, or Paraguay (the range countries of the species). With the information given in the UNEP–WCMC database, from 1987 through 2010, only 24 of the 1,669 live hyacinth macaws reported in trade were reported as wild-sourced, 1,537 were reported as captive bred or captive born, 35 were reported as pre-Convention, and 73 were reported with the source as unknown.

Through Resolution Conf. 8.4 (Rev. CoP15), the Parties to CITES adopted a process, termed the National Legislation Project, to evaluate whether Parties have adequate domestic legislation to successfully implement the Treaty (CITES 2010b, pp. 1–5). In reviewing a country's national legislation, the CITES Secretariat evaluates factors such as whether a Party's domestic laws designate the responsible Scientific and Management Authorities, prohibit trade contrary to the requirements of the Convention, have penalty provisions in place for illegal trade, and provide for seizure of specimens that are illegally traded or possessed. The Brazilian Government was determined to be in Category 1, which means they meet all the requirements to implement CITES. Bolivia and Paraguay were determined to be in Category 2, meaning legislation meets some but not all the requirements to implement CITES; however, both countries have submitted a CITES Legislation Plan, and Bolivia has also submitted draft legislation to the Secretariat for comments (*www.cites.org*, SC59 Document 11, Annex p. 1). Generally this means that Bolivia and Paraguay have not completed all the requirements to effectively implement CITES. However, since the hyacinth macaw is listed as an Appendix-I species under CITES, legal commercial international trade is very limited. Because very few of the 1,669 live hyacinth macaws reported in trade are wild-sourced (less than 2 percent), we believe that international trade controlled via valid CITES permits is not a threat to the species. In addition, Bolivia and Paraguay's Category 2 status under the National Legislation Project does not appear to be impacting the hyacinth macaw.

The capture of hyacinth macaws is illegal in Brazil, Bolivia, and Paraguay (Munn *et al.* 1989, p. 415) (See Factor D); however, despite this and CITES protection, bird catchers are known to have illegally harvested entire populations of hyacinths for both national and international trade (Munn *et al.* 1989, pp. 412–413), devastating many large populations and proving to be the cause of substantial declines in hyacinth macaws in parts of Brazil, Bolivia, and Paraguay (Munn *et al.* 1989, p. 410). In the 1970's and 1980's, substantial trade in hyacinth macaws was reported, but actual trade was likely significantly greater given the amount of smuggling, routing of birds through countries not parties to CITES, and internal consumption in South America (Collar *et al.* 1992a, p. 6; Munn *et al.* 1989, pp. 412–413). One report stated that 2,500 hyacinths were flown out of Bahía Negra, Paraguay from 1983 through 1984, (BLI 2011 unpaginated). From 1987 through 1988, 700 hyacinths were reportedly trapped and traded (Munn *et al.* 1989, p. 416). In the late 1980's and early 1990's, reports of hyacinth trapping included one trapper that worked an area for 3 years removing 200–300 wild hyacinths a month during certain seasons and another trapper who caught 1,000 hyacinths in 1 year and knew of other teams operating at similar levels (Silva (1989a) and Smith (1991c) in Collar *et al.* 1992a, p. 6). Smith (1991c, in Collar *et al.* 1992a, p. 6) estimated a minimum of 10,000 hyacinths were taken from the wild in the 1980's.

Trade in parrots was particularly high in the 1980's due to a huge demand from developed countries, including the United States, which was the main consumer of parrot species at that time (Rosales *et al.* 2007, pp. 85, 94; Best *et al.* 1995, p. 234). In the years following the enactment of the Wild Bird Conservation Act in 1992 (WBCA; see Factor D), studies found lower poaching levels than in prior years, suggesting that import bans in developed countries reduced poaching levels in exporting countries (Wright *et al.* 2001, pp. 715, 718). Although illegal trapping for the pet trade occurred at high levels during the 1980's, there is no information to suggest that illegal trapping for the pet trade is currently occurring at levels that are affecting the populations of the hyacinth macaw in its 3 regions.

In Pará, Indians aggressively defend their land and macaws from outsiders, preventing traders from operating successfully (Zimmerman *et al.* 2001, p. 18; Munn *et al.* 1989, p. 415). Munn *et al.* (1989, p. 414) noted that a well-organized professional bird-trading ring was a threat to the species in the Gerais region; however, the attitudes of the ranchers in this region were beginning to shift in favor of the macaw and against trappers on their property (Collar *et al.* 1992a, p. 8; Munn *et al.* 1989, p. 415). Thousands of hyacinths were trapped in the Pantanal for the pet trade during the 1980's, stripping many areas of this species (Antas *et al.* 2006, pp. 128–129; Munn *et al.* 1989, p. 414). However, ranch owners in the Pantanal were unhappy with the decline of hyacinth macaws on their land and began to deny bird catchers access to their land (Collar *et al.* 1992a, p. 8;

Munn *et al.* 1989, p. 415). The population of hyacinths in this region has continued to increase since the 1990's (BLI 2011, unpaginated; Antas *et al.* 2006, p. 128; Pinho and Nogueira 2003, p. 30).

We found little information on illegal trade of this species in international markets. One study found that illegal pet trade in Bolivia continues to involve CITES-listed species; the authors speculated that similar problems exist in Peru and Brazil (Herrera and Hennessey 2007, p. 298). In that same study, 11 hyacinths were found for sale in a Santa Cruz market from 2004 to 2007 (10 in 2004 and 1 in 2006) (Herrera and Hennessey 2009, pp. 233–234). Larger species, like the hyacinth, were frequently sold for transport outside of the country, mostly to Peru, Chile, and Brazil (Herrera and Hennessey 2009, pp. 233–234). We found no other data on the presence of hyacinths in illegal trade. During a study conducted from 2007 to 2008, no hyacinth macaws were recorded in 20 surveyed Peruvian wildlife markets, (Gastañaga *et al.* 2010, pp. 2, 9–10).

It is possible, given the high price of hyacinth macaws that illegal domestic trade is occurring; however, we found no information to support this. Certainly, trapping for trade has decreased significantly from levels reported in the 1980's. Additionally, we found no information identifying trade as a current threat to the hyacinth macaw. In the absence of data indicating otherwise, we find that illegal domestic and international trade is not a threat to the hyacinth macaw.

Hunting of hyacinths is illegal in Brazil, Bolivia, and Paraguay (Munn *et al.* 1989, p. 415) (See Factor D); however, hyacinths in Pará are most threatened by subsistence hunters and the feather trade by some Indian groups (Brouwer 2004, unpaginated; Munn *et al.* 1989, p. 414). Because the hyacinth is the largest species of macaw, it may be targeted by subsistence hunters, especially by settlers along roadways (Collar *et al.* 1992a, p. 7). Additionally, increased commercial sale of feather art by Kayapo Indians of Gorotire may be of concern given that 10 hyacinths are required to make a single headdress (Collar *et al.* 1992a, p. 7). The Gerais region is poor and animal protein, such as cattle, is not as abundant as in other regions; therefore, meat of any kind, including macaws, is sought as a protein source (Collar *et al.* 1992a, p. 7; Munn *et al.* 1989, p. 414).

Because the populations of hyacinth macaws that occur in Pará and the Gerais region are small, the removal of any individuals from the population would have a negative effect on reproduction and the ability of the species to recover. Hunting, for either meat or the sale of feather art, combined with habitat conversion, will continue to contribute to the decline of the hyacinth macaw in these regions. Hyacinths in the Pantanal are not hunted for meat or feathers (Munn *et al.* 1989, p. 413); therefore, these activities do not pose a threat to hyacinths in this region.

