

**Reply to: Endangered and Threatened Wildlife and Plants;
Listing the Scarlet Macaw; Proposed rule 50 CFR Part 17
[Docket No. FWS-R9-ES-2012-0039; 4500030115]**

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Deforestation

The problems of deforestation in the range of the Scarlet Macaw are frequently discussed in the proposed rule. Unfortunately USFWS has seemed to overlook the information available in global deforestation databases like the following:

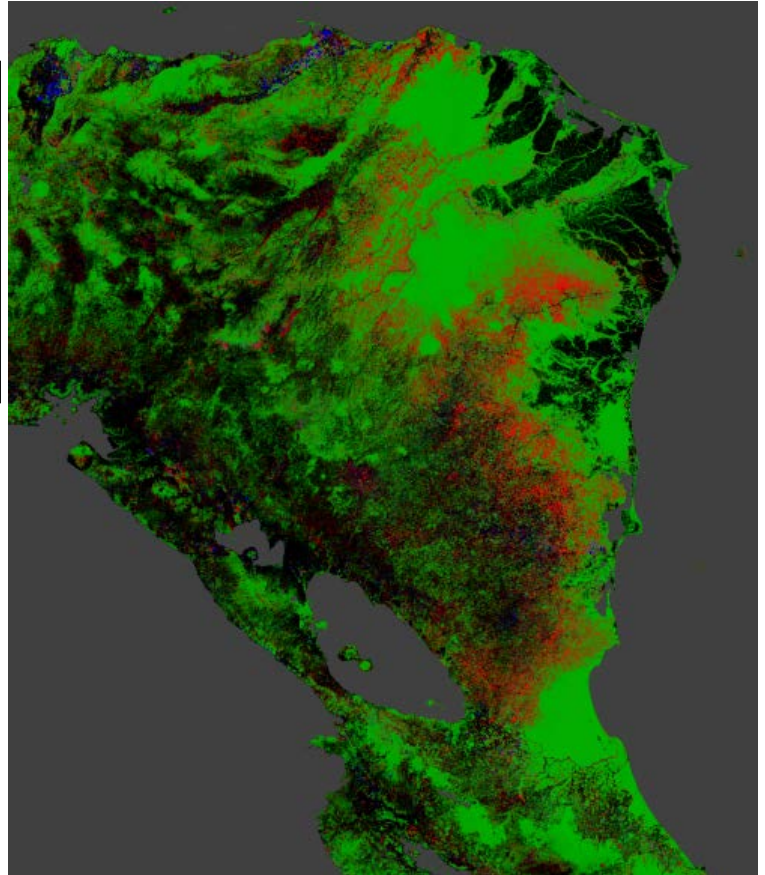
<https://earthenginepartners.appspot.com/science-2013-global-forest> . As a result they are relegated to using published documents and other authors' interpretations of deforestation instead of looking at the original data and how it may be impacting the species.

The above resource shows a variety of information relevant to the current issues:

- Isla Coiba as not having a current deforestation problem.
- The lowland areas of north-eastern and north-central Costa Rica is a patchwork of forest and clearing that is both losing and gaining forest cover. It is not an area with rampant deforestation.
- Eastern Nicaragua is suffering massive and rapid deforestation.
- The core areas of *A. m. cyanoptera* in Belize are not suffering from high rates of deforestation. Adjacent pine forests are being cleared, but the broadleaf forests are mostly remaining intact.
- The range of *A. m. macao* in Northern Colombia is having serious deforestation problems as discussed.
- The southern Pacific coast of Costa Rica between Carara and the Osa Peninsula retain a large percentage of the area with forest cover.

- There are breaks in forest cover between the ACOPAC population (Carara) and the small population in Palo Verde National Park.

Figure 1: Map of existing Forest Cover (green), Deforestation 2000 – 2013 (red), and Forest gain (blue) in Honduras, Nicaragua and Northern Costa Rica from <https://earthenginepartners.appspot.com/science-2013-global-forest>.



E-Bird

In the past decade, more than 90 peer-reviewed publications either used eBird data or studied aspects of the eBird project (Sullivan et al. 2014). It is clear that great strides are being made through the use of eBird data. Scarlet Macaws are relatively easy

to identify so are a good candidate for use for such a database. Individual sightings may be debated as people may make mistakes (any large macaw can look dark from a distance so they may be confused), individual birds may be escapees, etc. However, when there are many sightings from areas on different dates by different observers (or dozens of lists that do not record the species) scientists and regulators including the USFWS are ill advised to ignore these larger trends and make clear and definitive statements that contradict the trends in these data. As a result, USFWS should include data from the eBird system in their next revision of this proposed rule. The following account draws heavily on eBird data and uses it to guide the discussion.



Figure 2. Scarlet Macaw sightings in Costa Rica. Red place holders represent sightings in the last 30 days. Blue place holders represent sightings older than 30 days. Map was created on 29 May 2016 from <http://ebird.org/ebird/map/scamac1?neg=true&env.minX=-83.87532576656031&env.minY=5.303337621472818&env.maxX=-78.40413436031031&env.maxY=9.166227975223362&zh=true&gp=false&ev=Z&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2016> . Notice the following: 1) the nearly continuous distribution of sightings along the Pacific side of the country, 2) the distribution of the sightings in the north east and north central parts of the country, and 3) the unexpected sightings in western Panama.

Scarlet Macaw movement parameters

Research by my team and I on Scarlet Macaws in Peru show that Scarlet Macaws are estimated to fly at about 40 km per hour when they are in high cruising flight (Brightsmith unpublished data from GPS collared male in Tambopata). In addition, individual scarlet macaws are known to make seasonal movements in this region of 50 to 150 km and then return to their nesting areas (Brightsmith unpublished data). This information is relevant when discussing the movements and degree of isolation among sub populations of Scarlet Macaws as discussed below.

Status of *A. m. cyanoptera*

Population status of A. m. cyanoptera in Southeast Nicaragua Border and Northeast Costa Rica

The proposed rule states: P. 20309: Reevaluation of Status of *A. m. cyanoptera*: “. . . *anecdotal observations suggest the population in the eastern border region of Costa Rica and Nicaragua has increased in recent years*

It then goes on to state that

Although scarlet macaws are tolerant of some level of habitat fragmentation or modification, provided sufficient large trees remain for nesting and feeding requirements, several studies indicate the species occurs in disturbed or secondary forest at lower densities (Cowen 2009, pp. 11-15; Karubian et al. 2005, pp. 622-623; Lloyd 2004, pp. 269, 272). Thus, it is reasonable to conclude that the extent of increase in the population in this region (eastern Costa Rica) will likely be limited due to past and ongoing deforestation in the region.

Given the information in the cited references, the amount and quality of habitat in the region, the deforestation rates, evidence from field researchers working in the area, and the current expansion of the population, it is in no way reasonable to conclude that this expansion will be “limited.”

