from the pictograms of the safety defect reporting label by text and:

(A) The labels must be located such that the shortest distance from any of the lettering or graphics on the safety defect reporting label to any of the lettering or graphics on the air bag alert label is not less than 3 cm, or

(B) If the safety defect reporting and air bag alert labels are each surrounded by a continuous solid-lined border, the shortest distance from the border of the safety defect reporting label to the border of the air bag alert label must be not less than 1 cm.

(iii) At the option of the manufacturer, the requirement in paragraph (c)(1)(i) of this section for a permanently affixed label may instead be met by permanent marking and molding of the required information onto the specified location.

(2) *Owner's Manual.* (i) The manufacturer of each passenger motor vehicle must provide to the purchaser, in writing in the English language and not less than 10 point type, the following statement in the owner's manual, or, if there is no owner's manual or the owner's manual is electronic, on a one-page document:

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying [INSERT NAME OF MANUFACTURER]. To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1–888–327–4236 (TTY: 1–800–424–9153); go to *http://www.safercar.gov;* download the SaferCar mobile application; or write to: Administrator, NHTSA, 1200 New Jersey Ave. SE., Washington, DC 20590. You can also obtain other information about motor vehicle safety from *http://www.safercar.gov.*

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or [INSERT NAME OF MANUFACTURER].

(ii) The manufacturer must specify in the table of contents of the owner's manual the location of the statement required in paragraph (c)(2)(i). The heading in the table of contents must state ''Reporting Safety Defects.''

Issued in Washington, DC.

Raymond R. Posten,

Associate Administrator for Rulemaking.

[FR Doc. 2016–28125 Filed 11–25–16; 8:45 am]

BILLING CODE 4910–59–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. 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: Revised proposed rule; reopening of public comment period.

SUMMARY: We, the U.S. Fish and Wildlife Service, notify the public that we are making changes to our July 6, 2012, proposed rule to list the hyacinth macaw *(Anodorhynchus hyacinthinus)* as an endangered species under the Endangered Species Act of 1973, as amended (Act). Based on new information, we now propose to list the hyacinth macaw as a threatened species under the Act. We also propose a concurrent rule under section 4(d) of the Act for this species. We are reopening the comment period to allow comments on the new information presented in this document relevant to the changes described below. Comments previously submitted will be considered and do not need to be resubmitted. However, we encourage those who may have commented previously to submit additional comments, if appropriate, in light of this new information.

DATES: The comment period for the proposed rule published July 6, 2012 (77 FR 39965) is reopened. We will accept comments received on or before January 27, 2017. *Comments submitted electronically using the Federal eRulemaking Portal (see* **ADDRESSES***, below) must be received by 11:59 p.m. Eastern Time on the closing date. Requests for a public hearing must be received by January 12, 2017.*

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

(1) *Federal eRulemaking Portal: http://www.regulations.gov.* Follow instructions for submitting comments to Docket No. FWS–R9– ES–2012–0013.

(2) *U.S. mail or hand delivery:* Public Comments Processing, Attn: [FWS–R9–

ES–2012–0013]; Division of Policy, Performance, and Management Programs; U.S. Fish and Wildlife Service; 5275 Leesburg Pike, Falls Church, VA 22041.

FOR FURTHER INFORMATION CONTACT: Janine Van Norman, Chief, Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service, 5275 Leesburg Pike, MS: ES, Falls Church, VA 22041; 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

I. Purpose of the Regulatory Action

Before a plant or animal species can receive the protection provided by the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 *et seq.*), it must first be added to the Federal List of Endangered and Threatened Wildlife or the Federal List of Endangered and Threatened Plants, found in title 50 of the Code of Federal Regulations (CFR) in part 17. A species may warrant protection through listing if it is found to be an endangered or threatened species throughout all or a significant portion of its range. Under the Act, if a species is determined to be endangered or threatened we are required to publish in the **Federal Register** a proposed rule to list the species. We are proposing to list the hyacinth macaw as a threatened species under the Act. We are also proposing a rule under section 4(d) of the Act that defines the prohibitions and exceptions that apply to hyacinth macaws.

II. Major Provisions of the Regulatory Action

If adopted as proposed, this action will list the hyacinth macaw as a threatened species in the List of Endangered and Threatened Wildlife at 50 CFR 17.11(h), and will allow the import and export of certain hyacinth macaws into and from the United States and certain acts in interstate commerce without a permit under the Act. This action is authorized by the Act.

Information Requested

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. Therefore, we request comments or information from other concerned governmental agencies, the scientific community, industry, and any other interested parties concerning this revised proposed rule. We particularly seek comments concerning:

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

(a) New or expanding populations; and

(b) Estimates for new and expanding populations.

(2) Deforestation rates in areas where the hyacinth macaw occurs.

(3) Conservation actions or plans that address either the hyacinth macaw or deforestation in areas where the hyacinth occurs; as well as the status of those actions and plans (level of implementation, success, challenges, etc.).

(4) Availability of nesting cavities.

(5) The factors that are the basis for making a listing determination for a species or subspecies under section 4(a)(1) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(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.

(6) The potential effects of climate change on the subspecies and its habitat.

(7) The proposed rule under section 4(d) of the Act that will allow the import and export of certain hyacinth macaws into and from the United States and certain acts in interstate commerce without a permit under the Act.

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

Public Hearing

Section 4(b)(5) of the Act requires the Service to hold a public hearing on this proposal, if requested within 45 days of publication of the notice. At this time, we do not have a public hearing scheduled for this revised 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 **ADDRESSES**. 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 **FOR FURTHER INFORMATION CONTACT** by the date specified in **DATES**.

Peer Review

In accordance with our policy published on July 1, 1994 (59 FR 34270), we solicited peer review on our July 6, 2012, proposed rule. In accordance with our August 22, 2016 memorandum updating and clarifying the role of peer review of listing actions under the Act, we will solicit the expert opinions of at least three appropriate and independent specialists for peer review of this proposed rule. The purpose of such review is to ensure that decisions are based on scientifically sound data, assumptions, and analysis. We will send peer reviewers copies of this revised proposed rule immediately following publication in the **Federal Register**. We will invite peer reviewers to comment, during the public comment period, on the specific assumptions and conclusions regarding the proposed listing status for the hyacinth macaw. We will summarize the opinions of these reviewers in the final decision document, and we will consider their input and any additional information we receive, as part of our process of making a final decision on the revised proposal.

Previous Federal Actions

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, including the hyacinth macaw, 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, including the hyacinth macaw. We initiated the status review to determine if listing each of the 12 species as a threatened species or endangered species under the Act is warranted, and initiated an information collection period to allow all interested parties an opportunity to provide information on the status of these 12 species of parrots.

On October 24 and December 2, 2009, the Service received 60-day notices of intent to sue from Friends of Animals

and WildEarth Guardians, respectively, for failure to make determinations on whether the petitioned action is warranted, not warranted, or warranted but precluded by other listing actions within 12 months after receiving a petition presenting substantial information indicating listing may be warranted (''12-month findings''). On March 2, 2010, Friends of Animals and WildEarth Guardians filed suit against the Service for failure to make 12-month findings on the petition to list the 14 species within the statutory deadline of the Act *(Friends of Animals, et al.* v. *Salazar,* Case No. 1:10–CV–00357–RPM (D.D.C.)).

On July 21, 2010, a settlement agreement was approved by the Court, in which the Service agreed to submit to the **Federal Register** by July 29, 2011, September 30, 2011, and November 30, 2011, 12-month findings for no fewer than four of the petitioned species on each date. On August 9, 2011, the Service published in the **Federal Register** a 12-month 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 finding was published for the red-crowned parrot (76 FR 62016). On October 11, 2011, a 12-month finding and proposed rule was published for the yellow-billed parrot (76 FR 62740), and on October 12, 2011, a 12-month finding was published for the blue-headed macaw and grey-cheeked parakeet (76 FR 63480).

On September 16, 2011, the Court granted a request to extend the November 30, 2011, deadline allowing the Service to submit 12-month findings for the four remaining species, including hyacinth macaw, to the **Federal Register** by June 30, 2012. On July 6, 2012, the Service published in the **Federal Register** a 12-month finding and proposed rule to list the hyacinth macaw as an endangered species under the Act (77 FR 39965). On February 21, 2013, the Service reopened the public comment period to allow all interested parties an opportunity to provide additional comments on the proposed rule and to submit information on the status of the species (78 FR 12011).

Background

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in part 424 of title 50 of the Code of Federal 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. The Act defines ''endangered species'' as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and ''threatened species'' as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). Under section 4(a)(1) of the Act, a species may be determined to be an endangered or a threatened species 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.

We fully considered the comments and information we received from the public and peer reviewers. We also conducted a search for information that became available since our 2012 proposed rule. We made some technical corrections and included additional information on the work being done by the Hyacinth Macaw Project. Based on new information, we also reevaluated impacts to the species from deforestation and predation. Based on our evaluation of this new information, we are proposing to list the hyacinth macaw as a threatened species under the Act. We summarize below the information on which we based our evaluation of the five factors provided in section 4(a)(1) of the Act. We are also proposing a rule under section 4(d) of the Act that defines the prohibitions and exceptions that apply to hyacinth macaws.

Species Information

Taxonomy and Species Description

The hyacinth macaw (hyacinth) 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 1 meter (m) (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. Their legs, which are dark grey in most birds but lighter grey to white in older adults, 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).

The hyacinth macaw experiences late maturity, not reaching first reproduction until 8 or 9 years old (Guedes 2009, p. 117). Hyacinths are monogamous and faithful to nesting sites; a couple may reproduce for more than a decade in the same nest. They nest from July to January in tree cavities and, in some parts of its range, cliff cavities (Tortato and Bonanomi 2012, p. 22; Guedes 2009, pp. 4, 5, 12; Pizo *et al.* 2008, p. 792; Pinho and Nogueira 2003, p. 35; 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 (Guedes 2009, p. 4; 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).

Hyacinth macaws naturally have a low reproductive rate, a characteristic common to all parrots, due, in part, to asynchronous hatching. Although hyacinths lay two eggs, usually only one chick survives (Guedes 2009, p. 31; Faria *et al.* 2008, p. 766; Kuniy *et al.* 2006, p. 381; Guedes, 2004b, p. 6; Munn *et al.* 1989, p. 409). Not all hyacinth nests fledge young, and, due to the long period of chick dependence, hyacinths breed only every 2 years (Faria *et al.*

2008, p. 766; Schneider *et al.* 2006, pp. 71–72; Guedes 2004b, p. 7; Pinho and Nigueira 2003, p. 30; 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 as small or an even smaller percentage in Pará and Gerais attempt to breed (Munn *et al.* 1998, p. 409).