Summary of Factor B

Although trapping for the pet bird trade may have occurred in large numbers, especially in the 1980's, and was the cause of a drastic decline in hyacinth macaws, we have no information that trade is a current threat to the hyacinth macaw. Based on the WCMC Trade Database, less than 2 percent of the live hyacinth macaws reported in trade from 1987 to 2010 were wild-sourced. Therefore, we believe that international trade controlled via valid CITES permits is not a threat to this species. We found no information suggesting that illegal trapping and trade are current threats to the hyacinth macaw. In each of the regions of its range, the hyacinths are defended by the owners of the land (e.g., Indians in Pará and cattle ranchers in Gerais and Pantanal). Recent studies of wildlife markets in Bolivia and Peru found a very limited number of hyacinths for sale; the largest occurrence was in 2004 and consisted of only 10 hyacinth macaws. Furthermore, the population in the Pantanal has been increasing since the 1990's, suggesting that trapping is either no longer occurring or is not occurring such that it is impacting the hyacinth macaw at the population level in the wild.

Population and threats data is lacking for the hyacinth in the Pará and Gerais regions. We did not find any information indicating that trapping for the pet trade was a threat in these regions, but we found some information indicating that the hunting of hyacinths as a source of protein and for feathers to be used in local handicrafts may remain as threats. Although we do not have information on the numbers of macaws taken for these purposes, given the small populations in these two regions, any loss of potentially reproducing individuals could have a devastating effect on the ability of the populations to increase. Therefore, we find that hunting is a threat to the hyacinth macaw in the Pará and Gerais regions. In addition, we are not aware of any information currently available that indicates the use of this species for any scientific or educational purpose. Based on the best available scientific and commercial information, we find that overutilization for commercial, recreational, scientific, or educational purposes is a threat to the hyacinth macaw in the Pará and Gerais regions now and in the future.

C. Disease or Predation

Infectious diseases can pose many direct threats to individual birds, as well as entire flocks (Abramson *et al.* 1995, p. 287). Most of the available research on diseases in psittacines, however, addresses captive-held birds, while information on the health of psittacines, including the hyacinth macaw, in the wild is scarce (Allgayer *et al.* 2009, pp. 972–973; Raso *et al.* 2006, p. 236). Captive-held birds may have a higher incidence of disease than wild birds due to their exposure to sick birds, unsanitary conditions, and improper husbandry methods; therefore, it is not always clear how prevalent diseases may be in the wild and how they affect wild populations of birds. Some of the common diseases known in macaws are discussed below.

Pacheco's Parrot Disease

Pacheco's parrot disease is a systemic disease caused by a psittacid herpesvirus (PsHV–1) (Tomaszewski *et al.* 2006, p. 536; Abramson *et al.* 1995, p. 293; Panigrahy and Grumbles 1984, pp. 808, 811). It is an acute, rapidly fatal disease of parrots, and sudden death is sometimes the only sign of the disease; however, in some cases birds may show symptoms and may recover to become carriers (Tomaszewski *et al.* 2006, p. 536; Abramson *et al.* 1995, p. 293; Panigrahy and Grumbles 1984, p. 811). The outcome of the infection depends upon which of the four genotypes of PsHV–1 the individual is infected with, the species infected, and other unknown factors. For example, only genotype 4 is known to cause mortality in macaws (Tomaszewski *et al.* 2006, p. 536).

If clinical signs of Pacheco's disease are exhibited, they may include anorexia, depression, regurgitation, diarrhea, nasal discharge, central nervous system signs, and conjunctivitis (Abramson *et al.* 1995, p. 293; Panigrahy and Grumbles 1984, pp. 809–810). Death may occur 8 hours to 6 days after the onset of signs (Panigrahy and Grumbles 1984, p. 810). Potential sources may be an unapparent carrier or a recovered bird that is shedding the virus in its droppings (Tomaszewski *et al.* 2006, p. 536; Panigrahy and Grumbles 1984, p. 811).

Outbreaks of Pacheco's disease have resulted in massive die offs of captive parrots and is known to have caused

high mortality in endangered species of parrots in the United States (Tomaszewski *et al.* 2006, p. 536; Panigrahy and Grumbles 1984, p. 808). This disease and the presence of PsHV–1 have been known in captive and wild-caught hyacinth macaws (Tomaszewski *et al.* 2006, pp. 538, 540, 543; Panigrahy and Grumbles 1984, p. 809); however, we found no information indicating that this disease is impacting the hyacinth macaw at the population level in the wild.

Psittacosis

Psittacosis (Chlamydiosis), also known as parrot fever, is an infectious disease caused by the bacteria *Chlamydophila psittaci.* An estimated 1 percent of all birds in the wild are infected and act as carriers (Jones 2007, unpaginated). *C. psittaci* is transmitted through carriers who often show no signs of the disease. It is often spread through the inhaling of the organism from dried feces (Michigan Department of Agriculture 2002, p. 1), but may also pass orally from adults to nestlings when feeding via regurgitation or from the adult male to the adult female when feeding during incubation (Raso *et al.* 2006, p. 239). Clinical signs of psittacosis may include ruffled feathers, depression, anorexia, respiratory problems, dehydration, diarrhea, weight loss, conjunctivitis, rhinitis, sinusitis, and even death (Raso *et al.* 2006, pp. 235–236; Michigan Department of Agriculture 2002, p. 1). This disease can be treated with a tetracycline antibiotic (Michigan Department of Agriculture 2002, p. 1).

Wild birds living in a stable environment appear to have few complications from this disease and may not show clinical signs. This may be explained by a naturally occurring balanced host-parasite relationship (Jones 2007, unpaginated; Raso *et al.* 2006, pp. 236, 239–240). However, stress, including removal from its natural habitat or disturbance to its natural habitat or population, may disturb the host-parasite balance and the latency of *C. psittaci* may be changed, invoking the disease (Jones 2007, unpaginated; Raso *et al.* 2006, pp. 236, 239–240). There are few reports of mortality from *C. psittaci* in natural habitats, but recently captured wild birds may experience high mortality rates due to stress stemming from inadequate hygiene conditions, feeding, and overpopulation. In captivity, birds are more susceptible to infection, and latent infections become more apparent (Raso *et al.* 2006, pp. 239–240).

Hyacinth macaw nestlings stay in the nest longer than other parrot species and are, therefore, more susceptible to the disease due to transmission of the disease during feeding and through dried feces (Raso *et al.* 2006, p. 239). In a study conducted on wild hyacinth nestlings in the Pantanal of Mato Grosso do Sul, Brazil, *C. psittaci* was detected in some nestlings; however, no evidence of clinical disease or death due to psittacosis was found. We found no information indicating this disease is impacting the hyacinth macaw at the population level in the wild.

Papillomatosis

Papillomas are pink to white fleshy or granular growths, or lesions, commonly encountered in macaw species (Abramson *et al.* 1995, pp. 297–298). The cause of this disease is thought to be an infectious agent; however, this theory has not been confirmed. The onset of this disease may occur following major stressors, such as transporting, Pacheco's disease, or psittacosis (Abramson *et al.* 1995, p. 297).

Most of the birds with papillomas exhibit no clinical signs, however, cloacal lesions may cause straining, malodorous droppings, reduced fertility, secondary bacterial infections, bloody droppings, or anemia. Oral lesions may cause wheezing, secondary bacterial infections, sinusitis, excessive salivation, and difficulty swallowing. Lesions in the esophagus, crop, or proventriculus (the gizzard) may experience vomiting and weight loss (Abramson *et al.* 1995, pp. 297–298). Although this disease is common in macaw species, it has not been documented in the hyacinth macaw (Abramson *et al.* 1995, p. 297).