1. **Current population expansion:** The USFWS despite trying to discredit the sources by calling them “anecdotal” does admit that there is a population in the region that was

not there before and that the population is increasing. This is supported as well by a quick look at the data in eBird which show large concentrations of sightings in the Boca Tapada region, the La Selva/Puerto Viejo region and scattered sightings from Puerto Viejo to La Fortuna. In addition there are many sightings in the region since 2012 suggesting that the species has continued to expand in the region post 2012. So it is reasonable to conclude that the population in the region is larger than it was in 2012.

2. **Evidence from literature of lower density in modified habitats.** Unfortunately all three of the research projects cited to support this study clearly confound the different impacts of human presence: A) hunting and collection for the pet trade and B) habitat modification. This is most clearly addressed by Karubian: *Clearly, as with many large vertebrates, macaws are adversely affected by anthropogenic activities such as establishment and expansion of roads, communities, towns, and cities, collection for the pet trade or hunting, and habitat clearing, alteration, or degradation (Novarro et al. 2000, Bodmer and Lozano 2001). Throughout this paper, we use the term “human activity” to describe these actions, and use human population size in an area as a rough proxy for human activity.* So in the face of an expanding population in a country where poaching and hunting rates are clearly lower than reproductive rates it is difficult to predict how the species will expand in a disturbed habitat without intense hunting or poaching pressure.
3. **Evidence from field research.** Data collected in 2008 show that the species is doing well in the region, it is feeding on nonnative trees in forest plantations and is well adapted to the fragmented and heterogeneous landscape in the area (see abstract from Penard et al below). In fact Penard et al report that within the sampled transects the species preferred the more highly modified areas (while Great-green Macaws preferred the areas with less disturbance and more continuous canopy). As a result, it seems unreasonable to equate disturbed habitat with unusable habitat in Costa Rica.
4. **Evidence from other areas in Costa Rica:** It is clear that the Scarlet Macaw is also recovering quickly in the Pacific coast of Costa Rica (see below). As a result it seems clear that the current culture and regulatory climate are one in which this species has

the ability to recover. This suggests that the species will be able to expand further in this northeastern region. It also suggests that within Costa Rica, the USFWS is not justified in making a finding that “We found that the existing regulatory mechanisms were inadequate in addressing these threats.”

5. **Amount of occupied habitat.** The recent sightings on eBird, many of them since 2012 suggest that the Scarlet Macaws in northeastern Costa Rica (not counting adjacent areas in Nicaragua) inhabit over 2000 km². Unfortunately it is impossible to estimate the directly the number of birds in this large and under visited area because there are no density estimates calculated in this region. However, there may be some way to get a general idea of the density. In 2008 the experts of the Lapa Verde project estimated that there were about 210 Great Green Macaws in northeastern Costa Rica in an area of about 3000 km² (Monge et al. 2008). This gives a density of about 0.07 birds per km². At this same time, in the heart of the range of the Great Green Macaw transect censuses found 30 groups of Scarlet Macaws and only 12 groups of Great Green Macaws. If this trend were to hold for Scarlet Macaws throughout the occupied area there could be 200 or more Scarlet Macaws in northeastern Costa Rica.
6. **Amount of potential habitat and potential population expansion.** A quick calculation in Google Earth suggest that the amount of continuous lowland area in northern, north-eastern and eastern Costa Rica exceeds 11,000 km². USFWS in the proposed rule suggest that since Scarlet Macaws occur at lower densities in disturbed habitat the population expansion will be limited. *“Thus, it is reasonable to conclude that the extent of increase in the population in this region (eastern Costa Rica) will likely be limited due to past and ongoing deforestation in the region.”* If we use the data from references cited to support this argument, we could estimate the potential future expansion of Scarlet Macaws in NE Costa Rica. Cowen 2008 gives the unrealistically high density estimate of about 6.9 scarlet macaws per km², if we multiply that by the 11,000 km² we would have over 75,000 macaws in northern Costa Rica. Admittedly these numbers are a complete exaggeration but this is one set of numbers cited by USFWS as evidence that expansion in NE Costa Rica would be minimal. We could use the much more reasonable

densities calculated by Lee and Marsden 2012 of about 0.6 scarlet macaws per km² or Lloyd 2004 of 0.5 birds per km² both in somewhat disturbed areas. With these lower estimates we could theoretically have a population of 5000 to 6000 macaws in northeastern Costa Rica. Even at the minimal density of 0.1 estimated above the population could easily pass 2200. As a result, the conclusion that the future expansion of Scarlet Macaw in northeastern Costa Rica will be minimal is unwarranted.

7. **Deforestation rate.** As mentioned above

<https://earthenginepartners.appspot.com/science-2013-global-forest> shows the region in northeastern Costa Rica has having a mix of forest loss and forest gain and reasonable amount of remaining forest cover. Given that the species is already expanding in to this region, there is no reason to think that deforestation will effectively remove all the forest cover or other habitat elements needed for Scarlet Macaws from this region in the coming decades. The birds are known to like isolated trees in pastures for both nesting and feeding, so there is a reasonable chance that even with relatively high levels of disturbance the species can persist if there is not a great poaching risk.

As a result, I see no evidence to support the USFWS conclusion that *“the extent of increase in the population in this region (eastern Costa Rica) will likely be limited.”* Instead I would support a statement to the effect that the recovery of *A. m. cyanoptera* in northeastern Costa Rica has the potential to be the most important recovery and conservation improvement in the range of the subspecies.

In addition, it strikes me as inappropriate that data collected by one of the best and longest running macaw research projects (the Great-Green Macaw Project headed by Monge and Chassot) are presented as anecdotal. The reality is that the species HAS increased in this region in the past 2 decades and the USFWS needs to present it as such. See final section on “Information interpretation by USFWS” for more on this issue.

Status of A. m. cyanoptera in the remainder of the range

The USFWS concludes that there are 6 isolated populations of *A. m. cyanoptera*. On the map on page 20304 they should also include the remnant population at Volcan Cosiguina Nicaragua and

the introduced populations in Mexico, Honduras (see comments by Janice Boyd for a full list and geographic locations for these introduced populations).

Fragmentation: The service reports that the subspecies and its habitat are “highly fragmented.” It is likely that the population in northern Peten Guatemala and the population in southeastern Mexico are connected. There is continuous habitat and the birds from Guatemala when they disperse in the non-breeding season are known to go to the west of their breeding grounds (information from the WCS project in Peten). In addition there is almost no coverage by eBird participants in the highly remote regions between these two populations. As a result it is likely that these two populations are not isolated from each other.

However, there is all indication that the Belize population is currently isolated from the Guatemala and Mexico populations. The area around Flores and Tikal are well covered by eBird observers, but there have been no Scarlet Macaws reported near Tikal or Flores since 1992. The reason for this is unknown, as there is high quality habitat in relatively large blocks in the region.

Fortunately, the deforestation rates in the core range of Scarlet Macaws in Belize seem to be minor. In addition, comments on this listing by Mark McReynolds strongly suggest that poaching of the species in Belize is currently not a threat to the species <https://earthenginepartners.appspot.com/science-2013-global-forest>. As a result, the most parsimonious conclusion is that the species is either stable or increasing in this country.