Range and Population

At one time, hyacinths were widely distributed, occupying large areas of Central Brazil into the Bolivian and Paraguayan Pantanal (Guedes 2009, pp. xiii, 11; 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 areas totaling approximately 537,000 km^2, almost exclusively within Brazil: (1) Eastern Amazonia in Pará, Brazil, south of the Amazon River along the Tocantins, Xingu, and Tapajós rivers; (2) the Gerais region of northeastern Brazil, including the states of Maranhão, Piauí, Goiás, Tocantins, Bahia, and Minas Gerais; and (3) the Pantanal of Mato Grosso and Mato Grosso do Sul, Brazil and marginally in Bolivia and Paraguay. These areas have experienced less pressure from trapping, hunting, and agriculture (Birdlife International (BLI) 2014a, unpaginated; Snyder *et al.* 2000, p. 119; Juniper and Parr 1998, p. 416; Abramson *et al.* 1995, p. 14; Munn *et al.* 1989, p. 407).

Prior to the arrival of Indians and Europeans to South America, there may have been between 100,000 and 3 million hyacinth macaws (Munn *et al.* 1989, p. 412); however, due to the species' large but patchy range, an estimate of the original population size when the species was first described (1790) is unattainable (Collar *et al.* 1992, p. 253). Although some evidence suggests that the hyacinth macaw was abundant before the mid-1980s (Guedes 2009, p. 11; Collar *et al.* 1992, p. 253), the species significantly declined throughout the 1980s due to an estimated 10,000 birds illegally captured for the pet trade and a further reduction in numbers due to habitat loss and hunting. Although population estimates prior to 1986 are lacking, a very rapid population decline is suspected to have taken place over the last 31 years (three generations) (BLI 2014a, unpaginated). In 1986, the total population of hyacinth macaws was estimated 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 (Guedes 2004b, p. 2; Collar *et al.* 1992, p. 253; Munn *et al.* 1989, p. 413). In 2003, the population was estimated at 6,500 individuals; 5,000 of which were located in the Pantanal region, and 1,000–1,500 in Pará and Gerais, combined (BLI 2014a, unpaginated; Guedes 2009, p. 11; Brouwer 2004, unpaginated; WWF 2004, unpaginated). Observations of hyacinth macaws in the wild have increased in Paraguay, especially in the northern region (Espinola 2013, pers. comm.), but no quantitative data is available. Locals report the species increasing in Bolivia; between 140 and 160 hyacinths are estimated to occur in the Bolivian Pantanal, with estimates as high as 300 for the entire country (Guedes 2012, p. 1; Pinto-Ledezma 2011, p. 19).

Although the 2003 estimate indicates a substantial increase in the Pantanal population, the methods or techniques used to estimate the population are not described; therefore, the reliability of the estimation techniques, as well as the accuracy of the estimated increase, are not known (Santos, Jr. 2013, pers. comm.). Despite the uncertainty in the estimated population increase, the Pantanal is the stronghold for the species and has shown signs of recovery since 1990, most likely as a response to conservation projects (BLI 2014a, unpaginated; Antas *et al.* 2006, p. 128; Pinho and Nogueira 2003, p. 30). However, the overall population trend for the hyacinth macaw is reported as decreasing (BLI 2014a, unpaginated), although there are no extreme fluctuations reported in the number of individuals (BLI 2014a, unpaginated).

Essential Needs of the Species

Hyacinths use a variety of habitats in the Pará, Gerais, and Pantanal regions. Each region features a dry season that prevents the growth of extensive closed-canopy tropical forests and maintains the more open habitat preferred by this species. In Pará, the species prefers palm-rich várzea (flooded forests), seasonally moist forests with clearings, and savannas. In the Gerais region, hyacinths are located within the Cerrado biome, where they inhabit 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 forests 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).

Hyacinths have a specialized diet consisting of the fruits of various palm species, which are inside an extremely hard nut that only the hyacinth can easily break (Guedes and Harper 1995, p. 400; Collar *et al.* 1992, p. 254). Hyacinths 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 (Brightsmith 1999, p. 2; Pittman 1993, unpaginated). They forage for palm nuts and water on the ground, but may also forage directly from the palm tree and drink fluid from unripe palm fruits. Hyacinths also 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 (Juniper and Parr 1998, p. 417; Yamashita 1997, pp. 177, 179; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, p. 254).

In each of the three regions where hyacinths occur, they use only a few specific palm species. In Pará, 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. 254; Munn *et al.* 1987, pp. 407–408). Although hyacinths prefer 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 also have specialized nesting requirements. As a secondary tree nester, they require large, mature trees with preexisting tree holes to provide nesting cavities large enough to accommodate them (Tortato and Bonanomi 2012, p. 22; Guedes 2009, pp. 4, 5, 12; 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 the Pantanal region, the species nests almost exclusively (94 percent) in *Sterculia striata* (manduvi) as it is one of the few tree species that grows large enough to supply cavities that can accommodate the hyacinth's large size. Manduvi trees must be at least 60 years old, and on average 80 years old, to provide adequate cavities

(Guedes 2009, pp. 59–60; Pizo *et al.* 2008, p. 792; Santos Jr. *et al.* 2006, p. 185). Nesting has also been reported in *Pithecellobium edwalii* (angio branco), *Enterolobium contortisiliquum* (ximbuva), *Vitex sp.* (tarumá), and the cliff face of mountains on the border of the Pantanal (van der Meer 2013, p. 24; Guedes 2004b, p. 6; Kuniy *et al.* 2006, p. 381; Santos Jr. *et al.* 2006, p. 180; Pinho and Nogueira 2003, pp. 30, 33; Guedes 2002, p. 4; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 402; Collar *et al.* 1992, p. 255; Munn *et al.* 1987, p. 408).

Conservation Status

In 1989, the hyacinth was listed on the Official List of Brazilian Fauna Threatened with 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; IBAMA Ordinance No. 1522, of December 19, 1989). Due to actions to combat trafficking of animals, the hyacinth macaw was removed from the list in 2014 (Instituto Chico Mendes de Conservação da Bioversidade 2016, unpaginated). It is listed as ''critically endangered'' by the State of Minas Gerais and ''vulnerable'' by the State of Pará (Garcia and Marini 2006, p. 153). In Paraguay, the hyacinth is listed as in danger of extinction (Secretaría del Ambiente n.d., p. 4; Bauer 2012, pers. comm.).

From 2000 to 2013, this species was classified as ''endangered'' by the IUCN. However, in 2014, the hyacinth was downlisted to ''vulnerable'' because evidence suggested that it had not declined as rapidly as previously thought. A ''vulnerable'' taxon is considered to be facing a high risk of extinction in the wild, whereas an ''endangered taxon is considered to be facing a very high risk of extinction in the wild (BLI 2014a, unpaginated). The hyacinth macaw is also listed as Appendix I on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) list. Species included in CITES Appendix I are considered threatened with extinction, and international trade is permitted only under exceptional circumstances, which generally precludes commercial trade.

Factors Affecting the Species

Most of the information on the hyacinth macaw is from the Pantanal region, as this is the largest and most studied population. 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. We found little information on the status of the Pará and Gerais populations; therefore, we evaluated impacts to these populations by a broader region (*e.g.,* the Amazon biome for Pará and the Cerrado biome for Gerais).

Parrots in general have traits that predispose them to extinction (Lee 2010, p. 3; Thiollay 2005, p. 1121; Guedes 2004a, p. 280; Wright *et al.* 2001, p. 711; Munn *et al.* 1998, p. 409). Additionally, feeding and habitat specializations are good predictors of a bird species' risk of extinction. The hyacinth scores high in both food and nest site specialization (Faria *et al.* 2008, p. 766; Pizo *et al.* 2008, p. 795; Munn *et al.* 1998, p. 409; Johnson *et al.* 1997, p. 186; Guedes and Harper 1995, p. 400) as they feed on and nest in very limited number of tree species. Therefore, hyacinths are particularly vulnerable to extinction due to the loss of food sources and nesting sites (Faria *et al.* 2008, p. 766; Pizo 2008, p. 795; Munn *et al.* 1998, pp. 404, 409; Johnson *et al.* 1997, p. 186). As stated above, hyacinths naturally have a low reproductive rate; not all hyacinth nests fledge young, and, due to the long period of chick dependence, hyacinths breed only every 2 years. Only 15–30 percent of adults in the Pantanal attempt to breed; it may be that as small or an even smaller percentage in Pará and Gerais attempt to breed. The specialized nature and reproductive biology of the hyacinth macaw contribute to low recruitment of juveniles and decrease the ability to recover from reductions in population size caused by anthropogenic disturbances (Faria *et al.* 2008, p. 766; Wright *et al.* 2001, p. 711). This species' vulnerability to extinction is further heightened by deforestation that negatively affects the availability of essential food and nesting resources, hunting that removes individuals from already small populations, and other factors that further reduce naturally low reproductive rates, recruitment, and the population.

Deforestation

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 soybean meal has increased, causing land conversion to significantly increase to meet this demand (Barona *et al.* 2010, pp. 1–2). 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). Brazil has also 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 (Butler 2009, unpaginated).

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. Between 1995 and 2009, conversion of floodplain forests in the Amazon region to cattle ranching expanded significantly and was the greatest cause of deforestation (da Silva 2009, p. 3; Lucas 2009, p. 1; Collar *et al.* 1992, p. 257).

Cattle ranching has been present in the várzea (floodplain forests) of the Amazon for centuries (Arima and Uhl, 1997, p. 433). However, since the late 1970s, 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 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, incidence of disease, such as hoof-and-mouth disease and brucellosis, and ectoparasites are lower 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 in those areas and establishing larger farms in Pará to compete in the national market (Arima and Uhl, 1997, p. 446).

Although the immediate cause of deforestation in the Amazon was predominantly the expansion of pasture between 2000 and 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).

In the Brazilian North region, including Pará, cattle occupy 84 percent of the total area under agricultural and livestock uses. This area, on average, expanded 9 percent per year over 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), with a sizable portion of the state classified as cattle-producing area (Walker *et al.* 2009, p. 69). For 7 months of the year, cattle are grazed in the várzea, but are moved to the upper terra firma 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).

Pará has long been known as the epicenter of illegal deforestation (Dias and Ramos 2012, unpaginated) and has one of the highest deforestation rates in the Brazilian Amazon (Portal Brasil 2010, unpaginated). From 1988 to 2015, the state lost 139,824 km² (53,986 mi²), with annual rates varying between 3,780–8,870 km² (1,460–3,424 mi²) (Brazil's National Institute for Space Research (INPE) 2015, unpaginated; Butler 2010, unpaginated). Since 2004, deforestation rates in Pará have generally decreased; however, rates rose 35 percent in 2013 before decreasing again (INPE 2015, unpaginated) (Table 1).