Proventricular Dilatation Disease

Proventricular dilatation disease (PDD), also known as avian bornavirus (ABV) or macaw wasting disease, is a serious disease reported to infect psittacines. Macaws are among those commonly affected by PPD (Abramson *et al.* 1995, p. 288), although it is a fatal disease that poses a serious threat to all domesticated and wild parrots worldwide, particularly those with very small populations (Kistler *et al.* 2008, p. 1; Abramson *et al.* 1995, p. 288). This contagious disease causes damage to the nerves of the upper digestive tract, so that food digestion and absorption are negatively affected. The disease has a 100-percent mortality rate in affected birds, although the exact manner of transmission between birds is unclear. In 2008, researchers discovered a genetically diverse set of novel ABVs that are thought to be the cause (Kistler *et al.* 2008, p. 1). The researchers developed diagnostic tests, methods of treating or preventing bornavirus infection, and methods for screening for the anti-bornaviral compounds (Kistler *et al.* 2008, pp. 1–15). We found no information on this disease in hyacinth macaws.

Psittacine Beak and Feather Disease

Psittacine beak and feather disease (PBFD) is a common viral disease that has been documented in more than 60 psittacine species, but all psittacines should be regarded as potentially susceptible (Rahaus *et al.* 2008, p. 53; Abramson *et al.* 1995, p. 296). The causative agent is a virus belonging to the genus Circovirus (Rahaus *et al.* 2008, p. 53). This viral disease, which originated in Australia, affects both wild and captive birds, causing chronic infections resulting in either feather loss or deformities of the beak and feathers (Rahaus *et al.* 2008, p. 53; Cameron 2007, p. 82). PBFD causes immunodeficiency and affects organs such as the liver and brain, and the immune system. Suppression of the immune system can result in secondary infections due to other viruses, bacteria, or fungi. The disease can occur without obvious signs (de Kloet and de Kloet 2004, p. 2,394). Birds usually become infected in the nest by ingesting or inhaling viral particles. Infected birds develop immunity, die within a couple of weeks, or become chronically infected. No vaccine exists to immunize populations (Cameron 2007, p. 82). We found no information on this disease in hyacinth macaws.

Although there are many diseases that could negatively affect macaws, including the hyacinth macaw, in captivity and in the wild, we are unaware of any information indicating that any of those diseases are impacting the hyacinth macaw at a level that may affect the status of the species as a whole and to the extent that it is considered a threat to the species.

Predation

In a study conducted in the Brazilian Pantanal from 2002 through 2005, researchers identified several predators of hyacinth macaw eggs. These predators included toco toucans *(Ramphastos toco),* purplish jays *(Cyanocorax cyanomelas),* white-eared opossums *(Didelphis albiventris),* and coatis *(Nasua nasua).* Of 582 eggs monitored over 3 years, 23.7 percent (approximately 138) were lost to predators. The toco toucan was the main predator, responsible for 12.4 percent of the eggs lost and 53.5 percent of the eggs lost annually (Pizo *et al.* 2008, p. 795). Although most predators leave some

sort of evidence behind, toco toucans are able to swallow hyacinth macaw eggs whole, leaving no evidence behind. This may lead to an underestimate of nest predation by toucans (Pizo *et al.* 2008, p. 793). Toco toucans may also take over nest holes occupied by hyacinth macaws, killing nestlings.

The loss of eggs, nestlings, and adults can have a direct impact on the recruitment of hyacinth macaws and the ability of a population to increase. Despite the information on lost eggs in the Pantanal due to predation, most notably by the toco toucan, this population has been increasing, suggesting that predation is not occurring at a level that is affecting the status of the population. We found no information on potential predators or information indicating that predation may be a threat in the other parts of the hyacinth macaw's range. Therefore, we find that predation is not impacting the hyacinth macaw at a level that may affect the status of the species as a whole and to the extent that it is considered a threat to the species.

Summary of Factor C

Although there are many diseases that could affect the hyacinth macaw, we found no evidence of adverse impacts to the species such that it rises to the level of a threat. Predation is a normal occurrence in wild populations, and there is information indicating that hyacinth eggs are lost due to predation by toco toucans as well as other predators; however, we found no information indicating that this is occurring such that it rises to the level of a threat to the hyacinth macaw. As a result, we find that disease and predation are not threats to the hyacinth macaw in any portion of its range now or in the future.

D. Inadequacy of Existing Regulatory Mechanisms

National Laws

The hyacinth macaw is protected under Brazilian law (Snyder *et al.* 2000, p. 119; Stattersfield and Capper 1992, p. 257). Article 225 of the Brazilian Constitution (Title VIII, Chapter VI, 1988) states the right to an ecologically balanced environment for all people, including future generations, and gives the federal, state, and municipality governments the responsibility of protecting the environment and the fauna and flora of Brazil (Michigan State University, College of Law 2012, unpaginated). Wildlife species and their nests, shelters, and breeding grounds are protected according to Law No. 5197/1967. This law prohibits the hunting and trade of animal species without authorization. Hunting and trade are punishable by imprisonment of 2–5 years. Article 35 of this law also requires that textbooks include text on the protection of wildlife, primary and middle school educational programs include 2 hours per year on the matter, and radio and television programs include 5 minutes per week on wildlife protection. The hyacinth macaw is also listed under the Official List of Brazilian Endangered Animal Species (Order No. 1.522/1989). As described under Factor B, hunting and trade of hyacinth macaws has decreased significantly since the 1980's. Brazil's campaigns to protect wildlife and other outreach programs, which have contributed to the shift in attitudes, have contributed to this decline. The hyacinth is still threatened with some hunting in parts of its range, but given the drastic declines in both trade and hunting since the 1980's, these laws may be contributing to the protection of the hyacinth macaw. However, as discussed under Factor A, the food and nesting resources of the hyacinth macaw are threatened by deforestation for agriculture and cattle ranching. Deforestation and programs that encourage the expansion of economic activities, and the subsequent conversion of land, conflicts with the stated priority for protection (Seidl *et al.* 2001, p. 414); therefore, these laws do not appear to provide adequate protection to the habitat of the hyacinth macaw.

In 1998, Brazil passed the Environmental Crimes Law (Law No. 9605/98). Section I of this law details crimes against wild fauna, which include: The killing, harassment, hunting, capturing, or use of any fauna species without authorization (Clayton 2011, p. 4; UNEP, n.d., unpaginated). Additionally, except for the State of Rio Grande do Sul, commercial, sport, and recreational hunting are prohibited in Brazil. Penalties include a jail sentence of 6 months to 1 year, and/or a fine; the penalty is increased by half if the crime is committed under certain circumstances, including against rare species or those considered endangered, or within a protected area. However, it is not considered a crime to kill an animal when it is to satisfy hunger; to protect agriculture, orchards, and herds if authorized; or if the animal has been characterized as dangerous. This law also protects against other crimes involving the fauna species of Brazil. With respect to bird species, this law prohibits inhibiting reproduction without authorization; modifying or destroying nests or shelters; selling, offering, exporting, purchasing, keeping, utilizing, or transporting eggs, as well as products derived from fauna species without authorization; and introducing species into the country without license. Although this law provides protection to the fauna species of Brazil, it is more permissive than the prior law, the Fauna Protection Act (Law No. 5.197/1967), which provided more severe punishments (Clayton 2011, p. 4). We found that the loss of nesting trees in Pará and the Pantanal and hunting in the Pará and Cerrado regions were threats to the hyacinth macaw (Factors A and B); therefore, it appears that this regulation does not adequately protect this species or its nests.