I agree with the service that the population in the Mosquitia of Honduras and Nicaragua is likely isolated from all other populations. Unfortunately eastern Nicaragua is facing very high deforestation rates and continued domestic trade, so there seems to be little hope for the joining of the populations in northern and southern Nicaragua at any point in the near future. In addition, Hille reports that the species was not recorded in systematic surveys of the country over the last 20 years, suggesting that the range in country is likely very limited as suggested by all other data sources up until this point (Hille 2014).

Overall status of A. m. cyanoptera

The data presented here suggest that the population in Costa Rica is increasing and expanding rapidly in to new lowland areas. There are likely hundreds of individuals in this population and the potential for population increases are great. In addition, the information presented here suggests that the population in Belize may be stable or increasing. The information presented in the comment by Janice Boyd suggests that work in the Peten area is improving the conservation of the species. In addition, education, research, management and reintroduction projects are being conducted in Mexico, Guatemala, and Honduras. In these regions there has been no evidence presented by the USFWS or others that I am aware of any indication from the eBird sightings that the species has suffered significant range reductions in the past decade. As a result, the subspecies is not currently threatened with extinction throughout its entire range. Based on this, the subspecies should not be considered currently threatened with extinction. For this reason, the USFWS finding of “endangered” is not warranted.

Penard et al study information:

Title: Recovery of the Scarlet Macaw (*Ara macao*) and its potential interaction with Great Green Macaw in Maquenque National Wildlife Refuge, Costa Rica

Authors: Cindy Penard, Oscar Ramírez Alán, Guisselle Monge Arias, Olivier Chassot, Vladimir Jiménez Salazar, and Donald J. Brightsmith

Abstract. - Population density of Scarlet Macaw (*Ara macao*) in Maquenque National Wildlife Refuge, Costa Rica. - The Scarlet Macaw (*Ara macao*) is one of the most spectacular psittacines in the Neotropics. Although the species is still relatively common widespread in South America, the pressure from poaching and habitat and fragmentation has contributed to their decline in Central America. In Costa Rica, the populations are fragmented and the species is considered to have disappeared from the slope of the Caribbean after the 1950s. Nevertheless, there were reports of important groups in the northeastern Costa Rica have increased since 2004. For this reason, we examine here the abundance, the density and the foraging regime of the Scarlet Macaw in the Maquenque National Wildlife Refuge. Groups were observed reaching up to 9 individuals and They fed mostly from nonnative tree species in forest plantations such as terminalia (*Terminalia ivorensis*) and teak (*Tectona grandis*). The Scarlet Macaw seems to adapt well to fragmented and heterogeneous landscape of the area. This behavior contrasts in the same area with the Great Green Macaw (*Ara ambiguus*), an endangered species for which Maquenque is the last breeding area in Costa Rica.

Status of A. m. macao in Costa Rica

Status of the ACOSA Population

From Finding for the Northern Subspecies *A. m. cyanoptera*, P. 20312. *The most recent estimate of the ACOSA population, based on interviews with community members, is about 800–1,200*

birds. Although the majority of residents interviewed indicated that there appeared to be more macaws in the year 2005 than in the 5 years previous (the year 2000), these results are based on perceptions of scarlet macaw abundance at two points in time over a limited time period (2000 versus 2005). Thus, although scarlet macaws appeared to be more abundant in 2005 than in 2000, whether this conclusion reflects an increasing population trend is unknown. For this reason, we consider the results of Dear et al. to indicate that the ACOSA scarlet macaw population is currently stable and that the distribution is increasing (Dear et al. 2010, p. 20).

The evidence from Dear et al. shows that the range of the Scarlet Macaw is expanding up from the Osa Peninsula in the south. In addition, the evidence from eBird shows that the species is being sighted up and down the ENTIRE south Pacific coast from ACOPSA (Carara) down to ACOSA (Osa Peninsula). In addition, many of the sightings are from after 2005 when Dear did her work. For example, of the 30+ sightings in the area around Uvita, Costa Rica, all but one are after 2013. This shows that the species has continued to spread up the coast in the past decade. Given evidence presented here, it is clear that the ACOSA population is expanding. The population is clearly occupying a greatly increased area of its historical range in habitat that retains a great deal of forest cover and is not suffering from current deforestation

<https://earthenginepartners.appspot.com/science-2013-global-forest>. There is no reason to assume that the population is not increasing and that this is just a case of the same number of individuals expanding up and down the coast. This sort of displacement of birds from a stronghold to new areas in the absence of real population growth could be expected if there was massive deforestation or other disturbance in the Osa Penninsula yet there is no evidence of this having happened. It could be expected if a massive climate event caused a crash in food supply in the Osa Penninsula (but in this case the macaws would likely invade the new areas and return to the core area when the climate and food supply returned to normal). However, there is no evidence of either of these happening. As a result, the most parsimonious explanation is that the ACOSA population is increasing significantly and expanding its range relatively rapidly up the Pacific Coast of Costa Rica. As a result the finding by the USFWS that *“the ACOSA scarlet macaw population is currently stable”* is not supported by the best available

scientific data and is therefore unwarranted. Instead the finding should read “the ACOSA scarlet macaw population is currently expanding rapidly in both size and geographic area covered.”

Status of the ACOPAC population

P. 20312 However, new information indicates that the ACOPAC population is currently stable, and that the ACOSA population—the largest of the DPS— is currently stable or possibly increasing.

P. 20312. Although the ACOPAC and ACOSA populations are considered stable, both are small and isolated, and their range represents only a portion of the range of the DPS.

It is clear from the new (post 2012) evidence presented in eBird that the Scarlet Macaws in the ACOSA area are not confined to a small area in the central coast as suggested by available online range maps such as those presented in Neotropical Birds (available at: <http://neotropical.birds.cornell.edu/map/?cn=Scarlet%20Macaw&sn=Ara%20macao&sc=scamac1&species=20990>). By all indications the species has been expanding rapidly down the coast from the traditional stronghold in and around Carara National Park. From a quick review of a small fraction of the sites reporting the species in eBird, you find the following. At Jaco, 20 km south of the Bridge over the River Tarcoles where censuses of the Carara population were traditionally conducted, there have been at least 56 sightings reported to eBird and 45 of them have been since 2013. This includes groups of 30, 15, 25, 13, and sightings of pairs during the height of the reproductive season. Similarly Playa Hermosa ~30 km south of the Tarcoles Bridge reports over 79 sightings with 71 sightings since 2012 including groups of 15, 12, and 21. At Manuel Antonio National Park (about 70 km south of the Tarcoles Bridge) there have been 38 sightings 18 since 2013.

It is hard to determine how far south this population may have spread because of the fact that the ACOSA population is simultaneously expanding from the south so sightings may represent individuals from either of the populations. The approximate midway point between the traditional ACOSA and ACOPAC strongholds lies between Manuel Antonio to the North and Uvita to the south. In the area between these two sites lies Dominical and adjacent areas where there have been 19 sightings, 13 of which were since 2012.