TABLE 1—DEFORESTATION IN PARÁ (2004–2015)

Year	Accumulated deforested area (km²)	Annual deforested area (km²)	Annual change in deforestation rate (%)
2004	*98,257	8,870	24
2005	104,156	5,899	−33
2006	109,815	5,659	−4
2007	115,341	5,526	−2
2008	120,948	5,607	1
2009	125,229	4,281	−24
2010	128,999	3,770	−12
2011	132,007	3,008	−20
2012	133,748	1,741	−42
2013	136,094	2,346	35
2014	137,981	1,887	−20
2015	139,862	1,881	0

* Accumulation since 1988.

Given the role cattle ranching plays in national and international markets and the profitability of ranching, significant expansion of cattle herds in the Brazilian Amazon has continued (Walker *et al.* 2009, p. 68). The remaining forested areas of Pará are at risk of being cleared; Pará is one of the states where most of Brazil's agriculture expansion is taking place (BBC News 2014, unpaginated). Furthermore, modeled future deforestation is concentrated in eastern Amazonia, which includes Pará, where the density of paved highways (existing and planned) will continue to be highest for several decades (Soares-Filho *et al.* 2006, p. 522).

Gerais

The Gerais region is within the Cerrado biome, a 2-million-km² (772,204-mi²) area consisting of plateaus and depressions with vegetation that varies from dense grasslands with sparse shrubs and small trees to 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. 255). 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 source.

Approximately 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 continues to suffer high rates of habitat loss (Grecchi *et al.* 2015, p. 2865; Beuchle *et al.* 2015, p. 121; WWF 2015, p. 2; Soares-Filho *et al.* 2014, p. 364; Pearce 2011, unpaginated; WWF–UK 2011b, p. 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). From 2002 to 2008, the demand for land conversion in the Cerrado resulted in an annual deforestation rate of more than 14,200 km² (5,483 mi²) (Ministério do Meio Ambiente (MMA) 2015, p. 9; WWF–UK 2011b, p. 2). At this rate, the vegetation of the Cerrado region was disappearing faster than the Amazon rainforest (Pearce 2011, unpaginated; WWF–UK 2011c, p. 19; Pennington *et al.* 2006 In Beuchle *et* al. 2015, p. 117; Klink and Machado 2005, p. 708; Ratter *et al.* 1997, p. 228). However, since that time, the loss of natural vegetation decreased to an estimated 12,949 km² (4,999 mi²) per year from 2000 to 2005 and 11,812 km² (4,560 mi²) per year from 2005 to 2010 (Beuchle *et al.* 2015, pp. 124, 125). Between 2009 and 2010, the deforestation in the Cerrado decreased 16 percent. Compared to the deforestation rates of the early 2000s, deforestation has decreased about 40 percent (Critical Ecosystem Partnership Fund (CEPF) 2016, p. 145).

Since 2008, annual monitoring of deforestation in the Cerrado has taken place through a government program that monitors each of the Brazilian biomes. Although the annual rate of deforestation is generally decreasing, satellite monitoring of the area indicates a slow and steady increase in deforested area (MMA 2015, p. 9) (Table 2).

TABLE 2—DEFORESTATION IN THE CERRADO (2002–2011)

Years assessed	Accumulated deforested area (km^2)	Percent (%) of Cerrado deforested	Annual deforested area (km^2)	Annual deforestation rate (%)	Remaining areas of natural vegetation (km^2)
Up to 2002	890,636	43	–	–	1,148,750
2002–2008	975,710	47.8	14,179	0.69	1,063,676
2008–2009	983,347	48.2	7,637	0.37	1,056,039
2009–2010	989,816	48.5	6,469	0.32	1,049,570
2010–2011	997,063	48.9	7,247	0.35	1,042,323

The remaining natural vegetation of the Cerrado is highly fragmented (only 20 percent of the original biome is considered intact) and continues to be pressured by conversion for soy plantations and extensive cattle ranching (WWF–UK 2011c, p. 21; WWF–UK 2011b, p. 2; Carvalho *et al.* 2009, p. 1393; BLI 2008, unpaginated). About six in every 10 hectares of the Cerrado are suitable for mechanized agriculture (WWF–UK 2011b, p. 2). Maranhão, Tocantins, Piauí, and Bahia, states where hyacinth macaws occur, are undergoing rapid conversion, mostly to soy crops (CEPF 2016, p. 151). Soy production will continue to grow as the beans have many uses for food, feed, and industry in Brazil and abroad (CEPF 2016, p. 152). Furthermore, the Brazilian government has proposed a 731,735 km^2-agricultural development, of which 91 percent occurs in the Cerrado, with little regard for the environment, at least as of 2015 (Clark 2015 and Miranda 2015 In CEPF 2016, p. 95). Additionally, the conversion of land for biofuel production is likely imminent, creating a market for the expansion and establishment of new areas for soy, castor beans, other oil-bearing plants, and sugar cane (Carvalho *et al.* 2009, p. 1400).

Given that the Cerrado is the most desirable biome for agribusiness expansion and contains approximately 40 million ha (98.8 million ac) of ''environmental surplus'' that could be legally deforested (See discussion of Brazil's Forest Code, below) (Soares-Filho *et al.* 2014, p. 364), this region will likely continue to suffer high deforestation rates. Projections for coming decades show the largest increase in agricultural production occurring in the Cerrado (CEPF 2016, p. 145).

Pantanal

The Pantanal is a 140,000-km^2 (54,054-mi^2) seasonally flooded wetland interspersed with higher areas not subject to inundation (cordilleras), covered with cerrado or seasonal forests (Santos Jr. 2008, p. 133; Santos Jr. *et al.* 2007, p. 127; Harris *et al.* 2005, p. 715; Mittermeier *et al.* 1990, p. 103). Transitions during the 1990s to more intensive cattle ranching methods led to the conversion of more forests to pasture and the introduction of nonnative grasses. Ninety-five percent of the Pantanal is privately owned; 80 percent of the privately owned land is used for cattle ranches, making cattle ranching the predominant economic activity in this region and the greatest cause of habitat loss in the Pantanal (van der Meer 2013, p. 5; Guedes and Vicente 2012, pp. 146–147, 148; Guedes 2009, p. 12; 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).

Manduvi, the tree that hyacinth macaws almost exclusively use for nesting in this region, grow in cordilleras, which constitute only 6 percent of the vegetative area of the Pantanal (van der Meer 2013, p. 6; Pizo *et al.* 2008, p. 793; Johnson *et al.* 1997, p. 186). Much of these patches and corridors are surrounded by seasonally flooded grasslands used as rangeland for cattle during the dry season (Johnson *et al.* 1997, p. 186). During the flooding season (January to June), up to 80 percent of the Pantanal is flooded and ranchers move cattle to cordilleras, increasing cattle pressure on upland forests (van der Meer 2013, p. 3; Guedes 2002, p. 3). These upland forests are often removed and converted to cultivated pastures with exotic grasses (van der Meer 2013, p. 6; Santos Jr. 2008, p. 136; Santos Jr. *et al.* 2007, p. 127; Harris *et al.* 2006, p. 165; Harris *et al.* 2005, p. 716; 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).

Since 2002, regular monitoring of land use and vegetative cover in the Upper Paraguay Basin, which includes the Pantanal, has taken place. While the annual rate of deforestation is decreasing, satellite monitoring of the area indicates a slow and steady increase in deforested area (Table 3).

TABLE 3—DEFORESTATION IN THE PANTANAL (2002–2014)

Years assessed	Accumulated deforested area (km^2)	Percent (%) of Pantanal deforested	Annual deforested area (km^2)	Annual deforestation rate (%)	Citation
2002–2008	20,265	13.4	612	0.41	CI *et al.* 2009, pp. 30–32.
2008–2010	20,851	13.8	605	0.40	CI *et al.* 2011, pp. 3–4.
2010–2012	20,833	13.8	389	0.26	CI *et al.* 2013, pp. 4–5.
2012–2014	22,439	14.9	394	0.26	CI *et al.* 2015, pp. 2–4.

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, hyacinths occur near cattle ranches and feed off the palm nuts eliminated by the cattle (Juniper and Parr 1998, p. 417; Yamashita 1997, pp. 177, 179; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, p. 254).

However, other trees, including potential nesting trees, are often removed (Snyder *et al.* 2000, p. 119). Even in areas where known nesting trees were left and the surrounding area was cleared, competition with each other and other macaw species became so fierce that hyacinth macaws were unable to reproduce; both eggs and chicks were destroyed by pecking. Furthermore, 3 years after deforestation, the nesting trees that were left were lost due to isolation and damage from storms and wind.

Other activities associated with cattle ranching, such as the introduction of exotic foraging grasses, grazing, burning, compaction, and fragmentation, can negatively impact the nesting trees of the hyacinth macaw (Guedes 2013, unpaginated; Guedes and Vicente 2012, pp. 149–150; Santos Jr. *et al.* 2007, p. 128; Harris *et al.* 2006, p. 175; Snyder *et al.* 2000, p. 119). For example, 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 (Guedes and Vicente 2012, p. 157; 1995 in Santos Jr. *et al.* 2006, pp. 184–185) noted that 5 percent of manduvi trees 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; Santos Jr. *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. However, there is low recruitment of manduvi trees in classes greater than 5 cm (2 in) DBH, a strong reduction in the occurrence of trees greater than 50 cm (20 in) DBH, and very few trees greater than 110 cm (43 in) DBH (Santos Jr. *et al.* 2007, p. 128). Only 5 percent of the existing adult manduvi trees (trees with a DBH greater than 50 cm (20 in)) in south-central Pantanal (Guedes 1993 in Johnson *et al.* 1997, p. 186), and 10.7 percent in southern Pantanal (van der Meer 2013, p. 16), contain suitable cavities for hyacinth macaws. This finding indicates that potential nesting sites are rare and will become increasingly rare in the future (Santos Jr. *et al.* 2007, p. 128).

Impacts of Deforestation

Because the hyacinth is highly specialized in both diet and nesting sites, it is particularly vulnerable to the loss of these resources and extinction (Faria *et al.* 2008, p. 766; Pizo 2008, p. 795; Munn *et al.* 1998, pp. 404, 409; Johnson *et al.* 1997, p. 186). The loss of tree species used by hyacinths negatively impacts the species by reducing availability of food resources, creating a shortage of suitable nesting sites, increasing competition, and resulting in lowered recruitment and a reduction in population size (Lee 2010, pp. 2, 6, 12; Santos Jr. *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188).