Section II of the Environmental Crimes Law details the crimes against flora, which include the destruction and damaging of forest reserves; cutting trees in forest reserves, causing fire in forests; extracting minerals from public forests or reserves without authorization; receipt of wood or vegetable products for commercial or industrial purposes without requesting a copy of the supplier's license; polluting the environment at levels that may cause damage to the health of human beings, or death of animals or significant destruction of plants; and research or extraction of mineral resources without authorization. Penalties vary according to the crime and may be increased under certain circumstances; for example, the penalty may be increased by one sixth to one third if the crime results in a decrease of natural waters, soil erosion, or modification of climatic regime (Clayton 2011, p. 5; UNEP, n.d., unpaginated). As described under Factor A, we found forest destruction and the use of fire to clear land and maintain pastures were threats to the habitat of the hyacinth macaw; therefore, it appears that this regulation does not adequately protect native habitat.

Brazil's Forest Code, passed in 1965, is a central piece in the nation's environmental legislation (Barrionuevo 2012, unpaginated). It requires landowners in the Amazon to maintain 80 percent of their land in a natural state as a legal reserve; in the rest of Brazil, including the Cerrado and Pantanal, only 20 percent is required to be maintained in a natural state (Pearce 2011, unpaginated; Klink and Machado 2005, p. 708; Ratter *et al.* 1997, p. 228). This law was widely ignored by landowners and not enforced by the government, as evidenced by the high deforestation rates (Financial Times 2011, unpaginated; Pearce 2011, unpaginated; Ratter *et al.* 1997, p. 228).

However, in the last 6 years, Brazil began cracking down on illegal deforesters, and deforestation rates began to fall (Barrionuevo 2012, unpaginated).

Changes to the Forest Code are now being debated. In May 2011, Brazil's House of Representatives voted in favor of relaxing this Forest Code. Some of the proposed changes include: (1) Exemption of owners with plots under 405 ha (1,000 ac) from having to restore illegally deforested land; (2) amnesty for those who illegally deforested land prior to July 2008, meaning they would not have to restore lands or pay fines; and (3) cancellation of outstanding fines for environmental crimes if the violator joins a government-run program, however, strict timeframes for complying with the program were not included. In December 2011, Brazil's Senate approved a revised version (Barrionuevo 2012, unpaginated). This version would require 24 million ha (59 million ac) to be reforested, although 55 million ha (136 million ac) would have been required under the original code. Additionally, those who illegally deforested before July 2008 would be required to replant areas that should have vegetation in order to avoid fines. The House is expected to debate this version in March 2012, after which it goes to the President who has veto power (Barrionuevo 2012, unpaginated; Financial Times 2011, unpaginated; WWF–UK 2011a, unpaginated).

If this latest version is passed, it would be the greatest reforestation program in the world (Financial Times 2011, unpaginated). However, it will only be effective if it is properly enforced and adequately financed, which is questionable (Barrionuevo 2012, unpaginated). The original code was largely ignored by landowners and not enforced, leading to Brazil's high rates of deforestation. Although rates began to decrease, deforestation has spiked again in anticipation of the new reform (WWF–UK 2011a, unpaginated; WWF 2010, unpaginated). Given the ongoing and increasing deforestation rates in the Amazon, Cerrado, and Pantanal (See Factor A), it appears that this regulation does not adequately protect the forest resources of Brazil.

State Laws

The Mato Grosso do Sul State Senate passed State Act 3.348 in 2006, which forbids deforestation in the Pantanal's floodplains. However, it only prohibited deforestation for 1 year (2007), and licenses previously granted for cutting trees were allowed to be executed (Júnior 2008, p. 136). This law also set a limit for what constituted the flooding area; however, since the Pantanal is a plain that is subject to annual variation, much of the area remained outside of the realm of the law (Júnior 2008, p. 136). Therefore, this legislation did not contribute to hyacinth macaw conservation (Júnior 2008, p. 136).

To protect the main breeding habitat of the hyacinth macaw, Mato Grosso State Senate passed State Act 8.317 in 2005, which prohibits the cutting of manduvi trees, but not others. Although this protects nesting trees, other trees around it are cut, exposing the manduvi tree to winds and storms that otherwise provide shelter. Manduvi trees end up falling or breaking, rendering them useless for the hyacinths to nest in (Júnior 2008, p. 135; Júnior *et al.* 2006, p. 186). Five percent of hyacinth macaw nests in manduvi trees are lost each year to deforestation, fire, and storms in the Pantanal. Given the continuing deforestation in the Pantanal and the evidence of reduced recruitment of manduvi trees, it appears this legislation does not provide adequate protection to the nesting trees of the hyacinth macaw in the Pantanal.

Protected Areas

The main biodiversity protection strategy in Brazil is the creation of Protected Areas (National Protected Areas System (Federal Act 9.985/00) (Júnior 2008, p. 134). There are various regulatory mechanisms (Law No. 11.516, Act No. 7.735, Decree No. 78, Order No. 1, and Act No. 6.938) in Brazil that direct Federal and State agencies to promote the protection of lands and that govern the formal establishment and management of protected areas to promote conservation of the country's natural resources (ECOLEX 2007, pp. 5–7). These mechanisms generally aim to protect endangered wildlife and plant species, genetic resources, overall biodiversity, and native ecosystems on Federal, State, and privately owned lands (e.g., Law No. 9.985, Law No. 11.132, Resolution No. 4, and Decree No. 1.922). Brazil's formally established protection areas were developed in 2000, after a series of priority-setting workshops, and are categorized based on their overall management objectives. These include strictly protected areas (national parks, biological reserves, ecological stations, natural monuments, and wildlife refuges) for educational and recreational purposes and scientific research. There are also protected areas of sustainable use (national forests, environmental protection areas, areas of relevant ecological interest, extractive reserves, fauna reserves, sustainable development reserves, and private natural heritage reserves) that allow for different types and levels of human use with conservation of biodiversity as a secondary objective. As of 2005, there were 478 Federal and State strictly protected areas totaling 37,019,697 ha (14,981,340 ac) in Brazil (Rylands and Brandon 2005, pp. 615–616). There are other types of areas that contribute to the Brazilian Protected Areas System, including indigenous reserves and areas managed and owned by municipal governments, nongovernmental organizations, academic institutions, and private sectors (Rylands and Brandon 2005, p. 616).

Within the states where the hyacinth macaw occurs, there are a total of 53 protected areas; however, it only occurs in two (Collar *et al.* 1992a, p. 7). In the Amazon, there is a balance of strictly prohibited protected areas (49 percent of protected areas) and sustainable use areas (51 percent) (Rylands and Brandon 2005, p. 616). We found no information on the occurrence of the hyacinth macaw in any protected areas in Pará. The Cerrado biome is one of the most threatened biomes and is underrepresented among Brazilian protected areas. Only 2.25 percent of the original extent of the Cerrado is protected, (Marini *et al.* 2009, p. 1559; Klink and Machado 2005, p. 709; Siqueira and Peterson 2003, p. 11). Within the Cerrado, the hyacinth macaw is found only within the Araguaia National Park in Goiás (Collar *et al* 1992a, p. 7). In 2000, the Pantanal was designated as a Biosphere Reserve by UNESCO (Júnior 2008, p. 134). According to the State Department of Environment of Mato Grosso do Sul and IBAMA, only 4.5 percent of the Pantanal is categorized as protected areas (Harris *et al.* 2006, pp. 166–167), including strictly protected areas and indigenous areas (Klink and Machado 2005, p. 709). This includes the Taiamã Ecological Station and the Pantanal National Park (Mittermeier *et al.* 1990, p. 104), but the hyacinth macaw occurs only within the Pantanal National Park (Collar *et al* 1992a, p. 7). The distribution of Federal and State protected areas are uneven across biomes, yet all biomes need substantially more area to be protected to meet the recommendations established in the priority-setting workshops (Rylands and Brandon 2005, pp. 615–616).