As the evidence presented here suggests, the ACOPAC population of *A. m. macao* should no longer be considered to be confined to the Carara National Park region. The birds are clearly regularly occurring at sites 20, 30 and 70 km to the south. In conjunction with this major range expansion, there is no reason to believe that the expansion is due to birds being displaced from their traditional core areas. Instead the most parsimonious explanation is that the ACOPAC population is expanding rapidly to the south in both geographic range and total numbers. As a result of this expansion, censuses at the Tarcoles River Bridge (as done by traditionally by Vaughn and collaborators) can no longer be used to give us a complete count of the total number of birds in this population.

In addition, there have been sporadic reports of Scarlet Macaws from the areas immediately to the northwest of Carara. While the area does still contain a patchwork of forested habitats, this area continues to suffer from deforestation at a higher rate than those immediately to the south. As a result, the pattern suggests that Scarlet Macaws may frequently wander through these areas but may not be present continuously nor at high densities. To the north the nearest area with repeated sightings of the species is Ensenada Lodge at 60 km north of the Tarcoles Bridge. This site has 16 sightings 13 since 2012. However it is unclear what the source of these birds may be. Group sizes have been small (1 to 4) and the site is 40 km from the population at Palo Verde and 60 km from the core of the ACOPAC population. These could be escaped or released birds or could be natural dispersers from either of the above populations. The USFWS should make a concerted effort to contact sources familiar with the birds at Ensenada Lodge to determine the conservation relevance of this group.

In sum, the ACOPAC population of Scarlet Macaws is clearly expanding in numbers and geographic range to the south and individuals are visiting and may be attempting to occupy new areas to the north, but evidence is weak to support successful establishment and expansion to the north. However, due to the massive expansion seen to the south of Carara National Park the USFWS finding that the ACOPAC population is “small and stable” is unsupported by the evidence. Instead the ACOPAC population should be described as “rapidly expanding to the south in both geographic range and size.”

Isolation of the ACOPAC and ACOSA populations

P. 20311: *A. m. macao* has been extirpated from mainland Panama and much of its former range in Costa Rica, and the species has been all but extirpated from large areas of northwest Colombia. Its remaining distribution is highly fragmented, consisting of two isolated populations (ACOPAC and ACOSA) and an unknown number of birds isolated in northwest Colombia.

Isolation from a genetic point of view is defined by the interchange of < 1 individual per generation. It is clear from the evidence presented above that the current distribution of the Scarlet Macaw is basically continuous from the Osa Peninsula (ACOSA) to Carara National Park (ACOPAC). Manuel Antonio National Park 70 km south of ACOPA and Uvita 70 km north of the Osa Peninsula are separated by only 50 km and between these points lie the sightings from Domincal and 8 or so other sites with sporadic reports of the species. Given the massive increase in sightings in the region since 2012, the forest cover status, and the number of sightings in this 50 km section, there is every reason to believe that the abundance of Scarlet Macaws in this area will continue to increase and the connection between the ACOPAC and ACOSA populations will be complete within only a few years.

There is no reason to believe that the ACOPAC and ACOSA populations are genetically isolated at the present time, and there is no reason to believe that the populations will be isolated in any meaningful way within the next 5 to 10 years. As a result the finding by the USFWS that the ACOPAC and ACOSA populations are isolated is unwarranted.

General Isolation within Costa Rica

P. 20311: *Its remaining distribution is highly fragmented, consisting of two isolated populations (ACOPAC and ACOSA) and an unknown number of birds isolated in northwest Colombia.*

As reported above, there have been sporadic reports of Scarlet Macaws from the areas immediately to the northwest of Carara. While the area does still contain a patchwork of forested habitats, this area continues to suffer from deforestation at a higher rate than those immediately to the south. As a result, the pattern suggests that Scarlet Macaws may frequently wander through these areas but may not be present continuously nor at high densities. To the north the nearest area with repeated sightings of the species is Ensenada Lodge at 60 km north

of the Tarcoles Bridge. This site has 16 sightings 13 since 2012. However it is unclear what the source of these birds may be. Group sizes have been small (1 to 4) and the site is 40 km from the population at Palo Verde and 60 km from the core of the ACOPAC population. These could be escaped or released birds or could be natural dispersers from either of the above populations. The USFWS should make a concerted effort to contact sources familiar with the birds at Ensenada Lodge to determine the conservation relevance of this group. Regardless, recent sightings suggest that the birds in Palo Verde National Park are not as isolated from other Scarlet Macaws as traditionally thought.

Writing about the Palo Verde National Park population. P 20311 “... *an isolated group of 10–25 birds in Palo Verde in northwest Costa Rica*” “. . . *the Palo Verde group is extremely small, we are unaware of any information suggesting that this group represents a self-sustaining, viable population.*”

As a student I saw a nesting pair in spring 1992 (my first ever Scarlet Macaws) near the OTS station at Palo Verde National Park. At the time the population was seen as a remnant and I was inclined to write it off from a conservation perspective. However, 25 years later the population is obviously still persisting. According to eBird, there were as many as 14 seen in March of 2014 and 9 in April of 2015. As a result the absolute minimum in this population as reported by USFWS must be increased from 10 to 14. In the past few years individuals have been repeatedly seen throughout Palo Verde National Park and in the surrounding areas. The spatial and temporal patterns of sightings suggest the population is persisting and continuing to explore the surrounding area. The possibility exists that the population is increasing but that is not easily discernable from the current data. The USFWS should contact Jim Zook, eBird contributor and member of the CR Ornithological Association/CR Ornithological Union. He has a large number of sightings of individuals since 2000 (jrzook@racsa.co.cr). He should be able to provide good information on whether or not the populations are expanding in the Palo Verde region and in other parts of the country.

In summary, there is no evidence that the Palo Verde population is declining or inviable. The fact that 14 birds have been seen simultaneously in 2014 and that the birds are being seen

throughout the area more strongly supports the contention that the population is self-sustaining and viable than the contrary. As a result, I think that writing off this population and failing to consider it is inappropriate. It should be mentioned in all discussions of the species in the country by USFWS especially with respect to the conservation of the species in Guanacaste.

Another interesting fact is that there have been a relatively large number of scattered reports of Scarlet Macaws from down the east side of the Gulf of Nicoya in the direction of the ACOPAC population. The fact that the Palo Verde population and the Tarcoles Bridge are separated by only 100 km (< 3 hours flight time for a Scarlet Macaw) and the distribution of sporadic sightings throughout the area strongly suggests that individuals may be dispersing from one population to the other or that individuals from the matrix of habitat could be entering the Palo Verde Population. I think that the one would be hard pressed to defend the position that < 1 new Scarlet Macaw per generation is joining the population at Palo Verde National Park.