Its specialized diet makes hyacinth macaws vulnerable to changes in food availability. Inadequate nutrition can contribute to poor health and reduced reproduction in parrots generally (McDonald 2003 In Lee 2010, p. 6). Changes in fruit availability are known to decrease reproduction in hyacinths (Guedes 2009, pp. 42–43, 44). In Pará and the Gerais region, where food sources are threatened, persistence of the species is a concern given that 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 specialized food source, licuri palm stands (*Syagrus* sp.), to cattle grazing (Collar *et al.* 1992, p. 257).

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 jeopardize the persistence of the hyacinth macaw by constraining breeding density, resulting in lower recruitment and a gradual reduction in population size (Santos Jr. *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188; Guedes and Harper 1995, p. 405; Newton 1994, p. 265). This reduction 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 compromised (Santos Jr. *et al.* 2007, p. 128; Santos Jr. *et al.* 2006, p. 181).

Although a species may survive the initial shock of deforestation, the resulting lack of food resources and breeding sites may reduce the viability of the population and make the species vulnerable to extinction (Sodhi *et al.* 2009, p. 517). Given the land-use trends across the range of the hyacinth macaw, the continued availability of food and nesting resources is of great concern.

In response to the loss of its nesting tree, hyacinths in the Gerais region now use rock crevices for nesting. Hyacinths have been reported in various trees species and even on cliffs on the border of the Pantanal; however, the majority of their nests are in Brazil nut (in Pará) and manduvi (in the Pantanal) (see *Essential Needs of the Species*). We do not know if the hyacinths in this region will respond in the same way to the loss of nesting trees as those in the Gerais region. It is possible that if these primary nesting trees become scarcer, hyacinths may adapt to using cavities of other trees (Van der Meer 2013, p. 3) or perhaps even cliff faces. However, to accommodate their large size, hyacinth macaws require older trees with large cavities. Deforestation in these regions would likely impact any alternative nesting trees and food sources, resulting in the same negative effect on the hyacinth macaw. Furthermore, competition for limited nesting sites and food would continue.

Regulatory Protections

In general, wildlife species and their nests, shelters, and breeding grounds are subject to Brazilian laws designed to provide protection (Clayton 2011, p. 4; Snyder *et al.* 2000, p. 119; Environmental Crimes Law (Law No. 9605/98); Stattersfield and Capper 1992, p. 257; Official List of Brazilian Endangered Animal Species (Order No. 1.522/1989); Brazilian Constitution (Title VIII, Chapter VI, 1988); Law No. 5197/1967; UNEP, n.d., unpaginated). Additionally, the forests of Brazil are specifically subject to several Brazilian laws designed to protect them. Destruction and damaging of forest reserves, cutting trees in forest reserves, and causing fire in forests, among other actions, without authorization are prohibited (Clayton 2011, p. 5; Environmental Crimes Law (Law No. 9605/98); UNEP, n.d., unpaginated).

Brazil's Forest Code, passed in 1965, is a central component of the nation's environmental legislation; it dictates the minimum percentage and type of woodland that farmers, timber companies, and others must leave intact on their properties (Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated). Since 2001, the Forest Code has required landowners to conserve native vegetation on their rural properties. This requirement includes setting aside a Legal Reserve that comprises 80 percent of the property if it is located in the Amazon and 20 percent in other biomes. The Forest Code also designated environmentally sensitive areas as Areas of Permanent Preservation (APPs) to conserve water resources and prevent soil erosion. APPs include Riparian Preservation Areas, to protect riverside forest buffers, and Hilltop Preservation Areas to protect hilltops, high elevations, and steep slopes (Soares-Filho *et al.* 2014, p. 363).

For years this law was widely ignored by landowners and not enforced by the government, as evidenced by the high deforestation rates (Leahy 2011, unpaginated; Pearce 2011, unpaginated; Ratter *et al.* 1997, p. 228). However, as deforestation rates increased in the early 2000s, Brazil began cracking down on illegal deforesters and used satellite imagery to track deforestation, resulting in decreased deforestation rates (Soares-Filho *et al.* 2014, p. 363; Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated; Darlington 2012, unpaginated). Efforts to strengthen enforcement of the Forest Code increased pressure on the farming sector, which resulted in a backlash against the Forest Code and industry's proposal of a new Forest Code (Soares-Filho *et al.* 2014, p. 363).

In 2011, reforms to Brazil's Forest Code were debated in the Brazilian Senate. The reforms were favored by the agricultural industry but were greatly opposed by environmentalists. At that time, the expectation of the bill being passed resulted in a spike in deforestation (Darlington 2012, unpaginated; Moukaddem 2011, unpaginated; WWF–UK 2011a, unpaginated). In 2012, a new Forest Code was passed; although the new reforms were an attempt at a compromise between farmers and environmentalists, many claim the new bill reduces the total amount of land required to be maintained as forest and will increase deforestation, especially in the Cerrado (Soares-Filho *et al.* 2014, p. 364; Boadle 2012, unpaginated; Darlington 2012, unpaginated; do Valle 2012, unpaginated; Greenpeace 2012, unpaginated).

Environmentalists oppose the new law due to the complexity of the rule, challenges in implementation, and a lack of adequate protection of Brazil's forests. The new Forest Code carries over conservation requirements for Legal Reserves and Riparian Preservation Areas. However, changes in the definition of Hilltop Preservation Areas reduced their total area by 87 percent. Additionally, due to more flexible protections and differentiation between conservation and restoration requirements, Brazil's environmental debt (areas of Legal Reserve and Riparian Preservation Areas deforested illegally before 2008 that, under the previous Forest Code, would have required restoration at the landowner's expense) was reduced by 58 percent (Soares-Filho et al. 2014, p. 363). The legal reserve debt was forgiven for ''small properties,'' which ranged from 20 ha (49 ac) in southern Brazil to 440 ha (1,087 ac) in the Amazon; this provision has resulted in approximately 90 percent of Brazilian rural properties qualifying for amnesty.

Further reductions in the environmental debt resulted from: (1) Reducing the Legal Reserve restoration requirement from 80 percent to 50 percent in Amazonian municipalities that are predominately occupied by protected areas; (2) including Riparian Preservation Areas in the calculation of the Legal Reserve area (total area they are required to preserve); and (3) relaxing Riparian Preservation Area restoration requirements on small properties. These new provisions effectively reduced the total amount of land farmers are required to preserve and municipalities and landowners are required to restore. Reductions were uneven across states and biomes, with the Amazon and Cerrado biomes being two of the three biomes most affected and vulnerable to deforestation.

Altogether, provisions of the new Forest Code have reduced the total area to be restored from approximately 50 million ha (123.5 million ac) to approximately 21 million ha (51.8 million ac) (Soares-Filho *et al.* 2014, p. 363; Boadle 2012, unpaginated). Furthermore, the old and new Forest Codes allow legal deforestation of an additional 88 million ha (217.4 million ac) on private properties deemed to constitute an ''environmental surplus.'' ''Environmental surplus'' areas are those that are not conserved by the Legal Reserve and Riparian Preservation Area conservation requirements. The Cerrado alone contains approximately 40 million ha (98.8 million ac) of environmental surplus that could be legally deforested (Soares-Filho *et al.* 2014, p. 364).

Although the Forest Code reduces restoration requirements, it introduces new mechanisms to address fire management, forest carbon, and payments for ecosystem services, which could reduce deforestation and result in environmental benefits. The most important mechanism may be the Environmental Reserve Quota (ERQ). The ERQ is a tradable legal title to areas with intact or regenerating native vegetation exceeding the Forest Code requirements. It provides the opportunity for landowners who, as of July 2008 did not meet the area-based conservation requirements of the law, to instead ''compensate'' for their legal reserve shortages by purchasing surplus compliance obligations from properties that would then maintain native vegetation in excess of the minimum legal reserve requirements. This mechanism could provide forested lands with monetary value, creating a trading market. The ERQ could potentially reduce 56 percent of the Legal Reserve debt (Soares-Filho *et al.* 2014, p. 364).

The new Forest Code requires landowners to take part in a Rural Environmental Registry System, a mapping and registration system for rural properties that serves as a means for landowners to report their compliance with the code in order to remain eligible for state credit and other government support. On May 6, 2014, the Ministry for the Environment published a regulation formally implementing the Rural Environmental Registry and requiring all rural properties be enrolled by May 2015. However, on May 5, 2015, the deadline was extended to May 4, 2016. According to information provided by the Ministry for the Environment, at that time 1,407,206 rural properties had been registered since the New Code became effective. This number covers an area of 196,767,410 hectares and represents 52% of all rural areas in Brazil for which registration is mandatory (Filho *et al.* 2015, unpaginated). This system could facilitate the market for ERQs and payments for ecosystem services.

It is unclear whether the Brazilian Government will be able to effectively enforce the new law (Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated; Greenpeace 2012, unpaginated). The original code was largely ignored by landowners and not enforced, leading to Brazil's high rates of deforestation (Boadle 2012, unpaginated). Although Brazil's deforestation rates declined between 2005 and 2010, 2011 marked the beginning of an increase in rates due

to the expectation of the new Forest Code being passed. Another slight increase occurred in 2013, then doubled over 6 months (Schiffman 2015, unpaginated). Corruption in the government, land fraud, and a sense of exemption from penalties for infractions, have contributed to increases in illegal deforestation (Schiffman 2015, unpaginated). Additionally, amnesty afforded by the new Forest Code has led to the perception that illegal deforesters are unlikely to be prosecuted or could be exonerated in future law reforms (Schiffman 2015, unpaginated; Soares-Filho *et al.* 2014, p. 364). Enforcement is often non-existent in Brazil as IBAMA is underfunded and understaffed. Only 1 percent of the fines IBAMA imposed on individuals and corporations for illegal deforestation is actually collected (Schiffman 2015, unpaginated). In Para, one of two states where most of the clearing is occurring, 78 percent of logging between August 2011 and July 2012 was illegal (Schiffman 2015, unpaginated). Furthermore, while much logging is being conducted illegally, there is concern that even if regulations are strictly adhered to, the development is not sustainable (Schiffman 2015, unpaginated).

Additionally, State laws designed to protect the habitat of the hyacinth macaw are in place. 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 law protects nesting trees, other trees around nesting trees are cut, exposing the manduvi tree to winds and storms. Manduvi trees end up falling or breaking, rendering them useless for the hyacinths to nest in (Santos Jr. 2008, p. 135; Santos Jr. *et al.* 2006, p. 186).