There are many challenges and limitations to the effectiveness of the protected areas system. Brazil is faced with competing priorities of encouraging development for economic growth and resource protection. In the past, the Brazilian government, through various regulations, policies, incentives,

and subsidies, has actively encouraged settlement of previously undeveloped lands, which helped facilitate the large-scale habitat conversions for agriculture and cattle-ranching that have occurred throughout the Amazon, Cerrado, and Pantanal biomes (WWF–UK 2011b, p. 2; WWF 2001, unpaginated; Arima and Uhl, 1997, p. 446; Ratter *et al.* 1997, pp. 227–228). Although conservation strategies in the Amazon basin have focused on protected areas, they are insufficient for conservation (Soares-Filho *et al.* 2006, pp. 520, 522).

The Ministry of Environment is working to increase the amount of protected areas in the Pantanal and Cerrado regions, however, the Ministry of Agriculture is looking at using an additional 1 million km² (386,102 mi²) for agricultural expansion, which will speed up deforestation (Harris *et al.* 2006, p. 175). These competing priorities make it difficult to enforce regulations that protect the habitat of this species. Additionally, there is often a delay in implementation or a lack of local management commitment after the creation of protected areas, staff limitations make it difficult to monitor actions, and the lack of acceptance by society or the lack of funding make administration and management of the area difficult (Júnior 2008, p. 135; Harris *et al.* 2006, p. 175). The designation of the Pantanal as a Biosphere Reserve is almost worthless because of few strong actions for its conservation from public officials (Júnior 2008, p. 134), and neither of the national parks in which the hyacinth macaw is found is entirely secure (Collar *et al.* 1992a, p. 7).

Despite the designation of numerous protected areas throughout Brazil, these designations are not adequate enough to meet the recommendations established in the priority-setting workshops. Additionally, of 53 designated protected areas within the states the hyacinth macaw occurs, it is only found in the Araguaia and Pantanal National Parks; neither of which is secure. Additionally, the hyacinth macaw continues to be threatened in Pará and the Gerais region by hunting and habitat loss due to agricultural expansion and cattle ranching in all three regions. Therefore, it appears that Brazil's protected areas system does not adequately protect the hyacinth macaw or its habitat.

International Laws

The hyacinth macaw is listed in Appendix I of CITES. CITES is an international treaty among 175 nations, including Brazil, Bolivia, Paraguay, and the United States, that entered into force in 1975. In the United States, CITES is implemented through the U.S. Endangered Species Act of 1973, as amended. The Act designates the Secretary of the Interior as lead responsibility to implement CITES on behalf of the United States, with the functions of the Management and Scientific Authorities to be carried out by the Service. Under this treaty, member countries work together to ensure that international trade in animal and plant species is not detrimental to the survival of wild populations by regulating the import, export, and reexport of CITES-listed animal and plant species.

Through Resolution Conf. 8.4 (Rev. CoP15), the Parties to CITES adopted a process, termed the National Legislation Project, to evaluate whether Parties have adequate domestic legislation to successfully implement the Treaty (CITES 2010b, pp. 1–5). In reviewing a country's national legislation, the CITES Secretariat evaluates factors such as whether a Party's domestic laws designate the responsible Scientific and Management Authorities, prohibit trade contrary to the requirements of the Convention, have penalty provisions in place for illegal trade, and provide for seizure of specimens that are illegally traded or possessed. As discussed under Factor B, it has been determined that the Brazilian Government has met all the requirements to implement CITES (*www.cites.org,* SC59 Document 11, Annex p. 1). Bolivia and Paraguay have not completed all the requirements to effectively implement CITES, although both countries have submitted a CITES Legislation Plan and Bolivia has also submitted draft legislation to the Secretariat for comments (*www.cites.org,* SC59 Document 11, Annex p. 1).

As discussed under Factor B, we do not consider international trade to be a threat impacting this species. Therefore, protection under this treaty against unsustainable international trade is adequate to address unlawful commercialization of the species.

The import of hyacinth macaws into the United States is also regulated by the Wild Bird Conservation Act (WBCA) (16 U.S.C. 4901 *et seq.*), which was enacted on October 23, 1992. The purpose of the WBCA is to promote the conservation of exotic birds by ensuring that all imports to the United States of exotic birds are biologically sustainable and not detrimental to the species in the wild. The WBCA generally restricts the importation of most CITES-listed live or dead exotic birds except for certain limited purposes such as zoological display or cooperative breeding programs. Import of dead specimens is allowed for scientific specimens and museum specimens. The Service may approve cooperative breeding programs and subsequently issue import permits under such programs. Wild-caught birds may be imported into the United States if certain standards are met and they are subject to a management plans that provides for sustainable use. At this time, the hyacinth macaw is not part of a Service-approved cooperative breeding program and has not been approved for importation of wild-caught birds.

International trade of parrots was significantly reduced during the 1990s as a result of tighter enforcement of CITES regulations, stricter measures under EU legislation, and adoption of the WBCA, along with adoption of national legislation in various countries (Snyder *et al.* 2000, p. 99). As discussed under Factor B, we found that international trade is not a threat to this species; therefore, we believe that regulations are adequately protecting the species from international trade.

Summary of Factor D

Although there are laws intended to protect the forests of Brazil and the hyacinth macaw, deforestation for agricultural expansion and cattle ranching and hunting continue to be threats to this species. Conflicting priorities of encouraging development for economic growth and resource protection make enforcement of environmental laws intended to protect the environment and Brazil's natural resources difficult. Deforestation has long been a problem in Brazil leading to some of the highest deforestation rates in the world. In recent years, deforestation rates began to decline with greater enforcement of laws; however, deforestation rates have increased again, a result of an anticipated reform in the Forest Code. Despite laws to protect the environment and plans to significantly reduce deforestation, expansion of agriculture and cattle ranching continue and are threats to the recruitment of the food and nesting resources in which the hyacinth macaw is specialized. Without greater enforcement of laws, deforestation will continue to be a problem in Brazil. Trade of this species has decreased significantly since the 1980's, but hunting remains a threat to the small populations remaining in Pará and the Gerais region. Therefore, we find that inadequate regulatory mechanisms are a threat to the hyacinth macaw now and in the future.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Specialization

One of the main threats to the hyacinth macaw, in combination with human-related factors, is a low reproductive rate and the highly specialized nature of the *Anodorhynchus* genus (Faria *et al.* 2008, p. 777). Parrots, in general, have traits that predisposed them to extinction and make them particularly sensitive to changes in resources and increased mortality. These traits include a large body size, low rates of reproduction, low survival of chicks and fledglings, a late age at first reproduction, large proportion of nonbreeding adults, and restrictive nesting requirements (Lee 2010, p. 3; Thiollay 2005, p. 1121; Guedes 2004, p. 280; Wright *et al.* 2001, p. 711; Munn *et al.* 1998, p. 409). The low reproductive rate of the hyacinth macaw is due, in part, to asynchronous hatching, which usually results in only one chick surviving (Faria *et al.* 2008, p. 766; Kuniy *et al.* 2006, p. 381; Munn *et al.* 1989, p. 409). Additionally, observers in Brazil have reported that not all hyacinth nests fledge young and, due to the long period of chick dependence, hyacinths only breed every 2 years (Faria *et al.* 2008, p. 766; Schneider *et al.* 2006, pp. 71–72; Guedes and Harper 1995, pp. 407–411; Munn *et al.* 1989, p. 409). In a study of the Pantanal, the largest population of hyacinth macaws, it was suggested that only 15–30 percent of adults attempt to breed; it may be that a small or even smaller percentage in Pará and Gerais attempt to breed (Munn *et al.* 1998, p. 409).