In summary given its long persistence and current levels of sightings, there is no evidence that the Palo Verde population is about to go extinct. Given the fact that there are sightings of Scarlet Macaws scattered from Palo Verde NP south to Carara NP and throughout western Guanacaste, this population no longer should be considered completely isolated and irrelevant from a conservation perspective.

On the Nicoya Peninsula there are currently released groups of birds at Punta Islita, Playa Tamboor and Curu National Wildlife Refuge. The eBird data suggest that the populations are still fairly isolated but given their close proximity (all three within 50 km) these populations may merge in the near future. It is difficult to determine how these populations will fare over the coming decades, but these three could in the future form a core to help repopulate the Nicoya Peninsula. If this happens, these populations could be reinforced by individuals that disperse from Carara (35 km to the east) or Palo Verde (60 km to the north).

Given the current distribution of sightings of Scarlet Macaws from Costa Rica, it is clear that there are Scarlet Macaws moving through very large areas of the landscape. The sightings presented in eBird undoubtedly represent a mix of native, reintroduced and escaped individuals. However, the three largest populations in the country are expanding (ACOPAC,

ACOSA and *A. m. cyanoptera* in the northeast). This shows that the nation has created an amicable regulatory and social environment that allows the species to not just persist but reproduce and recover. As a result, it is reasonable to expect that these birds which are moving through the landscape (those reported sporadically from widely separated areas in eBird) will join established groups or create new groups and aid in the overall recovery of the species at the national level.

When viewed from a national level E-bird clearly shows that SCMA's are being seen in a nearly continuous strip in western Costa Rica that extends for over 330 km and includes Palo Verde National Park in the North down beyond the Osa Peninsula to the introduced population at Tiskitia Jungle Lodge in the south. In the north the species is scattered throughout the lowlands of mainland of Guanacaste with introduced populations at the tip of the Nicoya Peninsula. As a result, the finding by the USFWS that "*Its remaining distribution is highly fragmented, consisting of two isolated populations (ACOPAC and ACOSA)*" is an overly pessimistic view of the current situation and is unwarranted.

Occupancy of the historic range of *A. m. macao* in Costa Rica.

P. 20311: *A. m. macao* has been extirpated from mainland Panama and much of its former range in Costa Rica.

Given the redrawing of the range of *A. m. macao*, the recent expansion of *A. m. macao* in the Pacific Coast, the apparent stability of the Palo Verde population, the reintroduced individuals in the Nicoya Peninsula, and the sporadic sightings throughout western Guanacaste the USFWS needs to explicitly reassess its finding that the species has been extirpated from much of its former range in Costa Rica. USFWS should estimate the total range and the % occupied currently and present that in the next revision of the rule.

Extinction threat for *A. m. macao* in Costa Rica

P. 20312 *However, new information indicates that the ACOPAC population is currently stable, and that the ACOSA population—the largest of the DPS— is currently stable or possibly increasing. Therefore, as the two largest populations within the DPS are currently stable, it is*

reasonable to conclude that the northern DPS of A. m. macao is not currently in danger of extinction.

The evidence presented above shows that *A. m. macao* in Costa Rica is expanding rapidly on the southern and central Pacific Coast. The situation in Guanacaste is much more complex, but there is no indication that the species is declining. As a result, it is reasonable to conclude that the northern DPS of *A. m. macao* is not currently in danger of extinction (and given its rapid expansion) nor is it likely to become endangered in the near future. Given that the main population segment of the northern population of *A. m. macao* is not threatened, the USFWS should reevaluate whether or not the northern population as a whole warrants threatened status.

Status of *A. m. macao* in Panama

There are 7 recent e-bird sightings of the species from western Panama. See the following link for a good description and photos by well-known Neotropical Birder Marshal Iliff:

<http://ebird.org/ebird/view/checklist?subID=S23137051>

If these are wild birds it would suggest that the population from Costa Rica may be dispersing south over the border. In Tiskita there is an ongoing reintroduction project. When I was talking with the manager of the reintroduction project about 10 years ago he mentioned that the birds were interacting with wild native birds in the region. The border of Costa Rica and Panama in the south is heavily forested and could also be harboring Scarlet Macaws. As a result, the species may be able to expand over the border if the habitat and socioeconomic forces allow it.

Three sightings from the Azuero peninsula in southern Panama are also of interest. Great-green Macaws are known to persist in the area so there is the possibility of misidentification, but the three Scarlet macaw sightings are east of the area where the Great-greens have been sighted. Regardless of the nature of this sighting this IS likely to be a small and isolated population if it still exists.

Listing of southern subspecies of *A. m. macao* as “threatened”

P 20313: *As a result, the similarity of appearance between the unlisted southern DPS of *A. m. macao* and subspecies crosses to the listed northern DPS of *A. m. macao* and *A. m. cyanopectera* may result in the ability to pass off a protected specimen as the unlisted DPS or unlisted subspecies cross and poses an additional **threat** to the Northern DPS and *A. m. cyanopectera*.*

P 20314: *In most instances, the proposed rule will adopt the existing conservation regulatory requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Wild Bird Conservation Act (WBCA) as the appropriate regulatory provisions for the import and export of certain scarlet macaws.*

There is currently no evidence that I am aware of that the possibility of passing off individuals rises to the level of a threat given the definition of the word “threat” as used in this ruling. In order to show that this is actually a threat, the USFWS needs to show that someone trying to pass off an *A. m. cyanopectera* or northern *A. m. macao* as a southern *A. m. macao* could actually impact the wild population of *A. m. macao* or *A. m. cyanopectera*. If they cannot, then there would be no reason to list the southern subspecies or hybrids as threatened and listing them would be little more than an additional bureaucratic burden of no real conservation consequence.

If someone was trying to pass off as an *A. m. cyanopectera* or northern *A. m. macao* as a southern *A. m. macao* AND if the bird comes from a captive origin then there would be no threat to the wild populations as the movement of captive birds does not endanger the wild populations (the movement would already be subjected to extensive permitting and reviews under CITES and the WBCA so adding ESA protection would provide little extra protection). If the bird does NOT come from a captive origin then the importation protections that are in place due to the Wild Bird Conservation Act and CITES would allow the USFWS to prohibit its importation unless it was for an approved conservation purpose. As a result if someone was trying to pass off as an *A. m. cyanopectera* or northern *A. m. macao* as a southern *A. m. macao* AND if the bird comes from a wild origin then the provisions of the WBCA and CITES would ensure that the movement of the bird in to the USA would not be a threat to the wild populations. As a result, the evidence

suggests that listing southern *A. m. macao* would provide little or no additional conservation benefit to the wild populations of *A. m. cyanoptera* or northern *A. m. macao*.

A purely precautionary listing *A. m. macao* based on similarity alone is not warranted in the absence of any potential threat to the wild populations. As a result, in order for the USFWS to justify listing of the southern *A. m. macao* they would need to describe scenarios and show evidence of the plausibility of those scenarios through which someone trying to pass off as an *A. m. cyanoptera* or northern *A. m. macao* as a southern *A. m. macao* would actually rise to the level of a THREAT to the WILD population of either *A. m. cyanoptera* or *A. m. macao*. To the contrary, the listing of *A. m. macao* would cause extra layers of bureaucracy that would in no way benefit any Scarlet Macaws living in the wild.