Although laws are in place to protect the forests of Brazil, lack of supervision and lack of resources prevent these laws from being properly implemented (Guedes 2012, p. 3). Ongoing deforestation in the Amazon, Cerrado, and Pantanal are evidence that existing laws are not being adequately enforced. Without greater enforcement of laws, deforestation will continue to impact the hyacinth macaw and its food and nesting resources.

Habitat loss for the hyacinth macaw continues despite regulatory mechanisms intended to protect Brazil's forests. As described above, the hyacinth's food and nesting trees are removed for agriculture and cattle ranching and fire is used to clear land and maintain pastures. The original Forest Code was not properly enforced and, thus was not adequately protective. It is questionable whether the new Forest Code will be effectively enforced. Regardless of enforcement, given the provisions of the new Forest Code, some level of deforestation is highly likely to continue and will continue to compromise the status of the species.

Climate Change

Changes in Brazil's climate and associated changes to the landscape may result in additional habitat loss for the hyacinth macaw. Across Brazil, temperatures are projected to increase and precipitation to decrease (Carabine and Lemma 2014, p. 11; Siqueira and Peterson 2003, p. 2). The latest Intergovernmental Panel on Climate Change assessment estimates temperature changes in South America by 2100 to range from 1.7 to 6.7 °C (3.06 to 12.06 °F) under medium and high emission scenarios and 1 to 1.5 °C (1.8 to 2.7 °F) under a low emissions scenario (Magrin *et al.* 2014, p. 1502; Carabine and Lemma 2014, p. 10). Projected changes in rainfall in South America vary by region. Reductions are estimated for northeast Brazil and the Amazon (Magrin *et al.* 2014, p. 1502; Carabine and Lemma 2014, pp. 10, 11). At a national level, 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, where Pará is located, 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). Estimates of temperature changes in Amazonia are 2.2 °C (4 °F) under a low greenhouse gas emission scenario and 4.5 °C (8 °F) under a high-emission scenario by the end of the 21st Century (2090–2099) (Marengo *et al.* 2011, p. 27). Several models simulating varying amounts of global warming indicate Amazonia is at a high risk of forest loss and more frequent wildfires (Magrin *et al.* 2007, p. 596). 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, drought increases the vulnerability of seasonal forests of the Amazon, such as those found in eastern Amazonia, to wildfires during droughts (Laurance *et al.* 2001, p. 782).

Previous work has indicated that, under increasing temperature and decreasing rainfall conditions, the rainforest of the Amazon could be replaced with different vegetation. Some models have predicted a change from forests to savanna-type vegetation over parts of, or perhaps the entire, Amazon in the next several decades (Magrin *et al.* 2014, p. 1523; Marengo *et al.* 2011, pp. 11, 18, 29, 43; Magrin *et al.* 2007, pp. 583, 596). 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, we do not know how the specific food and nesting resources the hyacinth macaw uses will be impacted if there is an increase in the dry season. Furthermore, there are uncertainties in this modeling, and the 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). These uncertainties make it challenging to predict the likely effects of continued climate change on the hyacinth macaw.

Temperatures in the Cerrado, which covers the Gerais region, 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 to 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 91–123 species were predicted to decline by more than 90 percent in the potential distributional area (Siqueira and Peterson 2003, p. 4).

Of the potential impacts of predicted climate-driven changes on bird distribution, extreme temperatures seemed to be the most important factor limiting 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 timeframes (Marini *et al.* 2009, p. 1564). These species will likely have the most dire 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, such as hyacinth macaw, are predicted to become rarer (Marini *et al.* 2009, p. 1564).

Whether species will or will not adapt to new conditions is difficult to predict; 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. Species, like the hyacinth macaw, whose habitat is limited, population is reduced, are large in physical size, and are highly specialized, are more vulnerable to climatic variations and at a greater risk of extinction (Guedes 2009, p. 44).

We do not know how the habitat of the hyacinth macaw may change under these conditions, but we can assume some change will occur. The hyacinth macaw is experiencing 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; the ability of the hyacinth macaw to cope with landscape changes due to climate change is questionable given the specialized needs of the species. Furthermore, one of the factors that affected reproductive rates of hyacinths in the Pantanal was variations in temperature and rainfall (Guedes 2009, p. 42). Hotter, drier years, as predicted under different climate change scenarios, could result in greater impacts to hyacinth reproduction due to impacts on the fruit and foraging for the hyacinth macaw and competition with other bird and mammal species for limited resources (See *Other Factors Affecting Reproductive Rates*).

Hunting

In Pará and the Gerais region, hunting removes individual hyacinth macaws vital to the already small populations (Brouwer 2004, unpaginated; Collar *et al.* 1992, p. 257; Munn *et al.* 1989, p. 414). Hyacinths in Pará are hunted for subsistence 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.* 1992, p. 257). 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.* 1992, p. 257). The Gerais region is poor and animal protein is not as abundant as in other regions; therefore, meat of any kind, including the large hyacinth macaw, is sought as a protein source (Collar *et al.* 1992, p. 257; Munn *et al.* 1989, p. 414).

Because the hyacinth macaw populations in Pará and the Gerais region are estimated at only 1,000–1,500 individuals, combined, the removal of any individuals from these small populations has a negative effect on reproduction and the ability of the species to recover. Any continued hunting for either meat or the sale of feather art is likely to contribute to the decline of the hyacinth macaw in these regions, particularly when habitat conversion is also taking place.

Hunting, capture, and trade of animal species is prohibited without authorization throughout the range of the hyacinth macaw (Clayton 2011, p. 4; Snyder *et al.* 2000, p. 119; Environmental Crimes Law (Law No. 9605/98); Stattersfield and Capper 1992, p. 257; Munn *et al.* 1989, p. 415; Official List of Brazilian Endangered Animal Species (Order No. 1.522/1989); Brazilian Constitution (Title VIII, Chapter VI, 1988); Law No. 5197/1967; UNEP, n.d., unpaginated). However, continued hunting in some parts of its range is evidence that existing laws are not being adequately enforced. Without greater enforcement of laws, hunting will continue to impact the hyacinth macaw.

Low Reproductive Rates

As described above, the specialized nature and reproductive biology of the hyacinth macaw contribute to low recruitment of juveniles and decrease the ability to recover from reductions in population size caused by anthropogenic disturbances (Faria *et al.* 2008, p. 766; Wright *et al.* 2001, p. 711). This species' vulnerability to extinction is further heightened by deforestation that negatively affects the availability of essential food and nesting resources. In addition to direct impacts on food and nesting resources and hyacinth macaws themselves, several other factors affect the reproductive success of the hyacinth. In the Pantanal, competition, predation, disease, destruction or flooding of nests, and climatic conditions and variations are major factors affecting reproductive success of the hyacinth macaw (Guedes 2009, pp. 5, 8, 42; Guedes 2004b, p. 7).

In the Pantanal, competition for nesting sites is intense. The hyacinth nests almost exclusively in manduvi trees; however, there are 17 other bird species, small mammals, and honey bees (*Apis melifera*) that also use manduvi cavities (Guedes and Vicente 2012, pp. 148, 157; Guedes 2009, p. 60; Pizo *et al* 2008, p. 792; Pinho and Nogueira 2003, p. 36). Bees are even known to occupy artificial nests that could be used by hyacinth macaws (Pinho and Nogueira 2003, p. 33; Snyder *et al.* 2000, p. 120). Manduvi is a key species for the hyacinth, and, as discussed above, these cavities are already limited and there is evidence of decreased recruitment of this species of tree (Santos Jr. *et al.* 2006, p. 181). Competition for nesting cavities is exacerbated because manduvi trees must be at least 60 years old, and on average 80 years old, to produce cavities large enough to be used by the hyacinth macaw (Guedes 2009, pp. 59–60; Pizo *et al.* 2008, p. 792; Santos Jr. *et al.* 2006, p. 185). Given that there is currently a limited number of manduvi trees in the Pantanal of adequate size capable of accommodating the hyacinth macaw, evidence of reduced recruitment of these sized manduvi, and numerous species that also use this tree, competition will certainly increase as the number of manduvi decreases, further affecting reproduction by limiting tree cavities available to the hyacinth macaw for nesting (Guedes 2009, p. 60). Furthermore, a shortage of suitable nesting sites could lead to increased competition resulting in an increase in infanticide and egg destruction by other hyacinths and other macaw species (Lee 2010, p. 2). Black vultures (*Coragyps atratus*), collared forest falcons (*Micrastur semitorquatus*), and red-and-green macaws (*Ara chloropterus*) break hyacinth macaw eggs when seeking nesting cavities (Guedes 2009, p. 75).

A 10-year study conducted in the Miranda region of the Pantanal concluded that the majority of hyacinth macaw nests (63 percent) failed, either

partially or totally, during the egg phase. Predation accounted for 52 percent of lost eggs (Guedes 2009, pp. 5, 74). Of 582 eggs monitored over 6 years in the Nhecolândia region of the Pantanal, approximately 24 percent (138 eggs) were lost to predators (Pizo *et al.* 2008, pp. 794, 795). Researchers have identified several predators of hyacinth eggs, including toco toucans (*Ramphastos toco*), purplish jays (*Cyanocorax cyanomelas*), white-eared opossums (*Didelphis albiventris*), and coatis (*Nasua nasua*) (Guedes 2009, pp. 5, 23, 46, 58, 74–75; Pizo *et al.* 2008, p. 795). The toco toucan was the main predator, responsible for 12.4 percent of the total eggs lost and 53.5 percent of the eggs lost annually in the Nhecolândia region (Pizo *et al.* 2008, pp. 794, 795). Most predators leave some sort of evidence behind; however, toco toucans are able to swallow hyacinth macaw eggs whole, leaving no evidence behind. This ability may lead to an underestimate of nest predation by toucans (Pizo *et al.* 2008, p. 793).

The remaining eggs that were considered lost during the 10-year study of the Miranda region did not hatch due to infertility, complications during embryo development, inexperience of young couples that accidentally smash their own eggs while entering and exiting the nest, breaking by other bird and mammal species wanting to occupy the nesting cavity, and broken trees and flooding of nests (Guedes 2009, p. 75).

Guedes (2009, pp. 66, 79) also found in the 10-year study of the Miranda region that, of the nests that successfully produced chicks, 49 percent experienced a total or partial loss of chicks. Of these, 62 percent were lost due to starvation, low temperature, disease or infestation by ectoparasites, flooding of nests, and breaking of branches. Thirty-eight percent were lost due to predation of chicks by carnivorous ants (*Solenopis* spp.), other insects, collared forest falcon, and spectacled owl (*Pulsatrix perspicillata*). The toco toucan and great horned owl (*Bubo virginianus*) are also suspected of chick predation, but this has not yet been confirmed (Guedes 2009, pp. 6, 79–81; Pizo *et al.* 2008, p. 795).