The hyacinth macaw is highly specialized in both diet and nest sites, which makes it particularly vulnerable to extinction (Faria *et al.* 2008, p. 766; Pizo 2008, p. 795; Munn *et al.* 1998, pp. 404, 409; Johnson *et al.* 1997, p. 186). As discussed under *Species Description,* the hyacinth utilizes only a few species for food and nesting in the different regions of occurrence. *Anodorhynchus* macaws are highly selective in choice of palm nut; they have to be the right size and shape, as well as have an extractable kernel with the right lignin pattern (Pittman 1993, unpaginated). Hyacinth macaws require large, mature trees with preexisting holes to provide nesting cavities large enough to accommodate them (Pizo *et al.* 2008, p. 792; Abramson *et al.* 1995, p. 2). For example, in the Pantanal, hyacinths nest almost exclusively in the manduvi tree which must be at least 60 years old to provide adequate cavities (Pizo *et al.* 2008, p. 792; Júnior *et al.* 2006, p. 185).

The reproductive biology of the hyacinth macaw can result in low recruitment of juveniles and may decrease the ability to recover from reductions in population size caused by anthropogenic disturbances (Wright *et al.* 2001, p. 711). Hyacinths may not have a high enough reproduction rate and may not survive in areas where nest sites are destroyed (Munn *et al.* 1998, p. 409). Additionally, habitat and feeding specializations are good predictors of a bird species' risk of extinction, and the hyacinth macaw scores high in both food and nest site specialization (Pizo *et al.* 2008, p. 795). In Pará and Gerais, food resources are threatened by land conversion. This is cause for concern as another *Anodorhynchus* species, the Lear's macaw, is nearly extinct in part due to a shortage in its specialized food source (Guedes 2004, p. 781). In Gerais, a shortage of nesting trees has likely led the hyacinth macaw to utilize cliff cavities. The large, mature trees with preexisting holes that hyacinths require are often in shortage; given the land use trends in Pará and the Pantanal and evidence of significantly reduced recruitment of nesting trees in the Pantanal, the continued existence of nesting trees in these regions is a great concern. The effects of the low reproductive output of the hyacinth macaw and its high specialization are exacerbated by the pressure on the hyacinth macaw and its food and nesting resources due to hunting, and land conversion, making this species particularly vulnerable to extinction.

Competition

In the Pantanal, competition for nesting sites is intense. The hyacinth nests almost exclusively in manduvi trees; however, there are 17 other birds species, small mammals, and honey bees that also utilize manduvi cavities (Pizo *et al* 2008, p. 792; Pinho and Nogueira 2003, p. 36). Bees *(Apis melifera)* are even known to occupy artificial nests (Pinho and Nogueira 2003, p. 33; Snyder *et al.* 2000, p. 120). Manduvi is a key species for the hyacinth and, as discussed under Factor A, these cavities are already limited and there is evidence of decreased recruitment of this species of tree (Júnior *et al.* 2006, p. 181). Competition among breeding hyacinth macaws is exacerbated because only trees older than 60 years produce cavities large enough to be used by the large hyacinth macaw (Pizo *et al.* 2008, p. 792). With a limited number of manduvi trees, and a further limited number of adequate size trees capable of accommodating the hyacinth macaw, and numerous species looking to use this tree, competition will certainly be increased and further limit the cavities available to the hyacinth macaw for nesting.

The lack of suitable sites far enough from existing pairs may also limit breeding pairs of birds (Newton 1994, pp. 267, 273). Removal of manduvi seeds from the vicinity of the parent plant is necessary for the recruitment of the manduvi tree as seeds deposited beneath adult trees are preyed upon by peccaries (Tayassuidae) and agoutis *(*Dasyprocta spp.). Spreading also avoids the clumping of adults; this is beneficial to hyacinths as they do not nest close to one another (Pizo *et al.* 2008, pp. 794–795). A study found that the best manduvi seed disperser is the toco toucan. The toco toucan, however, is also known to prey on hyacinth eggs, take over hyacinth cavities, and kill nestlings (Pizo *et al.* 2008, p. 795; Hatfield and Leland 2003, p. 14).

Climate Change

Consideration of climate change is a component of our analyses under the Endangered Species Act. The term ''climate change'' refers to a change in the state of the climate that can be identified by changes in the mean or variability of its properties (e.g., temperature, precipitation) and that persists for an extended period, typically decades or longer, whether the change occurs due to natural variability or as a result of human activity (Intergovernmental Panel on Climate Change (IPCC) 2007a, p. 30).

Scientific measurements taken over several decades demonstrate that changes in climate are occurring. Examples include warming of the global climate system over recent decades, and substantial increases in precipitation in some regions of the world and decreases in other regions (for these and other examples see IPCC 2007a, p. 30; Solomon *et al.* 2007, pp. 35–54, 82–85).

Scientific analyses show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is ''very likely'' (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from fossil fuel use (IPCC 2007a, p. 5 and Figure SPM.3; Solomon *et al.* 2007, pp. 21–35). Therefore, scientists use a variety of climate models (which include consideration of natural processes and variability) in conjunction with various scenarios of

potential levels and timing of GHG emissions in order to project future changes in temperature and other climate conditions (e.g., Meehl *et al.* 2007, entire; Ganguly *et al.* 2009, pp. 11555, 15558; Prinn *et al.* 2011, pp. 527, 529).

The projected magnitude of average global warming for this century (as well as the range of projected values, which reflects uncertainty) is very similar under all combinations of models and emissions scenarios until about 2030. Thereafter, despite the projections showing greater divergence in projected magnitude, the overall trajectory is one of increased warming under all scenarios, including those which assume a reduction of GHG emissions (Meehl *et al.* 2007, pp. 760–764; Ganguly *et al.* 2009, pp. 15555–15558; Prinn *et al.* 2011, pp. 527, 529). (See IPCC 2007b, p. 8, for other global climate projections.)

Various types of changes in climate may have direct or indirect effects, and these may be positive or negative depending on the species and other relevant considerations, such as interactions of climate with nonclimate variables (e.g., habitat fragmentation). Identifying likely effects often involves climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including variability and extremes; it is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, p. 89; see also Glick *et al.* 2011, pp. 19–22). Because exposure, sensitivity, and adaptive capacity can vary by species and situation, there is no single method for conducting such analyses (Glick *et al.* 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change that are relevant to the hyacinth macaw.

As is the case with all influences that we assess, if we conclude that a species is currently affected or is likely to be affected in a negative way by one or more climate-related impacts, this does not necessarily mean the species meets the definition of a ''threatened species'' or an ''endangered species'' under the Act. If a species is listed as threatened or endangered, knowledge regarding the vulnerability of the species to, and known or anticipated impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

Factors that threaten the hyacinth macaw, such as habitat loss, may be exacerbated by changes in Brazil's climate and associated changes to the landscape. Climate change scenarios project significant temperature changes for most of South America (Marini *et al.* 2009, p. 1559). Across Brazil, temperatures are projected to increase and precipitation to decrease (Siqueira and Peterson 2003, p. 2). At a national level, simulation results suggest that climate change may induce significant reductions in forestland in all Brazilian regions (Féres *et al.* 2009, pp. 12, 15).

Temperature increases in Brazil are expected to be greatest over the Amazon rainforest with models indicating a strong warming and drying of this region during the 21st Century, particularly after 2040 (Marengo *et al.* 2011, pp. 8, 15, 27, 39, 48; Féres *et al.* 2009, p. 2). IPCC's best estimate of temperature changes by the end of the 21st Century (2090–2099) is 2.2 °C (4 °F) under a low greenhouse gas emission scenario and 4.5 °C (8 °F) under a high emission scenario (Marengo *et al.* 2011, p. 27).