Impacts on research

It is unclear if listing the various populations of the species as threatened and endangered will further inhibit conservation related research on the species. As of now the layers of permitting and bureaucracy needed to export samples for conservation research required by CITES, USDA, USFWS, university IACUC committees, and the host country governments (thanks to the implementation of the Convention on Biological Diversity) have already caused delays and increased expenses in time and money in exportation of samples. It is unclear to me if regular research activities by US based organizations (public universities which receive federal funds) will need additional permits for research on listed populations of Scarlet Macaws. If additional permits and reporting are needed this would divert even more resources of time and money away from conducting research and conservation activities and waste them on permitting and reporting. As a result, the USFWS should carefully consider for each population to be listed as threatened or endangered the implications for research permitting and take whatever steps possible to ensure that research progress, including foreign field work and the moving of samples in to and out of the USA, are not further delayed or complicated by these listings. It would be unfortunate if listings caused real damage to the species conservation efforts while not extending extra conservation benefits.

Discounting release programs and failure to acknowledge future roles of releases

Reintroduction Efforts. P. 20311. In this section the USFWS discusses information on the conservation releases done in the Golfito region (the Golfito release and the Punta Banco release also referred to as Tisita in my writings here). This section does not mention the release projects conducted on the Nicoya Peninsula in Curu, Playa Tambor and Punta Islita or others in Guatemala, Honduras, etc.

P 20311. *We are not aware of any information indicating that these three captive release programs adhere to the IUCN Species Survival Commission guidelines for re-introductions, published by IUCN to help ensure that re-introduction efforts achieve intended conservation benefits and do not cause adverse side-effects of greater impact (IUCN/SSC 2013, entire; IUCN/SSC 1998, entire). Nor are we aware that these reintroduction programs adhere to recommendations of White et al. (2012, entire) for the reintroduction of parrots. Therefore, because we are unaware of information indicating that these captive-release programs are contributing to either the recovery or endangerment of the DPS, we do not consider these programs or the birds in these programs to be consequential in evaluating the status of this DPS.*

The current and past reintroduction efforts have added a few hundred Scarlet Macaws to the wild populations in Costa Rica. With three reintroductions happening in the southern Nicoya Peninsula there is a real chance that the species may begin to recover in this region. I do not have recent information from these sites, but if the individuals in these populations begin to reproduce there is a real chance that the Nicoya Peninsula could be repopulated in large part by the offspring of these individuals. The USFWS should reach out to the Ara Project in Costa Rica for an update on the status of the Scarlet Macaws (total numbers and breeding) at the sites where they work.

In the above entry no reference is made to the information in Brightsmith et al 2005. This includes information on the Curu project in Nicoya and on methods used in Golfito. The next

version of the proposed rule should address all the information and evidence in a balanced discussion of the potential risks and benefits of reintroduction.

With reference to the Palenque reintroduction project of A. m. cyanoptera:

Reintroduction Efforts P. 20308. *Conversely, releases of captive scarlet macaws could potentially pose a threat to wild populations by exposing wild birds to diseases for which wild populations have no resistance, invoking behavioral changes in wild macaws that negatively affect their survival, or compromising the genetic integrity of wild populations (Dear et al. 2010, p. 20; Schmidt 2013, pp. 74–75; also see IUCN 2013, pp. 15– 17).*

According to Estrada (2014, p. 345), the program in Palenque, Mexico was designed to align as closely as possible to the IUCN guidelines and the recommendations made by White et al. So far, the program shows promise for establishing a viable population of A. m. cyanoptera—96 scarlet macaws were released between April 2013 and June 2014 with a 91% survival rate as of May 2015. In addition, 9 nesting events and successful use of wild foods by released birds have been observed. However, while this program shows promise for reintroduction efforts towards the establishment of viable populations in the future, it is currently uncertain as to whether this captive release program has resulted in conservation benefits to the species at present (IUCN/SSC 2013, entire; IUCN/ SSC 1998, entire).

The above section and the entire document presented by USFWS completely writes off any past, present, or future possible conservation benefits of reintroduction to the conservation of Scarlet Macaws. The text goes to great pains to discuss the possible conservation risks yet does not discuss the possible conservation benefits to the species. The presentation seems to be inherently biased against reintroduction and not a fair weighing of the actual and potential conservation risks and benefits. In the next version of the proposed rule the USFWS should go to great pains to correct this apparent bias.

For example the service discusses the potential risks of disease and behavioral contamination of wild birds posed by the birds released at Palenque. However, the birds at Palenque are 120 to 150 km away from the nearest current wild populations. There is no reason to predict that a recently released sick or behaviorally altered macaw will fly over 100 km in exactly the correct

direction and pose a threat to the wild populations. A much more reasonable scenario is that if the population in Palenque is successful and expands, in 1 to 2 + generations it could come in contact with the wild population. By that time, disease and behavioral issues from the introduced populations would be long gone. In addition Scarlet Macaws are not inherently social and do not usually roost in large close knit groups. As a result, the species is likely to be quite resistant to the spread of disease in wild populations.

Similarly in Costa Rica, the release projects in the Nicoya peninsula likely pose no current behavioral or disease threat to the wild populations. Again a much more reasonable scenario is that if these populations begin to breed they will spread and colonize the southern Nicoya Peninsula and spread north as the wild populations from the north spread to the south with the populations meeting in 1 or more generations from now with no risk of disease or behavioral problems.

The other possible benefits of reintroduction efforts have also been discounted by the USFWS. Most reintroduction projects conduct environmental education at a local level and attract additional media attention at the local and national level. As a result each high profile reintroduction project educates the populace about the importance of Scarlet Macaws and of conservation and the environment in general. It is clear from the repeated findings of increasing populations that in Costa Rica the sociopolitical climate has changed from one of exploiting macaws to protecting them. It is likely that the reintroduction projects have contributed to this mentality and are contributing to this mentality in other areas throughout the range of the species.

In the Neotropics there have been a relatively large number of Scarlet Macaw release projects and many have had high survival success and some breeding success. I am surprised and disappointed that this has been almost completely discounted in the proposed rules by the USFWS.

Captive Scarlet Macaws as a Safety Net

P. 20304. It has also been suggested that pet scarlet macaws and scarlet macaws captive-bred for the pet trade provide a safety net for the species by potentially providing a source of birds for reintroduction to the wild.

This statement is undoubtedly true and applies for Scarlet Macaws and other species which are threatened in the wild and common in captivity. As I show here below, the arguments which USFWS use to refute these claims are short-sighted and do not accurately reflect the realities of the current situation.

P. 20304. Pet scarlet macaws are poor candidates for re-introduction programs because those bred for the pet trade are bred with little regard for genetics and include an unknown number of subspecies crosses (Schmidt 2013, pp. 74–75).