Variations in temperature and rainfall were also found to be factors affecting reproduction of the hyacinth in the Pantanal (Guedes 2009, p. 42). Years with higher temperatures and lower rainfall can affect the production of fruits and foraging and, therefore, lead to a decrease in reproduction of hyacinths the following year (Guedes 2009, pp. 42–43, 44). This outcome is especially problematic for a species that relies on only two species of palm nuts as a source of food. Competition with other bird and mammal species may also increase during these years. Acuri are available year round, even during times of fruit scarcity, making it a resource many other species also depend on during unfavorable periods (Guedes 2009, p. 44). Additionally, the El Niño event during the 1997–98 breeding season caused hotter, wetter conditions favoring breeding, but survival of the chicks was reduced. In 1999, a longer breeding period was observed following drier, colder conditions caused by the La Niña that same year; however, 54 percent of the eggs were lost that year (Guedes 2009, p. 43).

Conservation Measures

The main biodiversity protection strategy in Brazil is the creation of Protected Areas (National Protected Areas System) (Federal Act 9.985/00) (Santos Jr. 2008, p. 134). Various regulatory mechanisms (Law No. 11.516, Act No. 7.735, Decree No. 78, Order No. 1, and Act No. 6.938) in Brazil direct Federal and State agencies to promote the protection of lands and 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 Protected Areas were established in 2000 and may be categorized as ''strictly protected'' or ''sustainable use'' based on their overall management objectives. Strictly protected areas include national parks, biological reserves, ecological stations, natural monuments, and wildlife refuges protected for educational and recreational purposes and scientific research. 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) allow for different types and levels of human use with conservation of biodiversity as a secondary objective. As of 2005, Federal and State governments strictly protected 478 areas totaling 37,019,697 ha (14,981,340 ac) in Brazil (Rylands and Brandon 2005, pp. 615–616). Other types of areas 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).

The states where the hyacinth macaw occurs contain 53 protected areas (Parks.it nd, unpaginated); however, the species occurs in only 3 of those areas (BLI 2014b, unpaginated; Collar *et al.* 1992, p. 257). The Amazon contains 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 within the Araguaia National Park in Goiás and the Parnaíba River Headwaters National Park (BLI 2014b; Ridgely 1981, p. 238). In 2000, the Pantanal was designated as a Biosphere Reserve by UNESCO (Santos Jr. 2008, p. 134). 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). Within these, the hyacinth macaw occurs only within the Pantanal National Park (Collar *et al* 1992; Ridgely 1981, p. 238). 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 priority-setting workshops. These workshops identified 900 areas for conservation of biodiversity and all biomes, including the Amazon, Cerrado, and Pantanal (Rylands and Brandon 2005, pp. 615–616).

Many challenges limit 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 facilitated the large-scale habitat conversions for agriculture and cattle-ranching that 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). However, the risk of intense wild

fires may increase in areas, such as protected areas, where cattle are removed and the resulting accumulation of plant biomass serves as fuel (Santos Jr. 2013, pers. comm.; Tomas *et al.* 2011, p. 579).

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 enact and enforce regulations that protect the habitat of this species. Additionally, after the creation of protected areas, a delay in implementation or a lack of local management commitment often occurs, staff limitations make it difficult to monitor actions, and a lack of acceptance by society or a lack of funding make administration and management of the area difficult (Santos Jr. 2008, p. 135; Harris *et al.* 2006, p. 175). Furthermore, ambiguity in land titles allows illegal occupation and clearing of forests in protected areas, such as federal forest reserves (Schiffman 2015, unpaginated). The designation of the Pantanal as a Biosphere Reserve is almost entirely without merit because of a lack of commitment by public officials (Santos Jr. 2008, p. 134).

Of 53 designated protected areas within the states in which the hyacinth macaw occurs, it is found in only 3 National Parks; none of which are effectively protected (Rogers 2006, unpaginated; Ridgely 1981, p. 238). The hyacinth macaw continues to be hunted in Pará and the Gerais region, and habitat loss due to agricultural expansion and cattle ranching is occurring in all three regions. Therefore, it appears that Brazil's protected areas system does not adequately protect the hyacinth macaw or its habitat.

In addition to national and state laws, the Brazilian Government and nongovernmental organizations have developed plans for protecting the forests of Brazil. In 2009, Brazil announced 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 fund $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. Between 2005 and 2010, Brazil reduced deforestation rates by more than three-quarters. Most of the decrease took place within the Amazon Basin. However, deforestation increased slightly in 2013, then doubled in 6 months in 2014–2015 (Schiffman 2015, unpaginated).

Brazil's Ministry of Environment and The Nature Conservancy have worked together to implement the Farmland Environmental Registry to curb illegal deforestation in the Amazon. This program was launched in the states of Mato Grosso and Pará; it later became the model for the Rural Environmental Registry that monitors all of Brazil for compliance with the Forest Code. 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 (Dias and Ramos 2012, unpaginated; Vale 2010, unpaginated). In response to this success, Pará launched its Green Municipalities Program in 2011. The purpose of this project is to reduce deforestation in Pará by 80 percent by 2020 and strengthen sustainable rural production. To accomplish this goal, the program seeks to create partnerships between local communities, municipalities, private initiatives, IBAMA, and the Federal Public Prosecution Service and focus on local pacts, deforestation monitoring, implementation of the Rural Environmental Registry, and structuring municipal management (Veríssimo *et al.* 2013, pp. 3, 6, 12–13). 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).

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 to safeguard the existence and viability of the Cerrado. 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, a type of protected area, that currently represent only 1.5 percent of the biome (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 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 awareness of the need for protection and efforts 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 2020, reducing deforestation by 40 percent, decreasing forest fires, expanding sustainable practices, and monitoring remaining natural vegetation. It also planned to expand the areas under protection in the Cerrado to 2.1 million ha (5 million ac) (Ribeiro *et al.* 2012, p. 11; 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 2004b, 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 its protection in the Pantanal (Santos Jr. 2008, p. 135; Harris *et al.* 2005, p. 719; Brouwer 2004, unpaginated; Guedes 2004a, 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 2009, p. xiii; Guedes 2004a, 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. Hyacinths have adapted to using the artificial nests, leading to more reproducing couples and successful fledging of chicks. Species that would otherwise compete with hyacinth macaws for nesting sites have also benefitted from the artificial nests as a result of reduced competition for natural nesting sites. Hyacinths reuse the same nest for many years; eventually the nests start to decay or become unviable. The Hyacinth Macaw Project also repairs these nests (natural and artificial) so they are not lost. In areas where suitable cavities are scarce, the loss of even one nest could have substantial impacts on the population. Additionally, wood boards are used to make cavity openings too small for predators, while still allowing hyacinths to enter (Brouwer 2004, unpaginated; Guedes 2004a, p. 281; Guedes 2004b, p. 8).

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 process began to increase the number of chicks that survived and fledged each year (Brouwer 2004, unpaginated; Guedes 2004a, p. 281; Guedes 2004b, p. 9).

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 2004a, p. 282; Guedes 2004b, p. 10). This shift in attitude has also diminished the threat of illegal trade in the Hyacinth Macaw Project area (Brouwer 2004, unpaginated).

The Hyacinth Macaw Project has contributed to the increase of the hyacinth population in the Pantanal since the 1990s (Harris *et al.* 2005, p. 719). Nest and chick management implemented by the Hyacinth Macaw Project has led to an increase in the Pantanal population; for every 100 couples that reproduce, 4 juveniles survive and are added to the population. Additionally, hyacinth macaws have expanded to areas where it previously disappeared, as well as new areas (Guedes 2012, p. 1; Guedes 2009, pp. 4–5, 8, 35–36, 39, 82).

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 has contributed to the increase in the hyacinth population, and farmers have begun to protect hyacinth macaws on their property, land conversion for cattle ranching continues to occur in the Pantanal. The recruitment of the manduvi tree has been severely reduced, and is expected to become increasingly rare in the future, due to ongoing damage caused by cattle grazing and trampling of manduvi saplings, as well as the burning of pastures for maintenance. If this activity 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. Furthermore, survival of hyacinth eggs and chicks are being impacted by predation, competition, climate variations, and other natural factors. Even with the assistance of the Hyacinth Macaw Project, only 35 percent of eggs survive to the juvenile stage.

Pet Trade

The hyacinth macaw is protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 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. Under this treaty, CITES Parties (member countries or signatories) regulate the import, export, and re-export 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 Management Authority of each CITES Party. Brazil, Bolivia, and Paraguay are Parties to CITES.

The hyacinth macaw is currently listed in 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 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, and if the issuing authority is satisfied that an import permit has been granted for the specimen (CITES Article III(2)).

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 of exotic birds to the United States 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. Import of dead specimens is allowed for scientific purposes and museum specimens. Permits may be issued to allow import of listed birds for various purposes, such as scientific research, zoological breeding or display, or personal pets, when certain criteria are met. 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 plan 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.

In the 1970s and 1980s, 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.* 1992, p. 256; Munn *et al.* 1989, pp. 412–413). Trade in parrots in the 1980s was particularly high 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 late 1980s and early 1990s, reports of

hyacinth trapping included one trapper who 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.* 1992, p. 256). More than 10,000 hyacinths are estimated to have been taken from the wild in the 1980s (Smith 1991c, in Collar *et al.* 1992, p. 256; Munn *et al.* 1987, in Guedes 2009, p. 12). In the years following the enactment of the WBCA, 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).

Based on CITES trade data obtained from United Nations Environment Programme—World Conservation Monitoring Center (UNEP–WCMC) CITES Trade Database, from the time the hyacinth macaw was uplisted to CITES Appendix I in October 1987 through 2011, and taking into account that several records appear to be overcounts due to slight differences in the manner in which the importing and exporting countries reported their trade, international trade involved 2,030 specimens, including 1,804 live birds. Of the 2,030 specimens, 106 (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 2011, only 24 of the 1,804 live hyacinth macaws reported in trade were reported as wild-sourced, 1,671 were reported as captive bred or captive born, 35 were reported as pre-Convention, and 74 were reported with the source as unknown.