Some leading global circulation models suggest extreme weather events, such as droughts, will increase in frequency or severity due to global warming. As a result, droughts in Amazonian forests could become more severe in the future (Marengo *et al.* 2011, p. 48; Laurance *et al.* 2001, p. 782). For example, the 2005 drought in Amazonia was a 1-in-20-year event; however, those conditions may become a 1-in-2-year event by 2025 and a 9-in-10-year event by 2060 (Marengo *et al.* 2011, p. 28). Impacts of deforestation are greater under drought conditions as fires set for forest clearances burn larger areas (Marengo *et al.* 2011, p. 16). Additionally, the seasonal forests of the Amazon, such as those found in eastern Amazonia, are more strongly affected by drought due to high rates of deforestation, which increases the vulnerability of forests to wildfires during droughts (Laurance *et al.* 2001, p. 782).

Direct deforestation is an immediate threat to the Amazon and could alter climate conditions in this region. When 40 percent of the original extent of the Amazon is lost, rainfall is expected to significantly decrease across Amazonia and the rainforests may not generate enough rainfall to sustain itself (Marengo *et al.* 2011, pp. 45, 48). This can be explained by an increase in carbon dioxide concentrations, increased temperatures, and decreased rainfall such that the dry season becomes longer. Previous work has suggested that, under these conditions, the rainforest of the Amazon could die back and be replaced with different vegetation. Although there are uncertainties in the modeling, some models have predicted a change from forests to savanna-type vegetation over parts, or perhaps the entire, Amazon in the next several decades (Marengo *et al.* 2011, pp. 11, 18, 29, 43). In the regions where the hyacinth macaw occurs, the climate features a dry season, which prevents the growth of an extensive closed-canopy tropical forest. Therefore, the transition of the Amazon rainforests could provide additional suitable habitat for the hyacinth macaw. However, there are uncertainties in this modeling, and projections are not definitive outcomes. In fact, some models indicate that conditions are likely to get wetter in Amazonia in the future (Marengo *et al.* 2011, pp. 28–29). Furthermore, we do not know if the specific food and nesting resources the hyacinth macaw utilizes would spread with an increase in the dry season.

Temperatures in the Cerrado are also predicted to increase; the maximum temperature in the hottest month may increase by 4 °C (7.2 °F) and by 2100 may increase to approximately 40 °C (104 °F) (Marini *et al.* 2009, p. 1563). Along with changes in temperature, other models have predicted a decrease in tree diversity and range sizes for birds in the Cerrado.

Projections based on a 30-year average (2040–2069) indicate serious effects of Cerrado tree diversity in coming decades (Marini *et al.* 2009, p. 1559; Siqueira and Peterson 2003, p. 4). In a study of 162 broad-range tree species, the potential distributional area of most trees was projected to decline by more than 50 percent. Using two climate change scenarios, 18–56 species were predicted to go extinct in the Cerrado, while 91–23 species were predicted to decline by more than 90 percent in potential distributional area (Siqueira and Peterson 2003, p. 4).

Extreme temperatures seemed to be the most important factor limiting bird distribution, revealing their physiological tolerances (Marini *et al.* 2009, p. 1563). In a study on changes in range sizes for 26 broad-range birds in the Cerrado, range sizes are expected to decrease over time, and significantly so as soon as 2030 (Marini *et al.* 2009, p. 1564). Changes ranged from a 5 percent increase to an 80 percent decrease under two dispersal scenarios for 2011–2030, 2046–2065, and 2080–2099 (Marini *et al.* 2009, p. 1561). The largest potential loss in range size is predicted to occur among grassland and forest-dependent

species in all time frames (Marini *et al.* 2009, p. 1564). These species will likely have the worst future conservation scenarios because these habitat types are the least common (Marini *et al.* 2009, p. 1559). Although this study focused on broad-range bird species, geographically restricted birds are predicted to become rarer (Marini *et al.* 2009, p. 1564).

It is difficult to predict whether species will or will not adapt to new conditions; synergistic effects of climate change and habitat fragmentation, or other factors, such as biotic interactions, may hasten the need for conservation even more (Marini *et al.* 2009, p. 1565). Although there are uncertainties in the climate change modeling discussed above, the overall trajectory is one of increased warming under all scenarios. We do not know how the habitat of the hyacinth macaw may change under these conditions, but we can assume there will be some change. The hyacinth macaw, as discussed under Factor A, is threatened with habitat loss due to widespread expansion of agriculture and cattle ranching. Climate change has the potential to further decrease the specialized habitat needed by the hyacinth macaw. Furthermore, the ability of the hyacinth macaw to cope with landscape changes due to climate change is questionable given the specialized needs of the species.

Summary of Factor E

Traits common to parrot species, and the particularly specialized nature of the hyacinth macaw, make it a species vulnerable to extinction. This is further exacerbated by the pressure on the hyacinth macaw and its food and nesting resources due to hunting and land conversion. Competition for nesting sites in the Pantanal is intense given the number of other species that also use the manduvi tree and the reduced recruitment of this tree due to cattle grazing. As the number of suitable trees is further limited, competition for adequate cavities to accommodate the hyacinth macaw will certainly increase. There are many uncertainties when modeling future climate change; however, overall, the trajectory is one of increased warming. We do not know how the habitat of the hyacinth macaw will change, but we can assume there will be a change to which the hyacinth macaw may be particularly vulnerable, given its specialized nature. Any loss of its food and/or nesting resources, via either competition or climate change, could have devastating effects on the recruitment of the species. Therefore, based on the best available scientific and commercial information, we find that other natural or manmade factors are a threat to the hyacinth macaw now and in the future.

Finding

As required by the Act, we conducted a review of the status of the species and considered the five factors in assessing whether the hyacinth macaw is endangered or threatened throughout all or a significant portion of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by the hyacinth macaw. We reviewed the petition, information available in our files, and other available published and unpublished information.

The hyacinth macaw is found in three populations in the Pará, Gerais, and Pantanal regions. The Pará and Gerais populations combined, according the most recent estimate in 2003, number 1,500 individuals. These small populations are threatened by high deforestation rates due to expanding agriculture and cattle ranching. In Pará, deforestation threatens both the food and nesting resources. In the Gerais region, deforestation threatens food resources as hyacinths in this population have utilized cliff crevices for nesting due to the loss of nesting trees. Additionally, we found some information indicating that the hunting of hyacinths as a source of protein and for feathers to be used in local handicrafts may remain as threats in these regions. The Pantanal population is the stronghold for this species and numbers 5,000 according to the most recent estimate. This population is threatened by limited and decreasing nesting sites due to expanding cattle ranching. Competition for nesting sites in the Pantanal has been documented. The occurrence of the hyacinth's nesting tree is limited by deforestation and cattle ranching. Data indicates significantly reduced recruitment, suggesting this species of tree, of adequate size to accommodate the hyacinth macaw, will become increasingly rare in the future. As this resource is limited, competition with the other 17 species known to utilize this nesting tree will increase.

Brazil has various laws to protect its natural resources. However, conflicting priorities of encouraging development for economic growth and resource protection make enforcement difficult. Despite these laws and plans to significantly reduce deforestation, expanding agriculture and cattle ranching continue to contribute to high deforestation rates. Although the deforestation rate began to decrease over the last 6 years, recent anticipated changes to reforestation requirements under Brazil's Forest Code have sparked increases in deforestation once again. Without effective implementation and enforcement of environmental laws, deforestation will continue. Parrots in general have traits that predispose them to extinction, but the hyacinth macaw is highly specialized in diet and nesting requirements and the loss of these resources makes it particularly vulnerable to extinction. Lastly, climate change models have predicted increasing temperatures and decreasing rainfall throughout most of Brazil, potentially causing landscape changes and affecting the distribution of the hyacinth macaw's food and nesting resources.