The genetic work done to date on Scarlet Macaws allows us to determine through genetic characteristics the approximate area from which Scarlet Macaws were originally collected. Given our current knowledge of genetic techniques and the rate at which genetic technology is progressing, it is already possible and will soon be simple to develop tests which determine where individual scarlet macaws have come from and whether or not they are from one pure single subspecies or a mix of subspecies. As a result, while some individuals of Scarlet Macaws in captivity in the USA will be a mixture of subspecies, it will be simple to determine which individual captive scarlet macaws are most valuable to the specific and currently unknown conservation problems faced in the future. These most valuable birds can then be used to begin conservation breeding efforts to produce birds for release back in to the wild.

The philosophy reflected in the statements by USFWS are extremely dated. It reflects the realities of the pre-genomics era and ignores the incredible pace of advance in the world of genetics. Since we are debating a decision to list Scarlet Macaws that could reduce or eliminate the captive Scarlet Macaw populations (especially of *A. m. cyanoptera*) in the USA forever, we need to think about how these birds can help conservation efforts using the genetic techniques that will be developed in the next 20, 50, or 100 years. Eliminating this captive population as an “insurance policy” now based on supposed genetic concerns is ill-advised.

P. 20304. *Pets socialized with humans fail to act appropriately with wild individuals when released, (Brightsmith et al 2005, p. 471)*

This is a true statement as my own research attests to. However, this interpretation shows some fundamental misunderstandings of animal behavior and how they reflect current conservation realities. Macaws RAISED as pets to adulthood and socialized by humans at all stages of life are not overly useful for release in to the wild because most do not have the skills they need to survive. However, my research shows that macaws bred in captivity and hand raised can form the core of release programs and survive in the wild: Brightsmith et al 2005 shows that Scarlet Macaws raised in isolation from humans, those raised in a rainforest lodge, and those raised in someone's dining room had high survival in the wild. These somewhat extreme examples show that captive bred birds raised under a broad array of conditions CAN and DO survive in the wild and be useful for reintroduction efforts. As a result, it is unwarranted to state that since human socialized pets are not good release candidates, ALL captive Scarlet Macaws have no current or future use for conservation.

Also the USFWS states that because birds raised to be pets cannot be released in to the wild they have no use to future conservation efforts. This is once again a very restrictive and short-sighted vision. Conservation is an activity that must be thought about at the level of decades and centuries if we are to be successful in truly aiding in conservation. Especially with species that can live for multiple decades like Scarlet Macaws.

There are two clear ways in which birds raised for the pet trade can contribute to conservation efforts.

1) Young birds raised for the pet trade can in the first year or so be tested for genetic makeup, isolated from people and integrated in to pre-release flocks and learn to survive in the wild. Since the techniques used at the Curu and Golfito sites in Costa Rica (Brightsmith et al 2005) span the range of the types of rearing done for many birds which are raised for the pet trade, it is clear that young birds could be integrated in to release programs regardless of how they were raised as young chicks.

2) Older birds that cannot be released in to the wild may still be taken in by a breeding program and set up to breed (Rick Jordan personal communication). Those that breed can then produce offspring that can be raised and integrated in to conservation release programs.

P. 20304. “. . .and individuals held as pets may pose a disease risk to wild populations (Brightsmith et al 2005, p. 471).”

Individuals that have been bred in a closed facility and tested for the common parrot illnesses (Avian Herpesvirus, PDD/Avian Borna Virus, Beak and Feather disease, etc) present almost no disease risk to or wild populations or other captive birds. In addition, different levels of disease risk can be managed through a mixture of testing, quarantining, and maintaining a closed colony. As a result, each individual bird can be assessed with regards to their potential disease risk and that risk managed. In the end, some individuals will be deemed unusable for conservation related purposes while others could be used for conservation breeding and some for direct release in to the wild.

In addition, as discussed above, if release sites are placed at a distance from the current natural populations the most likely is that the birds will not mix within the first generation. Instead as the two populations expand in the future they may come in to contact. Alternatively the satellite population may act as a social attractant to bring in individuals dispersing from the wild population and this would help expand the breeding area of the wild individuals and introduce genetic diversity and cultural knowledge to the reintroduced population.

As with all other aspects of avian science, our understanding of disease and diagnostic testing are constantly improving. In just the last few years we have determined the cause of Proventricular Dilatation Disease and developed ELISA and PCR tests (Hoppe et al. 2013). Over the coming decades there is every reason to believe that our ability to test for and prevent the spread of avian diseases will improve. As a result, our ability to use captive individuals for conservation purposes will continue to improve. However if current actions result in the elimination of potentially valuable captive populations, this option will be lost to us in the long term.

The trend in this document is for all current and future birds held in captivity in the private sector to be considered as “pets.” No mention of breeding birds is made nor the clear benefits of having populations of captive birds that can breed large numbers of macaws that can then be genotyped and used to aid the conservation of the species.

We still do not know the perfect methods for releasing parrots in to the wild. The hand raised birds in the projects reported in Brightsmith et al 2005 were not breeding at a high enough rate to be self-sustaining. However the field of parrot reintroduction science has made great advances in recent decades (White et al. 2012, 2013). We have come a long way since the early release efforts of the 1980’s and 1990’s (Snyder et al. 1994; Snyder et al. 1987). The USFWS in making statements about the potential future of parrot reintroductions needs to see not only the many current successes but also look in to the future with a vision that includes the fact that new studies are underway, other new studies will begin, and our knowledge of parrot reintroduction will continue to expand. As a result and birds once thought useless or marginally useful may become highly valuable. However the current proposed rule does not reflect the fact that reintroductions could become important in the future.

In summary the implicit finding of the proposed rule that reintroductions are of no current or future use to Scarlet Macaws is not warranted. Techniques of genetic testing, disease screening and macaw reintroduction continue to improve. The USFWS needs to explicitly address these realities in the next version of the proposed rule.

Pet Parrots ≠ Captive Parrots

Throughout this proposed rule all captive parrots are considered basically synonymous with pet parrots. However, a large number of Scarlet Macaws are held as breeders to produce stock for the commercial pet trade. As mentioned above, breeders can produce young which can then be specifically raised as release candidates. As a result, the USFWS should acknowledge the fact that there are breeding Scarlet Macaws in the USA and that these can be used to create birds that could be raised for release back in to the wild. Failure to do this is a failure to consider the future potential conservation benefits of these captive individuals and is a serious oversight.