Since our 2012 proposed rule published, CITES trade data from the UNEP–WCMC CITES Trade Database for the years 2012 through 2014 has become available. From 2012 through 2014 (the most recent year for which data is available from the WCMC–UNEP database), a total of 250 hyacinth macaw specimens, including 193 live birds, is reported in international trade in the WCMC–UNEP database. Except for five scientific samples imported by Switzerland in 2012, none of the other specimens were reported as being wild caught; all were either recorded as captive bred or captive born. Twenty live wild-caught hyacinth macaws are recorded as having been imported by Turkey from Cameroon in 2012; at the time of writing, we are still waiting for information from Turkey as to whether this data is accurate, and if so, whether this was lawful or unlawful trade.

We found little additional 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). During a study conducted from 2007 to 2008, no hyacinths were recorded in 20 surveyed Peruvian wildlife markets (Gastañaga *et al.* 2010, pp. 2, 9–10). We found no other data on the presence of hyacinths in illegal trade.

Although illegal trapping for the pet trade occurred at high levels during the 1980s, trade has decreased significantly from those levels. 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). We found no information indicating trade is currently impacting the hyacinth macaw. It is possible, given the high price of hyacinth macaws, that illegal domestic trade is occurring; however, we have 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 three regions.

Finding

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in part 424 of title 50 of the Code of Federal 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. 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 in danger of extinction throughout all or a significant portion of its range (endangered) or likely to become endangered within the foreseeable future throughout all or a significant portion of its range (threatened). We examined the best scientific and commercial information available regarding factors affecting the status of the hyacinth macaw. We reviewed the petition, information available in our files, and other available published and unpublished information.

In considering what factors may constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to the factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine if it may drive or contribute to the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as those terms are defined by the Act.

Hyacinth macaws have a naturally low reproductive rate. Not all hyacinth chicks fledge young and, due to the long period of chick dependence, hyacinths breed only every 2 years. In the Pantanal population, the largest population of hyacinth macaws, only 15–30 percent of adults attempt to breed each year; it may be that as small or an even smaller percentage in Pará and Gerais attempt to breed. Additionally, feeding and habitat specializations are good predictors of a bird species' risk of extinction; because the hyacinth macaw has specialized food and nest site needs, it is at higher risk of extinction from the anthropogenic stressors described above.

Across its range, the hyacinth macaw is losing habitat, including those essential food and nesting resources, to expanding agriculture and cattle ranching. Pará has long been the epicenter of illegal deforestation primarily caused by cattle-ranching. Large-scale forest conversion for colonization and cattle ranching has accelerated due to state subsidies, infrastructure development, favorable climate in Pará, lower prices for land, and expansion of soy cultivation in other areas that has led to displacement of pastures into parts of Pará. Although deforestation rates decreased between 2009 and 2012, Amazon deforestation increased between 2012 and 2013 with the greatest increase occurring in Pará.

In the Gerais region, more than 50 percent of the original Cerrado vegetation has been lost due to conversion to agriculture and pasture. Although annual deforestation rates have decreased, there is a slow and steady increase in the amount of deforested area. Remaining Cerrado vegetation continues to be lost to conversion for soy plantations and extensive cattle ranching. Projections for coming decades show the largest

increase in agricultural production occurring in the Cerrado.

The greatest cause of habitat loss in the Pantanal is the expansion of cattle ranching. Only 6 percent of the Pantanal landscape is cordilleras, higher areas where the manduvi occur. These upland forests, including potential nesting trees, are often removed and converted to pastures for grazing during the flooding season; however, palm species used by hyacinths for food are usually left, as cattle also feed on the palm nuts. While deforestation rates between 2002 and 2014 indicate a decrease in the annual deforestation rate, there continues to be a slow and steady increase in the area deforested. Fire is also a common method for renewing pastures, controlling weeds, and controlling pests in the Pantanal. Fires become uncontrolled and are known to impact patches of manduvi. Fires can help in the formation of cavities, but too frequent fires can prevent trees from surviving to a size capable of providing suitable cavities and can cause a high rate of tree loss. Five percent of manduvi trees are lost each year due to deforestation, fires, and storms.

In addition to the direct removal of trees and the impact of fire on forest establishment, cattle impact forest recruitment. 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. This type of repeated disturbance can lead to an ecosystem dominated by invasive trees, grasses, bamboo, and ferns. Manduvi, which contain the majority of hyacinth nests, are already limited in the Pantanal; only 5 percent of the existing adult manduvi trees in south-central Pantanal and 10.7 percent in the southern Pantanal contain suitable cavities for hyacinth macaws. Evidence of severely reduced recruitment of manduvi trees suggests that this species of tree, of adequate size to accommodate the hyacinth macaw, is not only scarce now, but likely to become increasingly scarce in the future.

Deforestation also reduces the availability of food resources. The species' specialized diet makes it vulnerable to changes in food availability. Another *Anodorhynchus* species, the Lear's macaw, is critically endangered due, in part, to the loss of its' specialized food source (licuri palm stands). Inadequate nutrition can contribute to poor health and is known to have reduced reproduction in hyacinth macaws. In Pará and the Gerais region, where food sources are being removed, persistence of the species is a concern.

Deforestation 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 jeopardize the persistence of the hyacinth macaw by constraining breeding density, resulting in lower recruitment and a gradual reduction in population size. This situation 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 compromised. While the Hyacinth Macaw Project provides artificial nest alternatives, such nests are only found within the project area.

Loss of essential tree species also negatively impacts the hyacinth macaw by increasing competition for what is already a shortage of suitable nest sites. In the Pantanal, the hyacinth nests almost exclusively in manduvi trees. The number of manduvi old and large enough to provide suitable cavities is already limited. Additionally, there are 17 other bird species, small mammals, and honey bees that also use manduvi cavities. Competition has been so fierce that hyacinths were unable to reproduce as it resulted in an increase in egg destruction and infanticide. As the number of suitable trees is further limited, competition for adequate cavities to accommodate the hyacinth macaw will certainly increase, reducing the potential for hyacinth macaws to reproduce.

In the Gerais region, hyacinth macaws mostly nest in rock crevices, most likely a response to the destruction of nesting trees. Although it is possible that hyacinths could use alternative nesting sites in Pará and the Pantanal, deforestation in these regions would impact alternative nesting trees, as well as food sources, resulting in the same negative effect on the hyacinth macaw. Furthermore, competition for limited nesting and food resources would continue.

Climate change models have predicted increasing temperatures and decreasing rainfall throughout most of Brazil. There are uncertainties in this modeling, and the projections are not definitive outcomes. How a species may adapt to changing conditions is difficult to predict. We do not know how the habitat of the hyacinth macaw may vary under these conditions, but we can assume some change will occur. The hyacinth macaw is experiencing habitat loss due to widespread expansion of agriculture and cattle ranching. Effects of climate change have the potential to further decrease the specialized habitat needed by the hyacinth macaw; the ability of the hyacinth macaw to cope with landscape changes due to climate change is questionable given the specialized needs of the species. Furthermore, hotter, drier years, as predicted under different climate change scenarios, could result in greater impacts to hyacinth reproduction due to impacts on the fruit and foraging for the hyacinth macaw and competition with other bird and mammal species for limited resources.

In addition to direct impacts on food and nesting resources and hyacinth macaws themselves, several other factors affect the reproductive success of the hyacinth. Information indicates that hyacinths in Pará and Gerais are hunted as a source of protein and for feathers to be used in local handicrafts. 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 those populations to increase. Additionally, in the Pantanal, predation, variations in temperature and rainfall, and ectoparasites all contribute to loss of eggs and chicks, directly affecting the reproductive rate of hyacinth macaws.

Brazil has various laws to protect its natural resources. Despite these laws and plans to significantly reduce deforestation, expanding agriculture and cattle ranching has contributed to increases in deforestation rates in some years and deforested areas continue to increase each year. Additionally, hunting continues in some parts of the hyacinth macaw's range despite laws prohibiting this activity. Without effective implementation and enforcement of environmental laws, deforestation and hunting will continue.

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.'' After analyzing the species' status in light of the five factors discussed above, we find the hyacinth macaw is a ''threatened species'' as a result of the following: Continued deforestation and reduced recruitment of forests (Factor A), hunting (Factor B), predation and disease (Factor C), competition (Factor

E), and effects of climate change (Factor E). Furthermore, despite laws to protect the hyacinth macaw and the forests it depends on, deforestation and hunting continue (Factor D).

In total, there are approximately 6,500 hyacinth macaws left in the wild, dispersed among 3 populations. Two of the populations, Pará and Gerais, contain just 1,000–1,500 individuals, combined. The current overall population trend for the hyacinth macaw is reported as decreasing, although there are no reports of extreme fluctuations in the number of individuals. The hyacinth population has grown in the Pantanal; however, the growth is not sufficient to counter the continued and predicted future anthropogenic disturbances on the hyacinth macaw. Because the hyacinth macaw has specialized food and nest site needs, it is at higher risk of extinction from anthropogenic stressors described above. Additionally, the hyacinth macaw has relatively low recruitment of juveniles, which decreases the ability of a population to recover from reductions caused by anthropogenic disturbances. Hyacinths may not have a high enough reproduction rate and may not survive in areas where nest sites and food sources are destroyed.

In our 2012 proposed rule, we found that the hyacinth macaw was in danger of extinction (an endangered species) based on estimates indicating the original vegetation of the Amazon, Cerrado, and Pantanal, including the hyacinth's habitat, would be lost between the years 2030 and 2050 due to deforestation, combined with its naturally low reproductive rate, highly specialized nature, hunting, competition, and effects of climate change. Deforestation rates in Pará decreased between 2013 and 2014 by 20 percent, and rates remained stable in 2015. More recent estimates of deforestation indicate annual deforestation rates in the Cerrado and Pantanal have decreased by approximately 40 and 37 percent, respectively. If these rates are maintained or are further reduced, the loss of all native habitat from these areas, including the species of trees needed by the hyacinth for food and nesting, and the hyacinth's risk of extinction is not as imminent as predicted. Therefore, we do not find that the hyacinth macaw is currently in danger of extinction. However, the hyacinth macaw remains a species particularly vulnerable to extinction due to the interaction between continued habitat loss and its highly specialized needs for food and nest trees. Given land-use trends, lack of enforcement of laws, and predicted landscape changes under climate change scenarios, the persistence of essential food and nesting resources and, therefore the hyacinth macaw, is of concern.