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The magnitude of the threats the hyacinth macaw is facing is high. Existing laws and regulations in Brazil are not being adequately enforced to significantly reduce deforestation rates. If current rates continue, two-thirds of the forest cover along the Tapajós and Xingu rivers will be lost by 2050; the remaining native habitat of the Cerrado region will be lost by 2030; and the original vegetation of the Pantanal will be destroyed by approximately 2050. Predicted changes in Brazil's climate may exacerbate the effects of habitat loss. Under drought conditions, as predicted by some climate change models, the forests of eastern Amazonia will be more vulnerable to deforestation as fires set to clear land burn a larger area. Additionally, climate change is predicted to significantly decrease tree distribution and ranges of bird species in the Cerrado region.

The hyacinth macaw has a low reproductive rate and, in a study of the Pantanal, where the largest population of hyacinth macaws is found, it was suggested that only 15–30 percent of adults attempt to breed, and a small or even smaller percentage in Pará and Gerais may attempt to breed. Reproduction of hyacinth macaws may be further reduced due to the loss of the already-limited nesting sites in the Pantanal and an increase in the competition for this resource. Although we do not have data on the number of hyacinths lost to hunting, because these populations are so small, the removal of any individuals from the population would have a negative effect on

reproduction and the ability of the species to recover. Long-term survival of this species is a concern. Lastly, because the hyacinth macaw is specialized in its food and nesting resources, the loss of these resources makes it particularly vulnerable to extinction. Impacts from habitat loss, hunting, competition, and climate change exacerbate the effects of specialization. Any loss of vital food and nesting resources or the loss of individuals from the population from current or future threats further reduces the already-limited habitat and is likely to affect the reproductive success of this species. We do not find that the factors affecting the species are likely to be sufficiently ameliorated in the foreseeable future. Therefore, on the basis of the best scientific and commercial information, we find that the hyacinth macaw meets the definition of an ''endangered species'' under the Act, and we are proposing to list the hyacinth macaw as endangered throughout its range.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and encourages and results in conservation actions by Federal and State governments, private agencies and interest groups, and individuals.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. These prohibitions, at 50 CFR 17.21 and 17.31, in part, make it illegal for any person subject to the jurisdiction of the United States to ''take'' (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or to attempt any of these) within the United States or upon the high seas; import or export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any endangered wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken in violation of the Act. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species and 17.32 for threatened species. With regard to endangered wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. For threatened species, a permit may be issued for the same activities, as well as zoological exhibition, education, and special purposes consistent with the Act.

Peer Review

In accordance with our policy, ''Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,'' that was published on July 1, 1994 (59 FR 34270), we will seek the expert opinion of at least three appropriate independent specialists regarding this proposed rule. The purpose of such review is to ensure listing decisions are based on scientifically sound data, assumptions, and analysis. We will send copies of this proposed rule to the peer reviewers immediately following publication in the **Federal Register**. We will invite these peer reviewers to comment, during the public comment period, on the specific assumptions and the data that are the basis for our conclusions regarding the proposal to list as endangered the hyacinth macaw (*Anodorhynchus hyacinthinus*) under the Act.

We will consider all comments and information we receive during the comment period on this proposed rule during preparation of a final rulemaking. Accordingly, our final decision may differ from this proposal.

Required Determinations

Clarity of 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:

(a) Be logically organized;

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

(c) Use clear language rather than jargon;

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

(e) 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 the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the names 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 we do not need to prepare an environmental assessment, as defined under the authority of the National Environmental Policy Act of 1969, in connection with regulations adopted under section 4(a) of 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 list of all references cited in this document is available at *http://www.regulations.gov,* Docket No. FWS–R9–ES–2012–0013, or upon request from the U.S. Fish and Wildlife Service, Endangered Species Program, Branch of Foreign Species (see **FOR FURTHER INFORMATION CONTACT** section).

Author

The primary authors of this notice are staff members of the Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service.

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—[AMENDED]

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

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. Amend § 17.11(h) by adding a new entry for ''Macaw, hyacinth'' in alphabetical order under Birds to the List of Endangered and Threatened Wildlife, as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	
BIRDS							
*	*	*	*	*	*	*	
Macaw, hyacinth	*Anodorhynchus hyacinthinus.*	Bolivia, Brazil, Paraguay.	Entire	E	.....	NA	NA
*	*	*	*	*	*	*	

Dated: June 26, 2012.

Gregory E. Siekaniec,

Acting Director, U.S. Fish and Wildlife Service.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 20

[Docket No. FWS–R9–MB–2012–0038; FF09M21200–123–FXMB1231099BPP0L2]

RIN 1018–AY66

Migratory Bird Hunting; Application for Approval of Fluoropolymeric Shot Coatings as Nontoxic for Waterfowl Hunting

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of application for nontoxic shot approval.

SUMMARY: We, the U.S. Fish and Wildlife Service, announce that Spectra Shot, LLC, of Lafayette, Louisiana, has applied for approval of steel shot with fluoropolymeric coatings as nontoxic for waterfowl hunting in the United States. Steel shot has long been approved for waterfowl hunting. The coatings will add less than 2 mg to the mass of a shot pellet. We have initiated review of the shot coatings under the criteria we have set out in our nontoxic shot approval procedures in our regulations.

DATES: This notice announces the initiation of our review of a Tier 1 application submitted in accordance with 50 CFR 20.134. We will complete the review of the application by September 4, 2012.

ADDRESSES: If we conclude that the application warrants a regulations change, you will be able to view the application and supporting materials by one of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov.* Search for Docket No. FWS–R9–MB–2012–0038.
- Request a copy by contacting the person listed under **FOR FURTHER INFORMATION CONTACT**.

FOR FURTHER INFORMATION CONTACT: George Allen, at 703–358–1825.

SUPPLEMENTARY INFORMATION:

Background

The Migratory Bird Treaty Act of 1918 (Act) (16 U.S.C. 703–712 and 16 U.S.C. 742 a–j) implements migratory bird treaties between the United States and Great Britain for Canada (1916 and 1996 as amended), Mexico (1936 and 1972 as amended), Japan (1972 and 1974 as amended), and Russia (then the Soviet Union, 1978). These treaties protect most migratory bird species from take, except as permitted under the Act, which authorizes the Secretary of the Interior to regulate take of migratory birds in the United States. Under this authority, we control the hunting of migratory game birds through regulations in 50 CFR part 20. We prohibit the use of shot types other than those listed in the Code of Federal Regulations (CFR) at 50 CFR 20.21(j) for hunting waterfowl and coots and any species that make up aggregate bag limits.

Since the mid-1970s, we have sought to identify types of shot for waterfowl hunting that are not toxic to migratory birds or other wildlife when ingested. We have approved nontoxic shot types and added them to the migratory bird hunting regulations in 50 CFR 20.21(j). We will continue to review all shot types submitted for approval as nontoxic.

Current Application

Spectra Shot, LLC, has submitted its application to us with the counsel that it contains all of the specified information required by 50 CFR 20.134 for a complete Tier 1 submittal, and has requested unconditional approval pursuant to the Tier 1 timeframe. Having determined that the application is complete, we have initiated a comprehensive review of the Tier 1 information under 50 CFR 20.134. After review, we will either publish a notice of review to inform the public that the Tier 1 test results are inconclusive, or we will publish a proposed rule to approve the candidate shot coating.

If the Tier 1 tests are inconclusive, the notice of review will indicate what other tests we will require before we will again consider approval of the shot coating as nontoxic. If the Tier 1 data review results in a preliminary determination that the coating does not pose a significant toxicity hazard to migratory birds, other wildlife, or their habitats, the Service will commence with a rulemaking proposing to approve the coating and add it to our list at 50 CFR 20.21(j).

Authority: We publish this notice under the authority of the Migratory Bird Treaty Act (16 U.S.C. 703–712 and 16 U.S.C. 742 a–j) and in accordance with the regulations at 50 CFR 20.134(b)(2)(i)(D)(3).

Dated: June 27, 2012.

Michael J. Bean,

Acting Assistant Secretary for Fish and Wildlife and Parks.

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