The Irony of the Endangered Listing for A. m. cyanoptera

Currently in captivity in the USA there are members of both *A. m. macao* and *A. m. cyanoptera*. Due to the special consideration under section 4(b) taxa which are considered as threatened they will still be allowed to be traded for commercial purposes within the USA. As a result of this, the populations of those taxa will likely continue to be maintained in captivity. However, if *A. m. cyanoptera* is listed as Endangered, breeding of this subspecies by private breeders will likely all but cease and this subspecies in its pure form will likely go extinct in US aviculture. This is ironic because it is exactly this subspecies of Scarlet Macaw that is at the highest risk in the wild, and the one that would be most likely to benefit from reintroduction projects in the future. The argument that scarlet macaws in captivity are not useful for conservation efforts because breeders have traditionally mixed them is not valid, because genetic techniques already exist that will allow owners and regulators to determine which individuals are still pure *A. m. cyanoptera*. As a result, the USFWS should list the subspecies as “threatened” as discussed above or explicitly discuss in the next draft of the proposed rule the fact that a finding of “endangered” will likely result in the extinction of *A. m. cyanoptera* in US aviculture and this could eliminate potentially important breeding stock and genetic variation from the global population of *A. m. cyanoptera*.

Information interpretation by USFWS

P 2306: *Distribution and Trend: Anecdotal evidence on scarlet macaws in northeast Costa Rica obtained during several years of research on great green macaws (Ara ambiguus) indicates that scarlet macaws in this region are increasing in number (Monge et al. 2012, p. 6, citing Chassot and Monge 2004, and Penard et al. in prep; Brightsmith 2012, <http://www.regulations.gov>: Docket number FWS–R9–ES–012–0039 #0066).*

P 20309: *Reevaluation of Status of A. m. cyanoptera: While anecdotal observations suggest the population in the eastern border region of Costa Rica and Nicaragua has increased in recent years.*

In scientific writing “anecdotal evidence” carries much less weight than rigorous scientific studies. Unfortunately in the world of wildlife policy and regulations there are few rigorous

scientific studies carried out to test hypotheses about the status and threats of endangered species (especially for foreign species). As a result, the vast majority of the evidence used to create rules and determine endangered status by IUCN, USFWS, etc is more like anecdotal evidence than like rigorous scientific studies.

In the proposed rule it is clear that the authors are using the phrase “anecdotal evidence” to downplay or discredit certain studies. It reads as though while they acknowledge that the information exists, they wish to discount it. In the above statement, the information by Monge was collected by one of the longest running macaw research projects in Central America (the Great Green Macaw Research Project) during research activities on the congeneric Great Green Macaw. The data collected for Penard, were scientific data suitable for scientific publication. Why is the USFWS labeling these data as “Anecdotal?” These data are better than the vast majority of those used in species determinations globally.

This instance seems to be part of a potentially larger pattern in the document. The label “anecdotal” is used three times in the proposed rule: to describe the above research showing an increase in NE Costa Rica, information suggesting that the population on Isla Coiba is currently stable, and information showing the expansion of the ACOSA population. In all three instances the population status was better than stated in the 2012 Proposed Rule. In contrast, evidence about extinctions and threats which suggest higher level of threats to populations, no matter how tenuous the evidence, is never described as “anecdotal.” In the revision of the proposed rule the USFWS should look to use a more even handed approach and not discount positive information of the species (or even give the impression that they are discounting positive information) through the use of the word Anecdotal.

The feeling that positive information is being discounted compared to negative information on population status seems to go beyond just the use of the word Anecdotal as describe here. It is reinforced by many of the issues discussed above. For example the proposed rule comes to the following conclusions (simplified and reworded by the author):

- The extent of increase in the population of *A. m. cyanoptera* in eastern Costa Rica will be limited and this implies that this expansion will be mostly irrelevant to the future of the subspecies
- The expansion of range of Scarlet Macaws in ACOSA does not mean an increase in population size
- The ACOPAC population is not increasing in size or geographic range
- The Palo Verde population is irrelevant from a conservation perspective
- The populations in Costa Rica are small and isolated
- Reintroduction projects are irrelevant to the conservation of Scarlet Macaws
- All captive Scarlet Macaws are basically synonymous with pets and therefore not useful for conservation
- The wild population of *A. m. cyanoptera* are threatened by the possibility of someone trying to pass off an *A. m. macao* as an *A. m. cyanoptera*

In all these instances the USFWS has interpreted the available information that the species is more threatened than it actually is and that all activities involving captive macaws are not useful to conservation. In a balanced evaluation of scientific evidence the evaluator is equally likely to err on both sides of the issue (in this case both towards overestimating the degree of threat and underestimating the degree of threat or over and underestimating the usefulness of captive birds in different scenarios). This balance was apparently lacking in the current document.

In the next round of the Proposed Rule for the listing of Scarlet Macaws the USFWS should take pains to eliminate any real or potential bias from the document by ensuring that both evidence for and against endangerment are equally considered and that the potential uses of captive birds in conservation are considered more carefully.

Partial list of references cited

Other references cited in the text are as found in the Proposed Rule

Hille, D. (2014). Occupancy trends in the family Psittacidae in Nicaragua over a 20-year monitoring period. MS M.S., University of Oklahoma

- Hoppes, S. M., I. Tizard, and H. L. Shivaprasad (2013). Avian Bornavirus and Proventricular Dilatation Disease: Diagnostics, Pathology, Prevalence, and Control. *Veterinary Clinics of North America: Exotic Animal Practice* 16:339-355.
- Monge, G., O. Chassot, H. Chaves, J. E. Rodríguez, G. Gutiérrez-Espeleta, K. Traylor-Holzer, and Y. Matamoros (2008). Taller de Conservación de la Guacamaya Verde (*Ara ambiguus*) Evaluación de Viabilidad Poblacional y de Hábitat (PHVA). Informe Final. 22 al 26 de setiembre, 2008. Estación Biológica La Selva Heredia, Costa Rica.
- Snyder, N. F. R., S. E. Koenig, J. Koschmann, J. Koschmann, H. A. Snyder, and T. B. Johnson (1994). Thick-billed Parrot releases in Arizona. *Condor* 96:845-862.
- Snyder, N. F. R., J. W. Wiley, and C. B. Kepler, (Snyder, N. F. R., J. W. Wiley, and C. B. Kepler)(Snyder, N. F. R., J. W. Wiley, and C. B. Keplers) (1987). The Parrots of Luquillo: Natural History and Conservation of the Puerto Rican Parrot. Western Foundation of Vertebrate Zoology, Los Angeles, California, United States.
- Sullivan, B. L., J. L. Aycrigg, J. H. Barry, R. E. Bonney, N. Bruns, C. B. Cooper, T. Damoulas, A. A. Dhondt, T. Dietterich, A. Farnsworth, D. Fink, et al. (2014). The eBird enterprise: An integrated approach to development and application of citizen science. *Biological Conservation* 169:31-40.
- White, T. H., N. J. Collar, R. J. Moorhouse, V. Sanz, E. D. Stolen, and D. J. Brightsmith (2012). Psittacine reintroductions: common denominators of success. *Biological Conservation* 148:106-115.
- White, T. H., N. J. Collar, R. J. Moorhouse, V. Sanz, E. D. Stolen, and D. J. Brightsmith (2013). Psittacine reintroductions and IUCN Guidelines - Response to Seddon. *Biological Conservation* 164:178-179.