Threats to the hyacinth macaw and remaining habitat, and declines in the population are expected to continue throughout its range in the foreseeable future. What habitat remains is at risk of being lost due to ongoing deforestation. Pará is one of the states where most of Brazil's agriculture expansion is taking place. Modeled future deforestation is concentrated in this area. The Cerrado is the most desirable biome for agribusiness expansion and contains approximately 40 million ha (98.8 million ac) of ''environmental surplus'' that could be legally deforested, therefore, this region will likely continue to suffer deforestation. Ninety-five percent of the Pantanal is privately owned, 80 percent of which is used for cattle ranches. Clearing land to establish pasture is perceived as the economically optimal land use while land not producing beef is often perceived as unproductive. Furthermore, potential nesting sites are rare and will become increasingly rare in the future. Continued loss of remaining habitat may lead to long-term effects on the viability of the hyacinth macaw, as hyacinth macaws may not have a high enough reproductive rate to survive where nest sites are destroyed. Additionally, any factors that contribute to the loss of eggs and chicks ultimately reduce reproduction and recruitment of juveniles into the population and the ability of those populations to recover. Therefore, long-term survival of this species is a concern. On the basis of the best scientific and commercial information, we find that the hyacinth macaw meets the definition of a ''threatened species'' under the Act, and we are listing the hyacinth macaw as threatened throughout its range.

Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. The term ''species'' includes ''any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature.'' We published a final policy interpreting the phrase ''Significant Portion of its Range'' (SPR) (79 FR 37578, July 1, 2014). The final policy states that (1) if a species is found to be endangered or threatened throughout a significant portion of its range, the entire species is listed as endangered or threatened, respectively, and the Act's protections apply to all individuals of the species wherever found; (2) a portion of the range of a species is ''significant'' if the species is not currently endangered or threatened throughout all of its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range; (3) the range of a species is considered to be the general geographical area within which that species can be found at the time the Service or the National Marine Fisheries Service makes any particular status determination; and (4) if a vertebrate species is endangered or threatened throughout an SPR, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

We found the hyacinth macaw likely to become endangered within the foreseeable future throughout its range. Therefore, no portions of the species' range are ''significant'' as defined in our SPR policy, and no additional SPR analysis is required.

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. 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.

Proposed 4(d) Rule

The purposes of the Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in the Act (16 U.S.C. 1531(b)). When a species is listed as endangered, certain actions are prohibited under section 9 of the Act and our regulations at 50 CFR 17.21. These include, among others, prohibitions on take within the United States, within the territorial seas of the United States, or upon the high seas; import; export; and shipment in interstate or foreign commerce in the course of a commercial activity. Exceptions to the prohibitions for endangered species may be granted in accordance with section 10 of the Act and our regulations at 50 CFR 17.22.

The Act does not specify particular prohibitions and exceptions to those prohibitions for threatened species. Instead, under section 4(d) of the Act, the Secretary, as well as the Secretary of Commerce depending on the species, was given the discretion to issue such regulations as deemed necessary and advisable to provide for the conservation of such species. The Secretary also has the discretion to prohibit by regulation with respect to any threatened species any act prohibited under section 9(a)(1) of the Act. Exercising this discretion, the Service has developed general prohibitions in the Act's regulations (50 CFR 17.31) and exceptions to those prohibitions (50 CFR 17.32) that apply to most threatened species. Under 50 CFR 17.32, permits may be issued to allow persons to engage in otherwise prohibited acts for certain purposes.

Under section 4(d) of the Act, the Secretary, who has delegated this authority to the Service, may also develop specific prohibitions and exceptions tailored to the particular conservation needs of a threatened species. In such cases, the Service issues a 4(d) rule that may include some or all of the prohibitions and authorizations set out in 50 CFR 17.31 and 17.32, but which also may be more or less restrictive than the general provisions at 50 CFR 17.31 and 17.32. For the hyacinth macaw, the Service is using our discretion to propose a 4(d) rule.

If the proposed 4(d) rule is adopted, we will incorporate all prohibitions and provisions of 50 CFR 17.31 and 17.32, except that import and export of certain hyacinth macaws into and from the United States and certain acts in interstate commerce will be allowed without a permit under the Act, as explained below.

Import and Export

The proposed 4(d) rule will apply to all commercial and noncommercial international shipments of live and dead hyacinth macaws and parts and products, including the import and export of personal pets and research samples. In most instances, the proposed 4(d) rule will adopt the existing conservation regulatory requirements of CITES and the WBCA as the appropriate regulatory provisions for the import and export of certain hyacinth macaws. The import and export of birds into and from the United States, taken from the wild after the date this species is listed under the Act; conducting an activity that could take or incidentally take hyacinth macaws; and foreign commerce will need to meet the requirements of 50 CFR 17.31 and 17.32, including obtaining a permit under the Act. However, the 4(d) rule proposes to allow a person to import or export either: (1) A specimen held in captivity prior to the date this species is listed under the Act; or (2) a captive-bred specimen, without a permit issued under the Act, provided the export is authorized under CITES and the import is authorized under CITES and the WBCA. If a specimen was taken from the wild and held in captivity prior to the date this species is listed under the Act, the importer or exporter will need to provide documentation to support that status, such as a copy of the original CITES permit indicating when the bird was removed from the wild or museum specimen reports. For captive-bred birds, the importer would need to provide either a valid CITES export/re-export document issued by a foreign Management Authority that indicates that the specimen was captive bred by using a source code on the face of the permit of either ''C,'' ''D,'' or ''F.'' For exporters of captive-bred birds, a signed and dated statement from the breeder of the bird, along with documentation on the source of their breeding stock, would document the captive-bred status of U.S. birds.

The proposed 4(d) rule will apply to birds captive-bred in the United States and abroad. The terms ''captive-bred'' and ''captivity'' used in the proposed 4(d) rule are defined in the regulations at 50 CFR 17.3 and refer to wildlife produced in a controlled environment that is intensively manipulated by man from parents that mated or otherwise transferred gametes in captivity. Although the proposed 4(d) rule requires a permit under the Act to ''take'' (including harm and harass) a hyacinth macaw, ''take'' does not include generally accepted animal husbandry practices, breeding procedures, or provisions of veterinary care for confining, tranquilizing, or anesthetizing, when such practices, procedures, or provisions are not likely to result in injury to the wildlife when applied to captive wildlife.

We assessed the conservation needs of the hyacinth macaw in light of the broad protections provided to the species under CITES and the WBCA. The hyacinth macaw is listed in Appendix I under CITES, a treaty which contributes to the conservation of the species by monitoring international trade and ensuring that trade in Appendix I species is not detrimental to the survival of the species (see *Conservation Status).* The purpose of the WBCA is to promote the conservation of exotic birds and to ensure that imports of exotic birds into the United States do not harm them (See Factor D). The best available commercial data indicate that legal and illegal trade of hyacinth macaws is not currently occurring at levels that are affecting the populations of the hyacinth macaw in its three regions. Accordingly we find that the import and export requirements of the proposed 4(d) rule provide the necessary and advisable conservation measures that are needed for this species. This proposed 4(d) rule, if finalized, would streamline the permitting process for these types of activities by deferring to existing laws that are protective of hyacinths in the course of import and export.

Interstate Commerce

Under the proposed 4(d) rule, a person may deliver, receive, carry, transport, or ship a hyacinth macaw in interstate commerce in the course of a commercial activity, or sell or offer to sell in interstate commerce a hyacinth macaw without a permit under the Act. At the same time, the prohibitions on take under 50 CFR 17.21 would apply under this proposed 4(d) rule, and any interstate commerce activities that could

incidentally take hyacinth macaws or otherwise prohibited acts in foreign commerce would require a permit under 50 CFR 17.32.

Persons in the United States have imported and exported captive-bred hyacinth macaws for commercial purposes and one body for scientific purposes, but trade has been very limited (UNEP–WCMC 2011, unpaginated). We have no information to suggest that interstate commerce activities are associated with threats to the hyacinth macaw or would negatively affect any efforts aimed at the recovery of wild populations of the species. Therefore, because acts in interstate commerce within the United States have not been found to threaten the hyacinth macaw, the species is otherwise protected in the course of interstate commercial activities under the take provisions and foreign commerce provisions contained in 50 CFR 17.31, and international trade of this species is regulated under CITES, we find this proposed 4(d) rule contains all the prohibitions and authorizations necessary and advisable for the conservation of the hyacinth macaw.

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:

(1) Be logically organized;

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

(3) Use clear language rather than jargon;

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

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us page numbers and 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.

Paperwork Reduction Act (44 U.S.C. 3501, et seq.)

This proposed rule does not contain any new collections of information that require approval by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. This rulemaking will not impose new recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. We may not conduct or sponsor, and you are not required to respond to, a collection of information unless it displays a currently valid OMB control number.

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, Ecological Services, 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, Ecological Services 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 further amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as proposed to be amended on July 6, 2012, at 77 FR 39965 and on April 7, 2016, at 81 FR 20302, 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; 1531–1544; 4201–4245; unless otherwise noted.

■ 2. Amend § 17.11(h) by adding an entry for ''Macaw, hyacinth'' in alphabetical order under Birds to the List of Endangered and Threatened Wildlife, to read 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	T	NA	NA	17.41(c)
*	*	*	*	*	*		*

* * * * *

■ 3. Amend § 17.41 by revising paragraph (c) introductory text, paragraphs (c)(1), (c)(2) introductory text, (c)(2)(ii) introductory text and (c)(2)(ii)(E) to read as follows:

§ 17.41 Special rules—birds.

* * * * *

(c) The following species in the parrot family: Salmon-crested cockatoo *(Cacatua moluccensis),* yellow-billed parrot *(Amazona collaria),* white cockatoo (*Cacatua alba*), scarlet macaw (*Ara macao macao* and scarlet macaw subspecies crosses (*Ara macao macao* and *Ara macao cyanoptera*)), and

hyacinth macaw (*Anodorhynchus hyacinthinus*).

(1) Except as noted in paragraphs (c)(2) and (c)(3) of this section, all prohibitions and provisions of §§ 17.31 and 17.32 of this part apply to these species.

(2) *Import and export.* You may import or export a specimen from the southern DPS of *Ara macao macao* and scarlet macaw subspecies crosses without a permit issued under § 17.52 of this part, and you may import or export all other specimens without a permit issued under § 17.32 of this part only when the provisions of parts 13, 14, 15, and 23 of this chapter have been met and you meet the following requirements:

* * * * *

(ii) *Specimens held in captivity prior to certain dates:* You must provide documentation to demonstrate that the specimen was held in captivity prior to the dates specified in paragraphs (c)(2)(ii)(A), (B), (C), (D), or (E) of this section. Such documentation may include copies of receipts, accession or veterinary records, CITES documents, or wildlife declaration forms, which must be dated prior to the specified dates.

* * * * *

(E) *For hyacinth macaws:* [EFFECTIVE DATE OF THE FINAL RULE] (the date this species was listed under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*)).

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Dated: November 19, 2016.

Stephen Guertin,

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

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